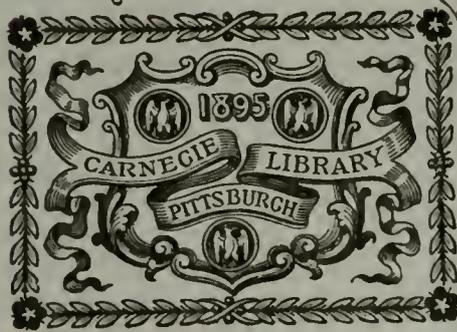


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The street railway franchise situation in Chicago remains practically unchanged. The mayor has submitted one message on this subject to the council and promises another one at an early date. Though every business man appreciates the absurdity of expecting the street railway companies to make any large investments until the question of franchise extension is settled, the mayor demands improved service at once and yet would postpone negotiations as to the franchises until the Legislature passes an act authorizing the city to own and operate street railways.

Some time ago in discussing the laws passed by various states for the protection of grade crossings of steam and electric railways we pointed out that while Illinois had no laws relating to the crossing rights of electric railways, it was probable that the general laws on crossings would apply to the electric interurbans which were incorporated under the general railroad law. The Illinois Railroad and Warehouse Commission has recently taken the position that it has jurisdiction of such electric lines, and decided that the Freeport General Electric Co., which desired to build a railway across the Chicago, Milwaukee & St. Paul, should erect an overhead crossing. An appeal has been taken from this ruling and the point will soon be adjudicated.

The appointment of a committee of 37 members at the recent meeting of the National Civic Federation in New York to act as a board of arbitration to settle labor disputes is a step in the right direction, and it is to be hoped that this board will be successful in effecting a peaceable solution of labor difficulties and will be able to prevent, at least in great part, the occurrence of strikes, which not only prove costly to the laborer as well as the capitalist, but which give rise to strife and bitter feelings, in stead of promoting the harmonious relations which ought to exist between the employer and employe. Both capitalists and laborers are working in their respective fields and all have rights which must be respected. It

is hoped that the new board will prove a sort of industrial clearing house where the grievances of both sides can be carefully discussed and thoroughly weighed; and with the weight of public opinion upon the side that is right, there is no reason why an amicable adjustment of disputes should not be readily reached. In the street railway field there have been within the last few years but few strikes which could fairly be settled by arbitration. The strikes have been in general the result of ill advised agitation and demands upon street railway companies which could not be reasonably granted. The street railway companies look well after the interest and comfort of their employes, knowing that efficient service can only be secured by a satisfied and contented class of men.

Disputes must arise at times between employers and employes, and the only rational way to effect settlements is by means of amicable argument, which will result in showing which side is right. It is in the prevention rather than the settlement of strikes that the permanent board of arbitration should prove of great value to the laborer and capitalist alike.

January 2d it was announced that the Everett-Moore syndicate found itself unable to meet the liabilities about to become due and had placed its affairs in the hands of a committee of Cleveland bankers who, in connection with the members of the syndicate, would administer the properties for the best interests of all concerned. The statement issued by the committee of bankers will be found on another page.

There cannot but be general regret that the syndicate has been even temporarily embarrassed in carrying out its plans. In the absence of detailed information from those in charge of the properties little can be said on their present condition, but the belief is general that the telephone rather than the traction interests are responsible for the difficulties.

The Everett-Moore syndicate controls about 1,300 miles of electric railways now in operation. Reports of operation for 9 or 10 months of 1901 for companies representing 800 miles out of the total of 1,300 are at hand. It appears that last year during the months covered by the reports, these companies showed gross earnings of \$6,100,000 as compared with \$5,310,000 during the corresponding period of 1900. The amount available for dividends was \$1,560,000 last year as against \$1,190,000 in 1900. Expressed in percentages, the gross earnings were 14.7 per cent greater and the amount available for dividends 31.3 per cent greater for that portion of 1901 covered by the report than during the corresponding months of the preceding year.

Concerning the other railways we have the statement of Mr. Newcomb, chairman of the bankers' committee, under date of January 6th. He says: "The trial balance reports for November indicate that practically all the urban and interurban electric railways of the syndicate are money-makers."

The Union Traction Co. of Indiana is about to commence the publication of a weekly magazine to be devoted to the interests of that company, and we consider this to be one of the best possible methods by which a railway company can keep in touch with its patrons and disseminate information on matters of interest which every street railway company desires from time to time to address to the public. In the "Review" for April, 1899, we published an editorial advising railway companies to do a little printing of their own. This advice was called forth by the hostile attitude frequently if not generally assumed by the daily press in regard to street railway companies, and the necessity of defending themselves at times from wholly unwarranted attacks.

It is gratifying to note that our advice has borne fruit in the shape of several weekly street railway newspapers. Among these may be mentioned the New Orleans & Carrollton Railroad Weekly, the Four Corners, published by the Rochester Railway Co., and the Whalom Breeze, published by the Fitchburg & Leominster Street Railway Co. At the time of our previous editorial on this subject there was no further reason for the publication of papers by the railway companies except, as stated, to counteract the prejudices fostered by adverse daily paper criticisms. It was pointed out that a patient course of education should be carried on by such a publication in which the good work the company is doing should be set forth without boastfulness, but in the same general tenor

that the daily papers treat the local institutions which they desire to commend.

With the growth of the present extensive interurban railway systems there have arisen further reasons for the usefulness of such a publication. On a large majority of roads street railway parks are now maintained by the companies and at most of these parks theatrical and other forms of entertainments are given which can be excellently advertised through the medium of the street railway paper. Most of the long roads now operate under regular time schedules, and the distribution on the cars of a paper containing complete information as to the running of cars would prove most useful and would be generally appreciated by passengers.

We have been advised that in all cases where these publications have been undertaken that they have met with the ready appreciation of the public, and especially where the papers have been made interesting by the addition of bright, readable articles each new issue is eagerly looked for by the company's patrons.

A paper of this kind if conducted successfully will soon command sufficient outside advertising to at least pay the expenses of publication and distribution which, of course, must be gratuitous, and we know of no better means by which a railway company can keep itself well and favorably known to the travelling public.

Pensions for Employes.

On another page we publish a full exposition of the plan for pensioning superannuated employes, and providing insurance in case of sickness or death, which has been adopted by the United Traction & Electric Co., of Providence, R. I., and which will we believe prove very interesting, especially to those concerned in the management of street railway companies that have already been in business for a long term, or that succeed to the business of such a company. The adoption of such a policy by private corporations is a comparatively new thing in this country and the United company of Providence is the first street railway here to inaugurate it. The question of what to do with faithful employes who have outgrown their period of activity is one which we know has already presented itself to a number of our readers, and it will occur to others each year.

There is no question but that a man who has labored faithfully during the years when work was a physical possibility has earned his living; society will care for him but at the alms house, which cannot but be viewed with terror by a man having any self-respect. It may be argued that the employer in whose service a man's working life has been spent should bear the cost of supporting him when he becomes disabled or superannuated, and pay him as a matter of right, instead of letting him become a public charge. This is often impracticable because the employer is financially unable to bear the burden of paying the pension. The close competition of the present day would often seriously handicap an employer who might feel a moral obligation to pension his men, when others in the same field had different ideas.

The practical side is, will it pay an employer to provide a pension fund in order to retain in his service experienced and reliable men? There are now several of our great steam railroad systems which have answered this question in the affirmative, to the extent of from \$100,000 to \$300,000 per annum.

It is not out of place to briefly review what the railroads have done in this direction. About two years ago Mr. W. H. Baldwin, president of the Long Island R. R., read a paper before the American Economic Association in which was given a history of the relief and pension funds established by various steam railroads in the United States. The first road to arrange for a relief fund was the Baltimore & Ohio in 1880, followed by the Pennsylvania R. R. in 1886, the Chicago, Burlington & Quincy in 1889 and later by others, in 1900 there being about 15 per cent of the railroad mileage and 20 per cent of the employes so provided.

In 1889 the Baltimore & Ohio established a pension system, the cost being borne entirely by the company. The pensions are based on the salary the employe receives at the time of his retirement; if the salary is over \$100 per month the pension is \$1.25 per day; between \$75 and \$100, \$1 per day; between \$50 and \$75, 75 cents per day, and between \$35 and \$50, 50 cents per day.

In addition to the Pennsylvania Voluntary Relief Department mentioned as being established in 1886, the Pennsylvania Railroad

Co. Jan. 1, 1900, organized a pension department to relieve from duty employes over 70 years of age, and those between 65 and 70 years of age who have been 30 years in the service, and pay them monthly pensions equal to 1 per cent of the average monthly wages for the 10 years next preceding retirement, multiplied by the number of years of service. The cost of this is paid by the company and in event the outlay at this rate exceeds \$300,000 per annum, the pensions will be ratably reduced to keep the total within that figure.

Just a year later, at the beginning of 1901, the Pennsylvania Co. by joint agreement with the seven other companies concerned established the Pension Department of the Pennsylvania Lines West of Pittsburg, on practically the same conditions but limiting the total annual cost to \$150,000, and making the maximum pension charge for the entire Pennsylvania system \$450,000.

The Pennsylvania Railroad on Jan. 1, 1901, had about 250 pensioners, and it is estimated that in 1905 the number will be 800 and in 1909, 2,250.

Jan. 1, 1901, the Chicago & Northwestern Railway Co. put in effect the following rules: All employes who have attained the age of 70 years, and who have been 30 years in the service, shall be retired and pensioned; provided, however, that this clause shall not be mandatory in its application to executive officers appointed by the board of directors.

"All employes 65 to 69 years of age, inclusive of both years, who have been 30 or more years in the service, and who have become incapacitated, may be retired and pensioned.

"The monthly allowance paid each person granted a pension shall be upon the following basis: For each year of service 1 per cent of the average regular monthly pay for the 10 years next preceding retirement; provided, however, that the annual pension disbursement of the company shall not exceed \$200,000. Should the aggregate pension allowances exceed this amount, in the absence of action by the board of directors increasing the yearly amount usable for pensions, a new rate shall be established proportionately reducing all allowances. Notice of any change of rate shall be given retired employes before the beginning of the fiscal year in which the change shall become effective."

July 1, 1901, the Illinois Central Railroad Co. put in effect a comprehensive pension system. The company made a cash gift to the fund of \$250,000 and agreed to pay any amount needed for pensions up to \$100,000 annually; if the annual burden exceeds this figure the \$250,000 will be drawn upon until it is gone, but should this reserve be exhausted the company reserves the right to make changes in the rates of the pension payments. The retiring age is 70 years, but there are exceptions, certain classes of employes retiring at the age of 65, and others being retired between the ages of 61 and 70 in case of disability. At least 10 years' service is required to make a man eligible to the pension list, and the monthly pension is 1 per cent of the average monthly wages during the term of service multiplied by the number of years of service. No inexperienced men over 35 years of age or experienced men over 45 years of age are to be hereafter permanently employed.

In September, 1901, the Chicago, Milwaukee & St. Paul Railway Co. established a pension and relief fund for employes. The employes contribute to the fund and their pensions are based on these payments and on their wages. The contributions are based on a sliding scale so that those receiving the larger incomes pay more in proportion than the men with small salaries. In case of accident or sickness the men who contribute more to the fund will receive benefits accordingly. The employe must become a member of the relief association in order to become entitled to a pension; if he has been 10 years in the service the pension right vests at the time of joining the relief association, otherwise only the benefit rights are in force until the 10 year term is completed. It is estimated that under this scheme the average pension will be about one-third of the salary received at the time of retirement.

It has just been announced that the American Steel & Wire Co. intends to pension old employes; this company has not, however, fixed upon any definite retiring age or rate of pension, each case standing on its merits.

Midway between the policy of pensioning superannuated employes by the company and that of doing nothing for them is a third which has been extensively adopted abroad and also by a number of institutions here. This plan is to withhold a portion

of the salary of each employe to create a fund, from which can be paid pensions based on term of service and salary received, the employer perhaps paying an equal sum. In some cases on leaving the service the employe receives his contributions to the pension fund with accrued interest, so that the scheme is merely one to compel the participants to be provident. The financial basis of such a fund is sound because the number contributing never decreases; when a vacancy occurs in the service by death or retirement which creates a charge on the fund, a new employe must be secured to do the work and he in turn becomes a contributor.

This plan was adopted by the Grand Trunk Ry. in 1874 and within two or three years by at least two Chicago banks.

On the State Railroads of France employes may be retired at 55 years of age after 24 years' service and must retire at 64; they receive pensions from a fund provided by retaining 5 per cent of the regular wages and the administration paying an equal sum.

In 1899 there was presented to the German Street Railway and Light Railway Association a report upon the desirability of establishing a Pension Fund for German Street Railways but the committee did not consider it expedient for the association to institute such a fund at that time, one reason being that a number of the street railways were affiliated with other funds or had pension systems of their own. The plans considered by this association provided for contributions on the part of both employer and employe.

In 1900 the British Electrical Superannuation Fund was constituted and placed under the management of trustees. The staff of the British Electric Traction Co. has given this fund satisfactory support and the other companies associated with the Traction company were invited to join. Mr. Emile Gareke, of this company, thus explained the general scheme in a letter to *Engineering* Jan. 25, 1901: "Speaking generally, each contributing company must make monthly a contribution equal to 3 per cent of the monthly salary of each contributing member on its staff, and the member himself must make monthly a contribution equal to 2½ per cent of his monthly salary, plus, in the case of those over 24, a certain extra percentage, varying with age. The 'retiring age' is 60, and a member must be of at least 10 years' standing before he is entitled to a pension. Upon retirement a member will receive for every year of service one-fiftieth of the average annual salary received by him during the seven years preceding retirement, the maximum scale of pension being two-thirds of salary. It is important here that service with any and every contributing company counts towards pension, so that an officer can pass from the service of one such company to that of another without injury to his pension prospects. This scheme, I should add, is intended to apply only to those members of the staff of a contributing company who are on the monthly salary list, and who are between the ages of 18 and 45. The trust deed and rules contain provisions in regard to members who wish to reckon their back years of service, and a number of other details. The secretary of the fund is Mr. W. G. Bond."

While such a plan as that adopted at Providence is a novelty here employes' relief and mutual benefit associations are no new thing among street railway companies, the first one in this country having been the Washington (D. C.) & Georgetown Railroad Employes' Relief Association. This association was organized in 1886 by Mr. Henry Hurt, then president of the company, and a full account of its working was given in a paper read before the A. S. R. A. by Mr. Hurt in 1889 and published in the proceedings of the association for that year on page 44. In the *"Review"* for 1900, page 67, 141 and 230 we gave brief accounts of 15 similar mutual benefit organizations, and during the last year numerous other ones have been started.

It is possible that the mutual benefit associations could be developed so as to include provisions for pensions as well.

In considering this subject it must not be forgotten that the steam railroads are in one very important point on an entirely different footing from most electric railways. The steam roads have in effect perpetual charters and are for the most part independent of municipal and local authorities, while the electric companies as a rule are operated under franchises which run for comparatively short terms, 25 to 50 years. The street railways of Rhode Island are an exception to the general rule and have per-

petual franchises and a contract with the state that the requirements of municipalities in the way of special services shall not be increased without the consent of the companies, nor shall "locations" be revoked without other equally good "locations" being granted. Thus the United Traction & Electric Co. is in an especially favorable position for inaugurating a pension system, that companies in other cities, Chicago for instance, could not attempt.

Many of the interurban electric roads are organized under general railroad laws and own their private rights of way, and are in a different position from the strictly urban companies; these roads are yet too young to feel the desirability of pensioning employes.

The results of the experiment at Providence will be closely watched and we believe that other urban companies will follow that example, though doubtless those less happily situated as regards franchises may incline rather to the "middle ground" of assisting the men to be provident than to a pension system proper.

CHICAGO FRANCHISE QUESTION.

The Chicago Council committee on local transportation made its report to the council on Dec. 16, 1901. The ordinance submitted as embodying the recommendations of the committee is in substantial accord with the report prepared by Mr. Geo. C. Sikes, secretary of the committee, which was published in the *"Review"* for November, 1901, page 853. A few minor changes may be noted. Concerning the construction of new lines the ordinance provides that the company shall construct and operate any new line ordered by the city council, and the clause permitting this question to be arbitrated in case of objection on the part of the company to the building of the line is omitted. The area in which the overhead trolley is prohibited is changed to read "North Ave. on the north, Ashland Ave. on the west and 22d St. on the south." The underground trolley system is specially named to substitute all the cable railway now in use.

The section regulating the hours of labor of employes, fixing the rate of compensation for them and dealing with labor questions in general has been omitted in the proposed ordinance; city detectives bearing cards signed by the Superintendent of Police are added to the list of those permitted to ride free.

The maximum rate of fare is fixed at 5 cents except in the case of tickets which are to be sold at the rate of 6 for 25 cents. As compensation for the grant the railway company will be required to pay monthly into the city treasury a percentage of its gross receipts.

January 6th Mayor Harrison presented his special message to the council explaining his attitude on the question of franchise extension. Briefly the things he demands are: Better service; compensation to the public; a waiver of the companies' rights under the "99-year act"; provision for the acquirement by the city of the lines at the expiration of the grant; the use of the underground trolley within certain boundary lines and the rearrangement of terminals; prohibition of the transfer of franchises to foreign corporations; a general system of transfers; the publicity of accounts; the use of grooved rails on all paved streets; the reference of all extension ordinances to a popular vote.

The mayor insists on waiting till the Legislature shall have had opportunity to pass an act authorizing the city to acquire the street railways. In the meantime he urges that the council pass mandatory ordinances with a view to improving the service.

PROPOSED MILWAUKEE ELEVATED ROAD.

It is stated that a company proposes to build an elevated railroad from Milwaukee to connect with the Metropolitan Elevated, of Chicago, and will begin work on the grading and construction as soon as an injunction suit, which is now pending, has been settled. The surveys for this line have been made, and Mr. Peter J. Somers, attorney for the company, states that the capital is in hand to prosecute this work. The time from the limits of Chicago to the limits of Milwaukee is expected to be one hour, and the company figures on having trains running between Milwaukee and Chicago within two years, which will make better time than the steam roads.

Chicago & Joliet Interurban Railway.

BY A. S. KIBBE, ENGINEER, THE AMERICAN RAILWAYS CO.

Notwithstanding the rapid growth which has characterized the development of suburban and interurban electric transportation throughout the neighboring states of Indiana and Ohio, comparatively little has hitherto been accomplished in this direction in the state of Illinois. While Chicago has for ten years been well provided with means of suburban transportation, almost no effort has been made to compete with, or to supplement, the service afforded by the many steam roads radiating in all directions from the down-town districts of the city to every considerable center of population in the surrounding and neighboring counties. Some few of these roads have brought their local service to a high degree of excellence; others have responded only moderately to requirements of this kind, and many have almost entirely ignored them. In spite of frequent and large accessions to the city's territory, the business district remains and apparently must remain constricted. It is difficult to understand how the steadily increasing railroad traffic can be accommodated without radical revision at an early date. Track elevation makes a road higher but not wider, and delays caused by frequent street crossings at grade constitute only a part of the difficulties. With possibly one exception, the writer believes that the steam roads entering Chicago would profit by the withdrawal of their so-called suburban trains, granted, of course, that acceptable facilities for this business were provided in another way. In localities like the one under discussion, the competition between electric and steam roads is more apparent than real. A well-operated electric road will develop a given district far more quickly than the best known steam suburban service, and the inevitable co-ordinate growth in the through passenger and freight traffic of the parallel steam road is handled by it with

operating toward Chicago in this district, if we except the Suburban Railroad, running between the city limits and the village of La Grange, in the western part of Cook County, about four miles south of Harlem. The lines between Carpentersville and Aurora have been brought under one management and extended to Yorkville. The Aurora, Elgin & Chicago Railway is now in

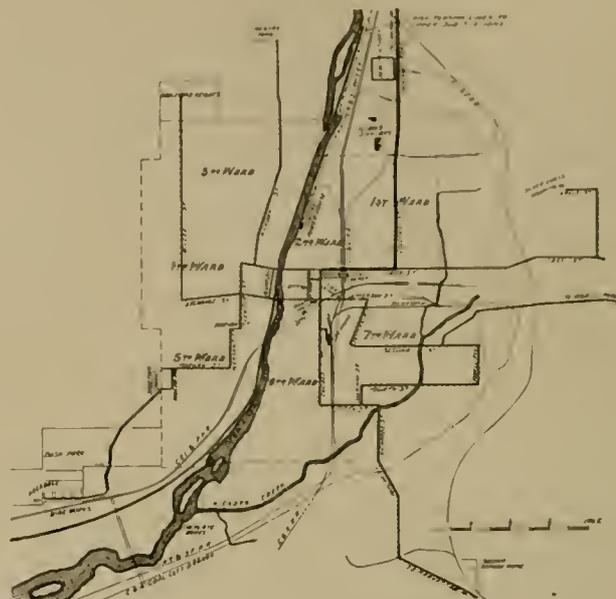


FIG. 2—JOLIET AND VICINITY, SHOWING LINES OF CHICAGO & JOLIET ELECTRIC RY.

course of construction to connect the towns mentioned in its title, with branches to Wheaton and to Batavia.

The Chicago & Joliet system is organized under two distinct charters: The Chicago & Joliet Electric Railway comprises the entire street railway system in and about Joliet and that portion of the Chicago line located in Will County; the Chicago & Desplaines Valley Electric Railway comprises the lines in Cook County. All lines are operated by the Chicago & Joliet Electric Railway Co.

Routes.—The lines of the Joliet Division, as shown on accompanying map, Fig. 2, cover the built up portions of the city very thoroughly, with extensions to all important points in the immediate vicinity, notably to Ingalls Park race track, the Swedish Orphans' Home, the village of Rockdale, the suburb of Boulevard Heights, Theiler's Park and the Silver Cross Hospital and cemeteries.

The Chicago Division parallels the Desplaines River, the Illinois and Michigan Canal, the Chicago Drainage Canal and the Chicago & Alton and Santa Fe railroads. The route is indicated by the following table, excepting the branch from Summit northerly to Lyons, a distance of about 2 2-3 miles.

Station.	Distance in miles.		Route.
	From Joliet.	Bet. Points.	
Joliet Co. House.	.0	1.9	Chicago—Cass—Collins Sts.
Penitentiary.....	1.9	3.2	Collins St.—Lockport Road.
Lockport, 9th St.	5.1	3.6	Lockport Road—Private right of way.
Romeoville.....	8.7	3.6	Private right of way—New Ave.
Lemont Sub station.....	12.3	1.3	Main St.
Hastings.....	13.6	2.6	Sag and Lemont Road—Private right of way.
Sag Bridge.....	16.2	4.0	Private right of way—Archer Road.
Willow Springs.....	20.2	0.8	Archer Road.
Mt. Forest.....	21.0	1.7	" "
Bethania Ceme'tery.....	22.7	1.5	" "
Summit Sub station.....	24.2	1.8	" "
Summit.....	26.0	3.7	Archer Ave.
Chicago City Limits.....	29.7		Cor. Archer and 48th Aves.



FIG. 1 INTERURBAN ELECTRIC RAILWAYS NEAR CHICAGO.

greater ease and at less expense than the carriage of short riders into and out of crowded and inadequate terminals.

Be this as it may, the Chicago city limits were first reached by an interurban line on Sept. 25, 1901, when the Chicago & Joliet Electric Railway Co. opened its service between the two cities named in its title, as indicated on the accompanying map, Fig. 1. The Chicago & Milwaukee Electric Railway runs from Waukegan to Evanston, connecting with the Chicago Union Traction lines at that point. These are the only interurban electric systems now

The Chicago Division operates 15½ miles of single and 16½ miles of double track, and the Joliet Division operates 20½ miles of single and ½ mile of double track, making the totals, 36 miles of single and 17 miles of double, or 70 miles, single track measurement, of which The Chicago & Joliet Electric Railway Co. owns 20 miles of single and 12 miles of double track, and the Chicago & Des-plaines Valley Electric Railway Co., 16 miles of single and 5 miles of double track.

Shortly after leaving the penitentiary, the top of the ridge is reached by a few stations of a 5 per cent grade, attaining an elevation of 40 ft. above the Sanitary District datum. The highest point on the line is at Shea's Hill 22 miles from Joliet and 65 ft. above datum. With the further exception of a few stations of 4 per cent grade at this point, the grades of the entire line are extremely light and nowhere exceed 2 per cent.

Outside of Joliet, Lockport, Lemont and Summit, the curves are elevated for, and may be taken at, a speed of 40 miles per hour. In many places, roads have been widened, or private property acquired, to accomplish this end.

recall, several acres of absolutely unique materials of enormous value, for which a suffering public will now yearn in vain.

The Sag "Short Cut" of 8,000 ft, effected a saving of 3,300 ft. in the length of the road, and of 190° in curvature. The section of highway thus avoided is furthermore narrow and at one point makes a sharp turn of about 135° and a 7 to 9 per cent grade. Notwithstanding the large amount of filling required, the cost of construction, inclusive of land damages, was no greater than would have been involved in following the highway.

The typical section on single track grading is 14 ft. in width at sub-grade on fills and 25 ft. in cuts.

For double track, with span construction, the fills are 25 ft., and the cuts 31 ft. wide at sub-grade, the tracks being laid on 11-ft. centers.

For double track with center pole construction, the fills are 30 ft. and the cuts 36 ft. wide at sub-grade, with tracks on 16-ft. centers.

The Chicago Division is ballasted throughout with crushed limestone between ties, and not less than 6 in. in depth under them.

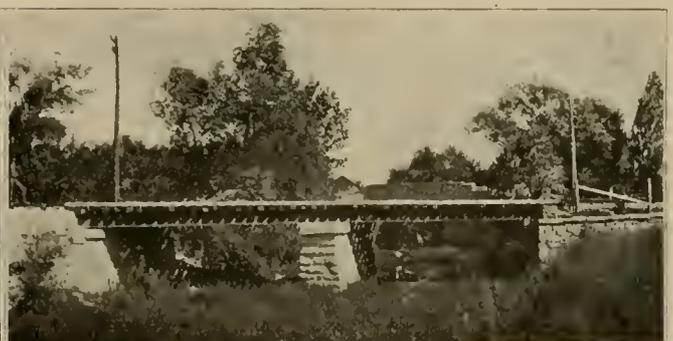


FIG. 3—BIG RUN—FOUR 34-FOOT SPANS.
FIG. 5—FRACTION RUN—30-FOOT SPAN.

FIG. 4—FIDDYMENT CREEK—TWO 26-FOOT SPANS.
FIG. 6—CALUMET FEEDER—ONE 50-FOOT AND TWO 20-FOOT SPANS

Roadway.

The road in general follows the highways. Where required by municipal authorities along built up portions of villages, the tracks have been laid in the center of the street but elsewhere every effort has been made to separate the paths of cars and other vehicles. Wherever possible, the idea has been to lay tracks on each side of the road leaving a drive-way of 20 to 30 ft. between inside rails. Where the highway lies adjacent to the Alton railroad, and the residences are consequently on one side only, both tracks have been laid on the opposite side of the road.

For the purpose of avoiding heavy grades and curves, private rights of way have been acquired to the extent of four miles between Lockport and Lemont and of 8,000 ft. near Sag Bridge. In only two instances did it become necessary to exercise the power of condemnation and in each of these the jury awarded less than one-half the amount offered to the property owner by the railway company, prior to the trial. Scientists have fondly imagined for years that the Sag Valley is formed from a very miscellaneous mixture of silt, peat and glacial drift, overlying the rock to various depths, but a portion of the evidence in one of these suits would seem to show that the electric railway has ruthlessly hurried beyond

This stone was in part crushed by the construction company, and in part purchased from crushing plants in the vicinity. It was distributed along the track in 5-yard side dump cars hauled by electric car between Joliet and Lockport, and by steam locomotive over the remainder of the road, at costs varying from 50 cents to \$1.10 per cu. yd in place.

Bridges and Culverts.

The accompanying views will give an excellent idea of the character of bridge construction. The Joliet Bridge & Iron Co. furnished and erected the 4 single track and 21 double track steel spans required between Joliet and Chicago, which varied from 14 to 56 ft. in length.

In the Big Run and Fraction Run bridges rolled beams were used, 24 in. deep and weighing 100 lb. per ft. For Fiddyment Creek, the beams were 20 in. deep and weighed 80 lb. per ft.

Fraction Run Opening is an extension of the old highway bridge—a semi-circular arch of 30-ft. span. The foundations extend 10 ft. below ground and the new masonry measures over 1,200 cu. yd. This structure was erected at a cost of \$7,000.

Bridges with steel spans are all within easy reach of quarries

and the abutments were thus economically built of coursed rubble masonry laid in "Star" or "Atlas" portland cement.

The future of the old Calumet (or Sag) Feeder being somewhat uncertain, and the depth to good foundation considerable, steel tubular piers were employed, centered on piles and lined with concrete. This bridge cost, complete as shown ready for traffic, \$6,000.

In extending culverts, already in existence, the usual course was to continue the same form of construction, where such was adequate. In a number of instances pipes built of sheet steel

In car barns the 40-lb T was used, except on open pit construction, where 1,100 track feet of 9-in., 106-lb. center bearing girder rails of Lorain section 106-364 were laid.

The subject of rail joints received especial attention. The company's standard drilling for rails up to 7 in. in depth is 1 15-16 x 5 x 6 in. for joint bolts with one 27-32 in. hole for bonds 4 7-16 in. from the end of the rail and in the line of the joint holes. The angle bar section recommended by the American Society of Civil Engineers shows a bulb on top which would interfere with a bond of the necessary size.*



NORTH END JOLIET CAR BARN, UNDER CONSTRUCTION.



FIG. 7—DECK CONSTRUCTION OF BRIDGES. (Between Lockport and Romeo)

from 1/4 in. to 3/8 in. thick were used. For the smaller sizes double strength terra cotta pipe was used where the fills were of some depth. In very shallow fills and where exceptional strength was requisite the pipe was of cast iron. All culverts are provided with substantial head walls, of rubble masonry in portland cement below Sag, and principally of portland cement concrete between Sag and Chicago.

Tracks.

Within the limits of Joliet all tracks are laid with 6-in. T-rails. The outlying lines of the Joliet Division are constructed of standard T-rails of weight proportioned to the prospective business. One extension 1 1/2 miles, was laid with 40-lb. T; another, 1 mile, with 55-lb. T; another with 70-lb. T; and all others with

For the 70-lb. T-rails, a special joint was rolled by the Illinois Steel Co., conforming in every respect with the A. S. C. E. section, save that the upper face on inside is straight like the lower one, and affording ample room for a No. 0000 "Protected" bond as long as the angle bar is serviceable. This modification has since been made by a number of rail users; it is very slight and hardly affects the weight or value of the angle bar as a joint; and will doubtless become standard for electric railways using such joints.

The Lorain Steel Co. also altered its then standard joint plate, for 6-in. T-rails to provide such room as would permit a small or worn plate to be tightened without pressing on a No. 0000 bond.

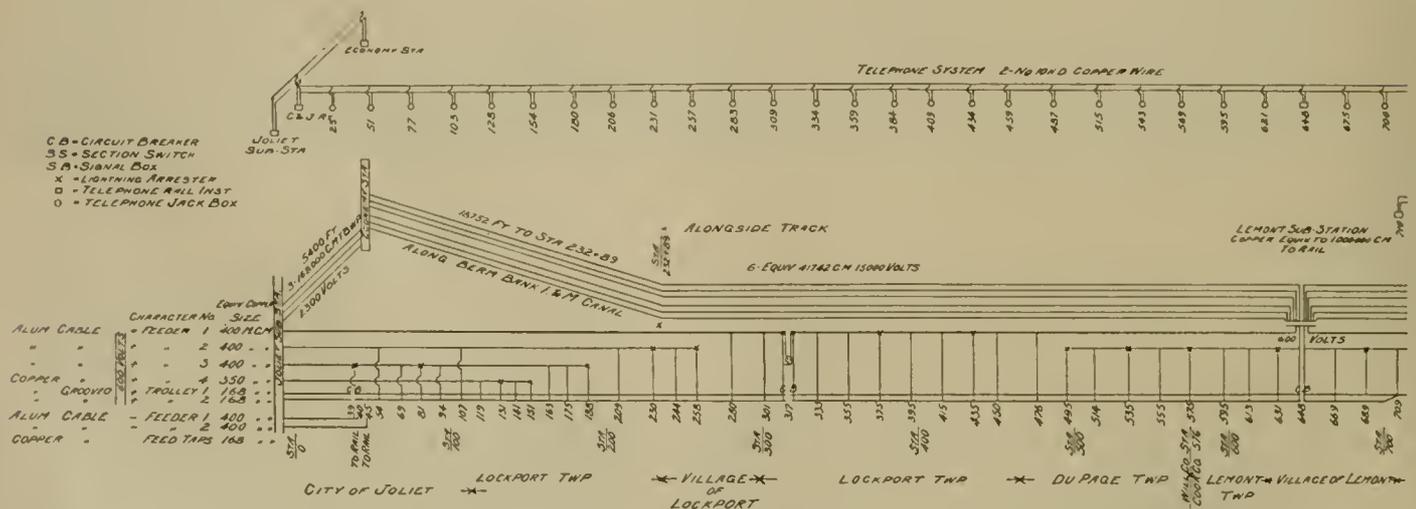


FIG. 9—OVERHEAD DIAGRAM.

6-in. T, to provide against the contingency of paving in the near future.

The Chicago Division outside of Joliet, is laid with 70-lb. T-rail of the A. S. C. E. section, with the exception that through the villages of Lemont, and Spring Forest, 7-in girder rails have been employed. There are 42 miles laid with 70-lb. T, A. S. C. E. section made by the Illinois Steel and Cambria mills; 20 1/2 miles with 60-lb., 6-in. Lorain 60-263 and 5 miles with 73-lb. 7-in. girder rails Lorain 73-291.

As indicated the entire system is bonded with one "Protected" bond at each rail joint; these bonds are 9 in. between the centers of the terminals and have 24 strands with a cross section equivalent to a No. 0000 wire. Cross bonds are of the "Crown" type No. 00,

*Instances have been numerous in electric railway construction, where the bonds so interfered with the joint plates as to absolutely prevent a bearing on the rail, to the serious detriment of the bond and the ruination of the rails. The writer is aware of a large amount of 9-in. girder rail laid on one of the largest systems under precisely these circumstances and he believes that hundreds of miles of track are now being operated under similar circumstances.

and are placed between the rails of each track and across from track to track at intervals of 300 ft.

Ties are spaced 2 ft. between centers and with the exception of 20,000 white cedars from northern Michigan, and of a few thousand white oaks, the ties on the Chicago Division are of hew- chestnut from southern Ohio. On open work they are 6 in. x 8 in. x 8 ft. 6 in., but in Joliet use was made largely of sawed white oak ties, 6 in. x 8 in. x 7 ft. 6 in.



FIG. 8—ALONG THE SAG SHORT CUT.

The deck construction of bridges is shown in Fig. 7. Bridge ties are 7 in. x 9 in. white oak, dapped for flanges of beams or girders and laid on 16-in. centers. Every alternate tie is bolted to beams. Inner guards of 60-lb. T-rails are laid with 7-in. throat and brought to a point in the center of the track, 60 ft. from the end of the bridge in the direction of approaching traffic. Outer guards are of 6 in. x 6 in. yellow pine dapped one inch for each tie and bolted to every alternate tie.

On lines where traffic is not heavy, use is made of bolted special

past joints in steam tracks. Crossing compromises to 6-in. T are made by cast welding a section of the high T-rail to the crossing arm.

Sharp curves on the Chicago Division are guarded with rail of the same section as the running rail, with cast iron separators and bolts spaced 3 ft. apart.

All girder and high T-rails are laid with two brace tie plates every 10 ft., the braces coming up close under heads of rails.

All tracks thus far laid in paved streets are of 6-in. T-rails. The spaces between ties have been filled with concrete. Along the outer sides of the rails were run two stretcher courses of bricks. Along the gage side of the rails were laid special stretcher bricks, filling the space between flanges and heads of the rails and affording a shoulder for paving between rails and a proper flangeway for the wheels.

Overhead Lines.

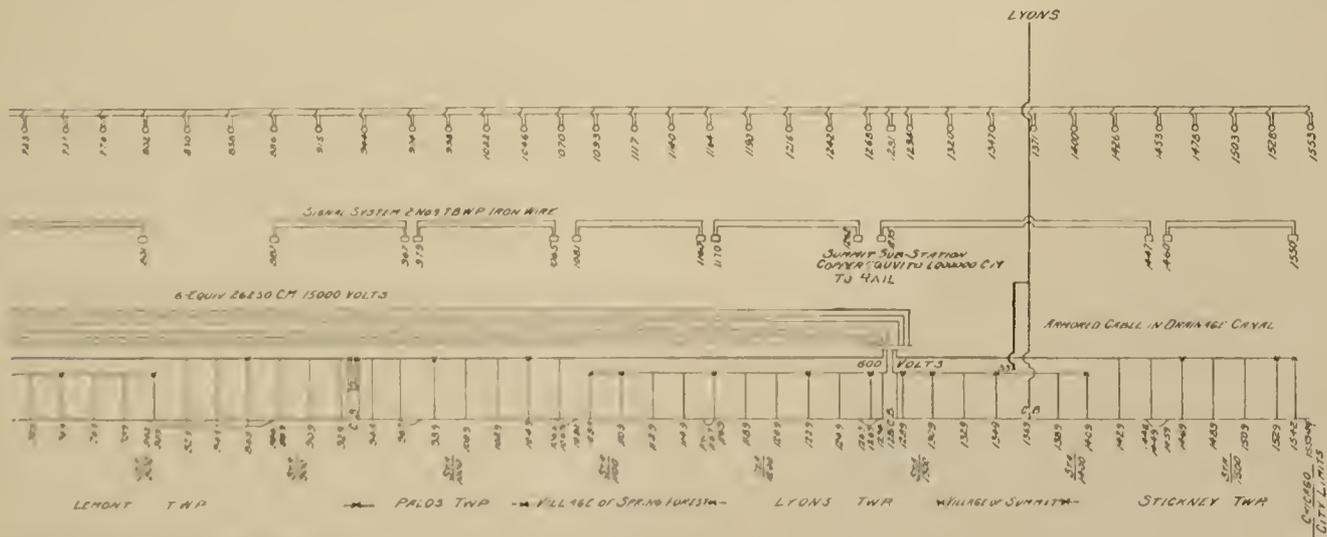
The overhead system in Joliet is all of span construction. Bracket construction is largely used elsewhere on single track lines and span construction along double tracks, with the exception of the Sag Short Cut above referred to. Here a fill was made several thousand feet in length, and of a depth varying from 6 to 12 ft. The nature of the foundation would have necessitated the widening of the fill to such an extent for the proper support of span poles, that it was deemed advisable to employ center bracket construction as shown in Fig. 8.

The accompanying overhead diagram, Fig. 9, exhibits the various circuits installed on the Chicago Division, with taps and connections.

Efforts to obtain suitable chestnut poles within a reasonable time, were unavailing. The entire overhead system of the old lines has been rebuilt and that of the new lines built with cedar poles, the standard being 35 ft. long with 7-in. top.

The pole layout on single track bracket lines of the Chicago Division is shown in Fig. 10. Poles are set not less than 7 ft. in the ground, with face not less than 5 ft. from the nearest rail.

Cross arms are all long leaf Georgia pine, 4 1/4 x 3 1/4 in. The two upper arms in the figure are devoted to the duplicate high tension circuits. They are furnished with 1 1/2 x 11 in. locust pins boiled in paraffine, and so spaced as to form two deltas with 20-in. sides. The third arm is reserved for direct current feeders, and the lower arm for telephone and signal wires, the pins on both



CHICAGO & JOLIET INTERURBAN RY.

work of 6-in. T rail with rolled guard, furnished by the Paige Iron Works, Chicago, and the Indianapolis Switch & Frog Co., Springfield, O. The standard special work is of 6 and 7-in. girder guard rail, with manganese steel switch tongues, mate points and frog centers, manufactured by Wm. Wharton Jr. & Co. Lateral switch tongues are of 100 ft. radius and in equilateral switches the tongues are of the Carver type of 350 ft. radius.

Railroad crossings are built of 85 and 70 lb. T rails, with full rail guard on both tracks and with easer rails extending 18 in.

being standard locust, untreated. All cross arms are set in gains 1 1/2 in. deep and fastened to the pole with one 5/8-in. through bolt. Braces are fastened as indicated with 4 x 3/8-in. bolts, through the cross arms and with 4 x 1/2-in. lag screws into the pole.

Fig. 8 illustrates the bracket work as constructed and shows the character of poles employed. On span construction, as illustrated in Fig. 7, the high tension cross arms are carried on the westerly line of poles, and the direct current circuits occupy the tops of the easterly poles.

The brackets are of the type shown, exceptionally long and heavy. The pipes are 2 in. in diameter, of structural steel tubing, made from high carbon steel by Messrs. Howe & Polk, Danville Pa. The castings are all of malleable iron.

The trolley insulating details in general are of the Macaller make, furnished by the Mayer & Englund Co. The hangers are of round top, extra heavy pattern with 3/4-in. studs. Three-screw malleable iron clips are used on straight line work, and deep groove 15-in. soldered ears on curves.

Feed-spans are of No. 000 copper cable, clamped into and soldered to a bronze feed yoke into which a 3/4-in. stud has been cast, for connection with trolley ears. Feed-tap terminals are connected to feeders with aluminum clamps.

Line lightning arresters are the General Electric M. D. type, installed as shown in Fig. 9.

The trolley wire is of grooved section of No. 000 capacity, drawn by the Roebling company.

The feeder wires of the Chicago Division are all of aluminum cable, furnished by the Pittsburg Reduction Co., with the exception of a short piece of 350,000-c. m. copper cable on the Joliet end. The following table shows quantity and character of the feeders:

Miles.	No. strands	Insulation.	Copper equivalent circular mils.	Voltage	Use.
3 1/2	19	TBWP	168,000	2,300	Economy Sta. to Joliet Sub-station.
7 1/2	7	bare	41,742	15,000	" " Lemont "
7 1/2	7	"	26,240	15,000	Lemont Sub-sta. to Summit Sub sta.
40	37	"	400,000	600	Out of town feeders.
20	37	TBWP	400,000	600	Feeders in city and villages.

Joints in aluminum cable have been made altogether by splicing somewhat after the fashion of a span wire wrap, giving each strand in each piece several wraps about the other piece and cutting it off after hooking it under the succeeding strand. In this manner a tapered joint is obtained, (about 3 ft. in length in the case of the larger cables) having more strength than the original cable

of rendering them less attractive as targets they are glazed in chocolate color. The cables are fastened with aluminum tie wire.

For the direct current feeders, the insulators are of malleable iron screw cap type, made by the Albert & J. M. Anderson Co. Care is taken to keep the saddles and caps smooth and free from any protuberances which might abrade the bare wires.

The only difficulty experienced with the aluminum wires has had its source in the comparatively large co-efficient of expansion of that metal. Men accustomed only to copper feeders, will string aluminum too loose in winter and too tight in summer. The latter is perhaps the more serious error and particularly where the num-



FIG. 11 ECONOMY POWER PLANT, JOLIET.

ber of wires turning a corner is large, the pole line will be severely tested during ensuing cold spells.

The telephone system has a No. 10 hard drawn copper circuit between Joliet and Chicago, with wall instruments in offices and power stations. Compact and heavy malleable iron plug boxes are installed along the line at turnouts and at intervals of one-half mile. The wires are hung on deep groove, double petticoat insulators, and are transposed at every fourth pole. Notwithstanding the proximity of the telephone wires to the high tension circuits for a distance of over 15 miles, the system works very well when kept free from grounds.

United States Electric Signals have been installed along single track portions of the Chicago Division, as indicated in Fig. 9, using No. 9 T. B. W. P. iron wire for the circuits.

Power Generation.

The power required for the operation of the road is derived from the water of the Desplaines River, as re-enforced by the flow in the great Chicago Drainage Canal. This enormous artificial channel, extending a distance of 30 miles from Chicago to Lockport, is fed from the waters of Lake Michigan and discharges into the Desplaines River at the latter place. Up to the present time, no attempt has been made to utilize the power thus afforded, until the arrival of the waters at Joliet, where the Economy Light & Power Co's. plant has been erected, as indicated in Fig. 2 and illustrated in Fig. 11, with a proposed ultimate capacity equal to the flow for which the drainage channel has been designed. While at the present time the old lighting apparatus is being utilized temporarily, it is intended to install six or seven units identical with the one shown in Fig. 12, which gives an excellent interior view of the new plant.

The portion here represented consists of two alternators (one in the foreground and one in the far end of room), and twelve water wheels for driving them. The six wheels have their shafts vertical and each is connected to the generator shaft by bevel gears. The alternators are of the General Electric make; of 750 kw. capacity each with a frequency of 60 cycles at 2,300 volts. The excitors and switchboard are also located at the far end of this room where current of this character is furnished to the Railway company by the Light & Power company.

Transmission.

The Railway company has established sub-stations in Joliet, in Lemont and near Summit.

Current is conveyed to the Joliet sub-station direct from the Economy switchboard at the generator voltage as indicated on Fig. 9, the distance being but a trifle in excess of one mile.

For transmission to Lemont (12 miles) and to Summit (24

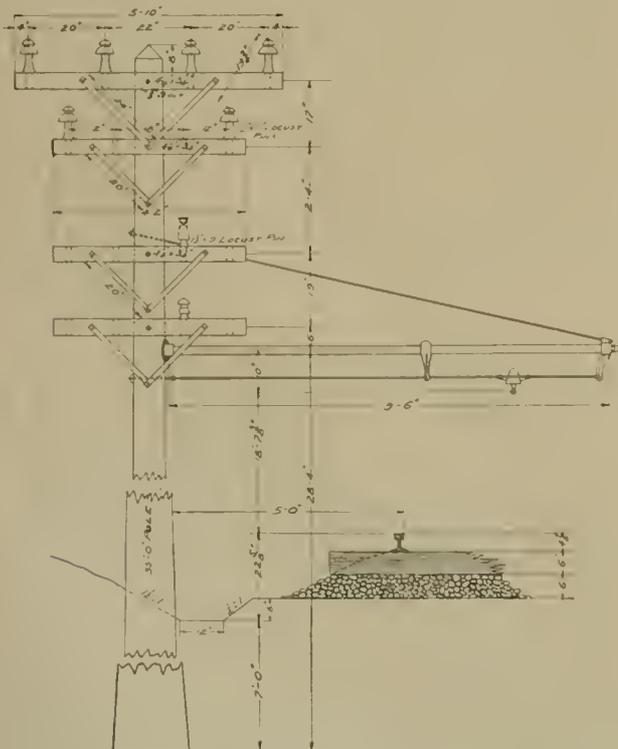


FIG. 10-POLE LAY-OUT.

and with conductivity about one quarter greater. No solder whatever was used in connection with this metal.

For the high tension lines 5-in. triple petticoat porcelain insulators of "Imperial" manufacture, have been used. In the hope

miles), the current from the Economy switchboard is brought into the little apartment pictured in Fig. 13, where it is stepped up, through air blast transformers from 2,300 to 15,000 volts.

These transformers are four in number (three active and one in reserve), and stand upon a concrete air chamber into which air is driven by blowers barely visible in the picture.

Conversion.

Led by the determination of the Economy Light & Power Co. to generate nothing but 60-cycle current, and in view of the annoying lack of stability in 60-cycle rotaries running in multiple on railway circuits under different conditions the Railway company has adopted induction motor-generators for the conversion of the alternating into direct current. Figs. 14, 16 and 18 illustrate the interior of the Joliet sub-station. Fig. 14 shows one of the motor-generators in the foreground. Fig. 16 shows the switchboard of which the first six panels are for the direct current feeders; the next panel is equipped with clock, recording ammeter and recording wattmeter; the next two panels control the battery and booster; the next three, the direct current generators; the next is blank and the last three control the induction motors.

Three units are installed in this station, each composed of a six-pole, 250 kw. 600-volt railway generator, mounted on a common base and shaft with, and driven by a 14-pole 350-h. p., 2,300-volt induction motor, running at 514 r. p. m.

In the upper sub-stations, the current is received at 15,000 volts and is stepped down through oil cooled transformers to 550 volts. In Lemont there are installed three 110-kw. transformers; in Summit, six.

The motor-generators in these stations (one in Lemont and two in Summit), are identical with those in Joliet, save for the induction motor fields which are accommodated to 550 volts instead of 2,300.

In all three stations are installed compensators designed to start the induction motors without the consumption of energy in excess

dam and be wasted, rendered it absolutely essential that the demands by the railway upon the Economy station should be regulated as much as possible.

To attain this end storage batteries have been installed by the Electric Storage Battery Co. at each of the three sub-stations, and Fig. 17 shows the Joliet battery room.

Each battery consists of 288 cells with room therein for one-half as many more plates as have been furnished. The rated capacity of the Joliet battery is 640 amperes, and of the upper bat-

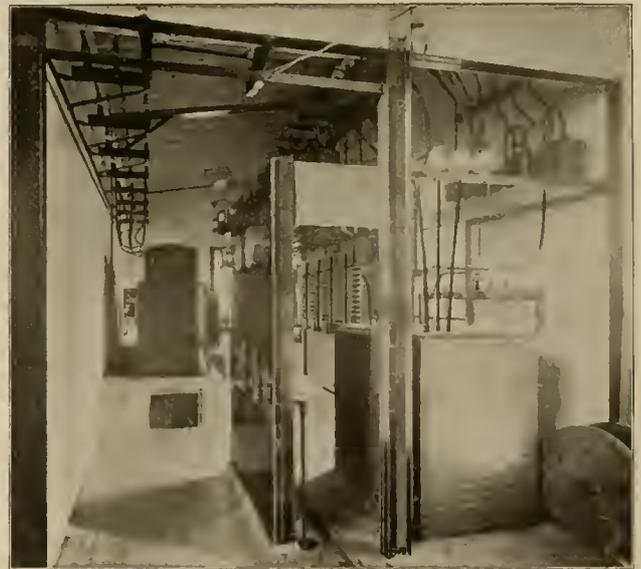


FIG. 13—RAILWAY TRANSFORMING APPARATUS, ECONOMY STATION, JOLIET.

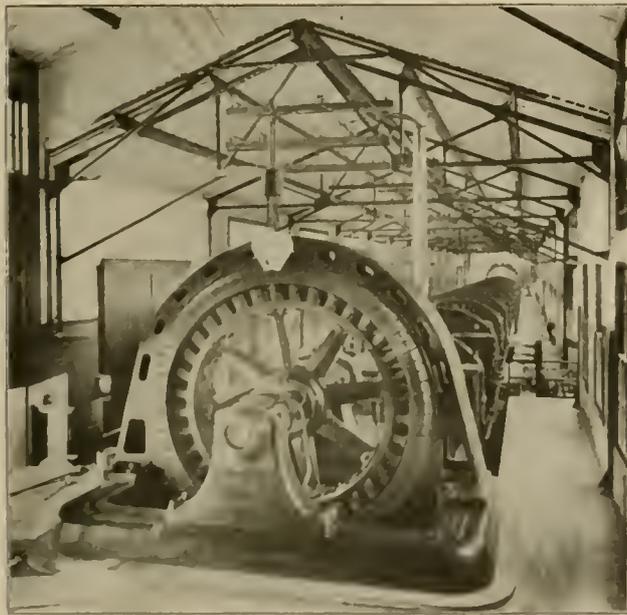


FIG. 12—75-K. W. ALTERNATOR IN ECONOMY STATION, JOLIET.

of the rated output of the sets. Connections and switches are likewise provided on all switchboards to enable the operators to start the machines by operating the generator as a motor until speed is attained, whereupon current is admitted on the alternating end and the generator switched into the line.

All electrical machinery including generators, motors and transformers was furnished by the General Electric Co.

Regulation.

The fact that the railway was to be operated with rented power, derived from a station run by water power; where, if the water were not used when it reached the station, it would flow over the

teries 480 amperes each, but all have been momentarily discharged at double these rates.

The effect of the batteries is not only to regulate the demand for current on the Economy Station, but to reduce the number of motor-generators necessary to take care of the railway business. The generator sets are running with fluctuations of only about 10 per cent of their average output, instead of 100 to 150 per cent as usual in an unregulated plant. Two units now handle the work of the Joliet sub-station where four would be required without a battery.

The charging and discharging of the batteries is regulated in each station by a motor driven booster with compound winding.

Buildings.

All car barn and sub-station buildings are as nearly fireproof as stone, brick, concrete, steel and tile will make them.

The Joliet station is 475 ft. long by 90 ft. wide. The southerly 75 ft. is devoted to generator and battery rooms and paint shop, the latter having a further addition of 30 ft., as shown in Fig. 15. The northerly 400 ft. is divided as shown in Fig. 19, by a longitudinal tile wall, stiffened by steel columns at intervals of 20 ft. The two halves of the trusses are independent of each other, and one-half the roof load is borne by the columns. The north end, Fig. 20, is framed with steel columns and the gable is to be closed with roofing tile, the doors being of the Kinnear rolling pattern.

Space in this building is apportioned as follows

Space.	Dimensions, ft.	Area, sq. ft.	Track, ft.
Car storage.....	45 x 360	16,200	1,440
Inspection pits.....	45 x 230	10,350	920
Wash tracks.....	45 x 60	2,700	220
Repair shop.....	45 x 80	3,600	140
Paint shop.....	22 x 105	2,310	105
Store room.....	90 x 20	1,800	
Holler room and blacksmith.....	45 x 20	900	
Armature repairs.....	18 x 33	594	
Generators.....	54 x 33	1,782	
Battery	72 x 33	2,376	
Employee.....	26 x 10	260	
Total.....		42,872	2,825

All floors are of concrete with the exception of car storage tracks which are paved with brick taken from old walls, when the steam plant was dismantled.

Interior partitions are of 8-in., and the south wall of 12-in., hollow hard burned tile made by the Pioneer Fireproofing Co. The other walls are of brick and stone. The roof trusses and interior frame of steel were furnished by the Joliet Bridge & Iron Co.

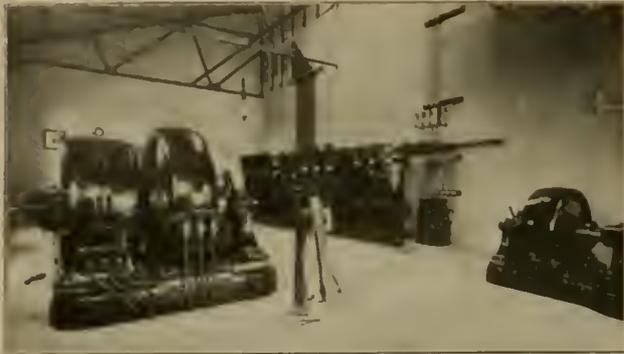


FIG. 14 JOLIET SUB-STATION.

The roof is covered with the Ludowici interlocking tile laid on sheathing over generator, battery and paint rooms and directly on steel angles on all other portions of the building. Skylights are formed with glass tile of identical shape, placed at will and readily changed if alterations are desired.

The details of pit construction are shown in Figs. 19 and 21. Piers of American portland cement concrete were built as indicated, on 12-ft. centers, with 11-ft. clear spans between them. To

floor between tracks is of Roebbling flat construction, finished level with the outer trans of rails, the heads of which thus form a slight rim for pits.

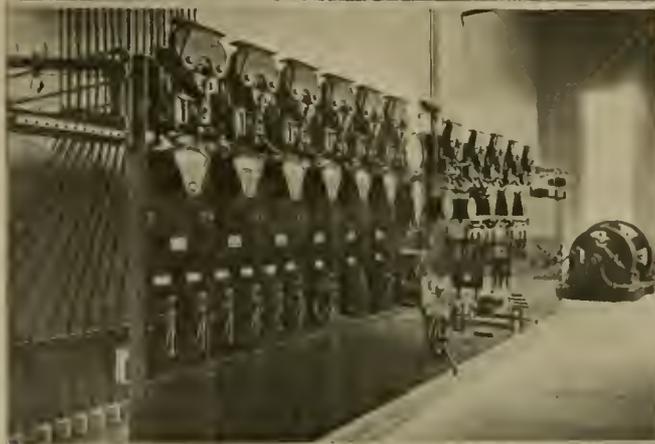
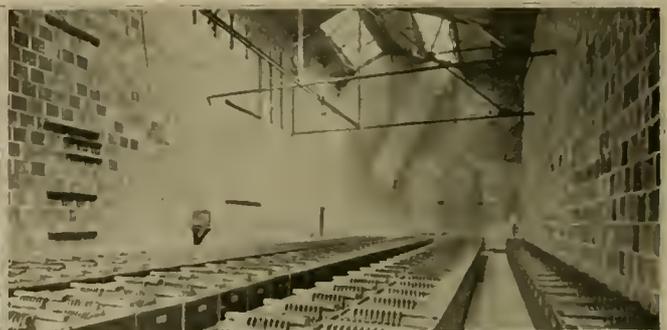
In the boiler room are installed a horizontal tubular boiler with pumps, etc., for heating all portions of the building except the storage barn. For this purpose the Webster system has been adopted, by reason of numerous obstacles to a gravity return. The pits will be heated by radiators set parallel with piers, the steam line running in open spaces above piers and the return line through openings shown at floor level.

The upper sub-stations are identical in plan with the exception that the one at Lemont is provided with a waiting room for passengers. Fig. 22 illustrates this station during construction, and before the completion of the roofs and indicates the general character of construction, and the arrangements for bringing the feeders into the building. The high tension wires are anchored outside and inside, and pass through the walls in 6-in. glazed tiles with 8-in. glazed tile hoods on outside as shown. The ground plan of Lemont station is shown in Fig. 23. The Summit station lacks waiting room and porch. The wire towers are located at the corners of the generator rooms over the switchboard, and the only interior openings in the towers are through the ceilings of generator rooms.

The second story of each sub-station, over the generator room, is divided into living quarters for the operator and his family, consisting of two chambers, living room, kitchen and bath room, with all conveniences. There are also provided two chambers for other employes who may be compelled to pass the night here in case of emergency.

The sub-stations are heated by low pressure steam apparatus, with gravity return.

Two hundred feet of track space is provided in each building for construction cars, snow plows, etc., and for cars which may be required for early or late runs on the upper end of the line.



JOLIET SUB-STATION AND CAR BARN.

Fig. 15—South End.
Fig. 16—Switchboard.

Fig. 17—Battery Room.
Fig. 18—Booster.

the upper surfaces of piers are anchored $\frac{1}{4}$ x 12-in. plates furnished with clips to hold the rails in place. The tracks are formed with 9-in. center bearing girder rails, Lorain section 106-364 (Kansas City standard, weighing 106 lb. per yd.), held to gage across the dummy tracks with tie rods spaced 5 ft. apart. The

In all stations the machine foundations and pits are built of concrete, the space under generators, back of switchboard and under transformers being arched over.

All low tension wiring is done with lead covered cable laid in ducts running under the floors between pits. High tension wires

are insulated with oiled cambric tape and carried on porcelain insulators on brackets back of switchboard and over transformers. High tension lightning arresters are installed on walls of wire tower, with stone barriers between adjacent sets.

The roof construction at sub-stations is the same as that employed in Joliet, with Ludowici interlocking tile covering, of glass where skylights are required and elsewhere of buff clay.

The Lemont and Summit buildings were constructed by the firm

In view of the extent of city and village streets traversed, it was deemed advisable to keep the body low enough for one platform step.

The bodies are 36 ft. long with 13 windows on a side in straight passenger cars, smoking compartments having five and the other portion eight. Fig. 24 illustrates combination passenger and baggage cars which are of same size as straight passenger cars. Other specifications of general interest are as follows: Length over all,

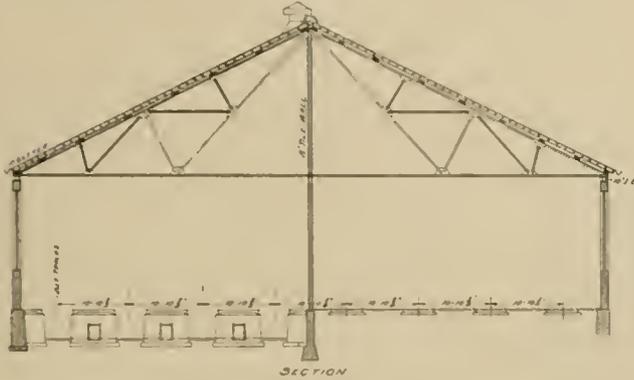


FIG. 19—JOLIET CAR BARN.

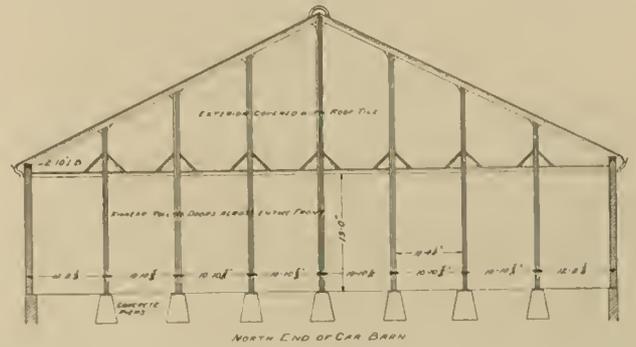


FIG. 20—JOLIET CAR BARN.

of Delosse & Olsen, under plans prepared in the office of Mr. F. R. Schock, architect.

Cars and Motors.

For service in and about Joliet, the standard equipment consists of 20-ft. closed bodies with six windows and longitudinal seats, built by the J. G. Brill and Pullman companies, and mounted on Peckham "Cincinnati special" trucks. These cars are equipped with two Westinghouse No. 49 motors.

For suburban service, cars with 30-ft. bodies, 40 ft. over all, with cross seats and smoking compartments, have been found very

48 ft.; width over sills, 8 ft. 8 in.; width over all, 9 ft. 1/2 in.; top of rail to under side of sill, 33 3/4 in.; under side of sill to top of trolley board, 9 ft. 6 in.; top of rail to step, 17 1/2 in.; step to platform, 14 1/2 in.; platform to floor, 8 in.; side sills, yellow pine, 5 in. x 8 in.; side sills, plated, 1 in. x 8 in.; end sills, white oak, 5 in. x 7 in.; end sills, plated, 3/4 in. x 6 in.; two 5-in., 6 1/2-lb. channel stringers full length of body; platform knees re-enforced with angle irons.

The exterior is painted in aurora red glazed with light No. 40 carmine, with cream trimmings and lettered and striped in gold; the interior finish is quartered oak.

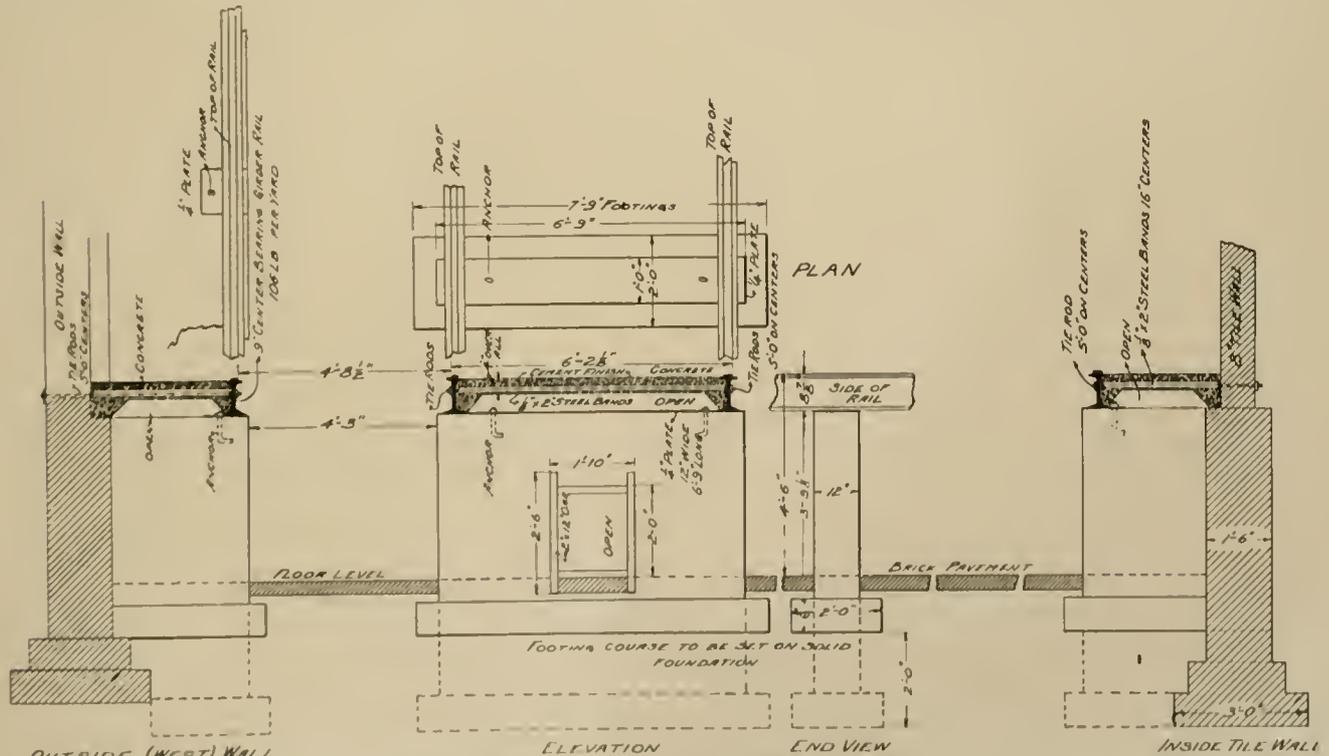


FIG. 21—DETAILS OF INSPECTION AND REPAIR PITS.

satisfactory. They were built by the Jackson & Sharpe Co. and are mounted on Brill No. 27 G trucks and equipped with four Westinghouse 12A motors and Christensen air brakes.

For the interurban line, effort has been made to provide cars of the very best construction possible, affording easy entrance and exit at stopping points, and comfort and safety while under way.

The seats are Wheeler No. 42 "Walkover," in rattan, with offset backs and corner handle. Consolidated No. 93 S heaters run the full length of each side of the car along the truss plank. International double registers with 3/4 in. square rod ringers are used.

The trucks are the Brill No. 27, with solid forged steel frames, and weigh 6,500 lb. each. The wheel base is 6 ft. and the gage



FIG. 22—LEMONT SUB-STATION.

standard. The wheels are single plate, weighing 490 lb.; diameter 33 in.; flanges 1 in. deep, 1 1/4 in. thick; tread 3 in.; axles 4 1/4 in.; brakes are inside hung with Christensen air equipment.

The electrical equipment consists of four G. E. 67 motors, geared to 40 miles per hour, K-6 controllers and Thompson recording watt-meters. Under service conditions, the car weighing about 50,000 lb. loaded, they make the 30-mile run including between twenty and thirty stops, in 80 minutes, with a current consumption of about 75-90 kw. hours.

These cars and trucks were made by the J. G. Brill Co. and they have answered the requirements of the service admirably. Frequent

The cars of this company are all equipped with the Crouse-Hinds removable headlight, in which an ordinary 16 c. p. lamp has given satisfaction on city lines.

The so-called "stereopticon" incandescent lamp made by the General Electric Co. has a filament in the form of a compact conical helix with a maximum diameter of perhaps 1/2 inch, making it possible to focus the lamp in a headlight with nearly the same accuracy as is attainable with an arc. The question is then reduced to one of intensity desirable for the purpose.

Repeated trials showed that a 32 c. p. stereopticon lamp properly focussed in a headlight would so illuminate the track as to render objects visible at a distance of 600 ft. on a clear, dark night, and Fig. 25 shows the method of wiring the interurban cars for lights, whereby the 32 c. p. lamps might be used in the headlights in series with 16 c. p. lamps in the car. The ordinary Crouse-Hinds receptacle might have been used, but in event of the burning out of one of the end pair of lamps, while the headlight was on other end of car, the current through other of the pair would be nearly doubled with resulting violent deterioration or burning out.

The new contact noted on the diagram is connected with the upper one when the headlight stem is inserted into receptacle and the pair of lamps on that end is therefore cut out. With the headlight out, each of the four series of lamps is independent of the others. When the headlight is in use the burning out of any inside lamp will merely dim the headlight until the lamp is replaced.

The Chicago & Joliet Electric Railway Co. was organized as a consolidation of the former Joliet Railroad Co. (operating in and about Joliet with a branch toward Chicago as far as Lockport) with the Chicago & Joliet Rapid Transit Co. under which charter the road was constructed between this terminus of the Joliet Railroad and the point where the Chicago Division crosses the line between Cook and Will Counties, near the village of Lemont. The new line was opened as far as Lemont, on Sept. 19, 1900, and for one year was operated under a rather slow schedule, with medium speed cars, in order to permit hauling ballast and other materials of construction without disarrangement of passenger traffic. Under these circumstances there was no objection to stopping cars at any point and this was done.

The through line to Chicago was formally opened and a regu-

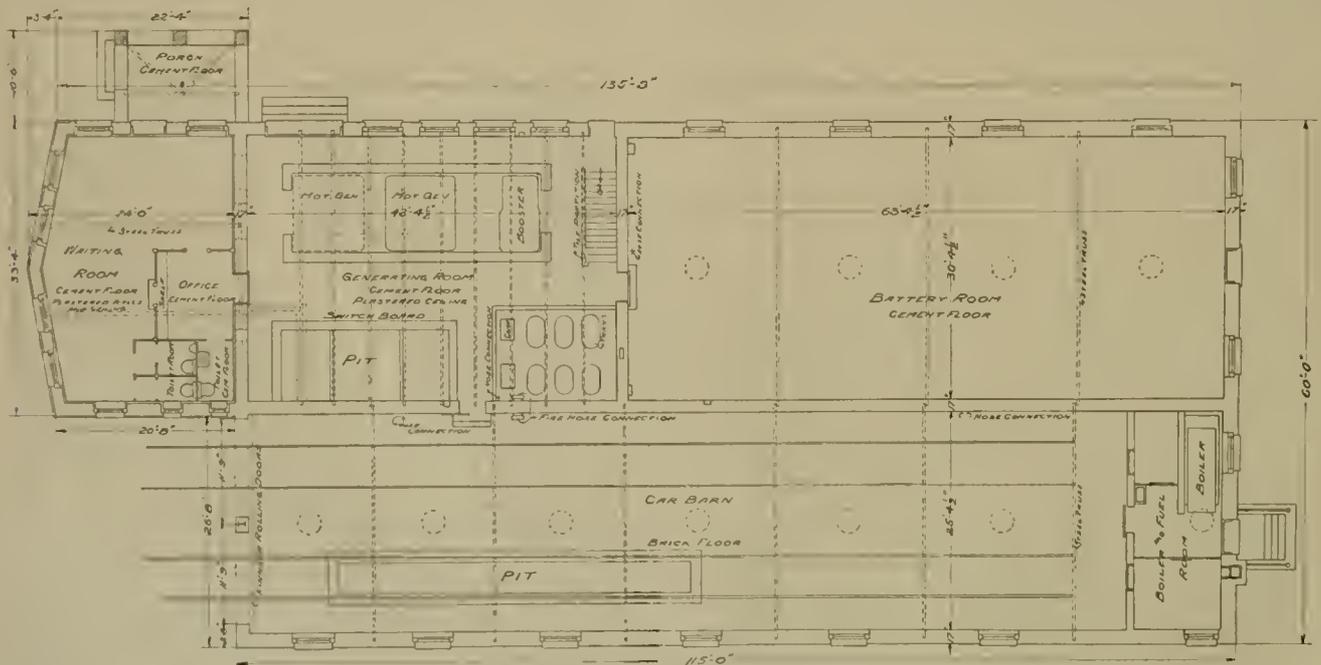


FIG. 23—FIRST FLOOR PLAN, LEMONT SUB-STATION.

favorable comments upon their riding qualities have been a source of much gratification to those responsible for their design.

Careful investigation seemed to establish the fact that the arc headlight is in a state either of transition or of hopelessly arrested development. Its failure at critical moments and the travel of the arc while burning render its use extremely precarious.

The incandescent headlight is reliable, steady and is readily made portable.

lar schedule established on Sept. 26, 1901. For a period of one month the schedule time for the 30-mile run was two hours, the comparatively slow speed being adopted for the purpose of familiarizing those living along, and using, the highway with the new order of things.

On Nov. 4, 1901, the present schedule was put into force, allowing one hour and a half for the run. To make this time, it became necessary to establish regular stopping places and to limit

their number, particularly in the city and villages. Seven stops are made (if desired) in the first two miles, in Joliet; four in one mile through Lockport; four in a mile in Lemont, and four in two miles in Spring Forest, and at suitable intervals elsewhere. The necessity for this might be expected to appeal to the ordinary intellect, where anything like competition with steam railroad service was demanded by the traveling public, and the great bulk of riders promptly acquiesced. Some extraordinarily constituted individuals in Lemont, however, pondered over this invasion of their sacred prerogatives. They took a trip one day to an intermediate point near Lemont and when they were carried a short distance past their chosen destination, advised the conductor of their purpose to amend the rules prior to his return. Their amendment went into force immediately upon the passage of some ties, under their able guidance, from the side of the road to the track, in the path of an approaching car. The general manager could not have changed the rules as quickly and the car did stop. Luckily it was in the day time, and no damage ensued, but the prospect of holding the next committee meeting in the penitentiary has placed matters in a new light to the reformers and the prompt action taken in their case will doubtless have a salutary effect upon similar geniuses.

One-half the Chicago line is double tracked and along the other half are located turnouts 1,000 ft. long and two miles apart. The private right of way is all double tracked, affording an excellent opportunity for making up time, in case of delay.

The line is divided into eight 5-cent fare sections, strip tickets being sold, six for 25 cents or 50 for \$2. By the use of the latter, the fare is reduced to 32 cents from Joliet Court House to the Chicago city line, where a 5-cent fare is collected by the Chicago City Railway Co., by which a passenger may reach the Chicago City Hall or any point on the South Side division of Chicago. There will be placed on sale at Joliet, Lockport, Lemont, Sag, Willow Springs, Summit and City Line, single and round-trip tickets for the convenience of those not provided with commutation tickets above referred to. Conductors are also provided with the ordinary form of duplex ticket.

As indicated, connection is now made with the cars of the Chicago City Ry. at the intersection of Archer Ave. with the city line at 48th Ave. With the completion in the spring of the branch from Summit northerly, connection will be established with the Chicago Union Traction Co.'s lines, giving direct access to all parts of the township of Cicero and the North Side of Chicago. From fifty minutes to one hour is now consumed in the trip from the city line to the Chicago City Hall

The work of construction has been carried on by the DuPage Construction Co., under the immediate charge of Frederic E.

The railway and construction companies are, through ownership of stock, controlled by The American Railways Co., of Philadelphia, Samuel K. De Coursey, president; William F. Harrity, vice-president; C. L. S. Tingley, secretary and treasurer; Silas W. Pettit, general counsel; H. J. Crowley, general manager, and A. S. Kibbe, engineer.

SOUTHWESTERN ASSOCIATION.

The fourth annual meeting of the Southwestern Gas, Electric Light & Street Railway Association, will be held in San Antonio, Tex., Apr. 18-21, 1902. The meeting promises to be the largest



FIG. 24 COMBINATION INTERURBAN CAR.

one in the association's history and there will not be less than 100 delegates present, coming from all parts of Texas.

The directors of the association have arranged for the reading of a number of papers on engineering subjects among which may be mentioned: "Fuel Oil," "Flat Rate Evil," "Best Management of Street Railways," "Inspection of Inside Wiring," "Personal Injury and Damage Cases."

The officers of the association are F. H. McGregor, president; E. H. Jenkins, vice-president; F. H. Stuart, secretary; J. D. Miller, treasurer.

LANGHORN-SOMERTON INTERURBAN.

Plans are now being prepared showing the route of the Philadelphia & Langhorne Passenger Railroad Co., which has been

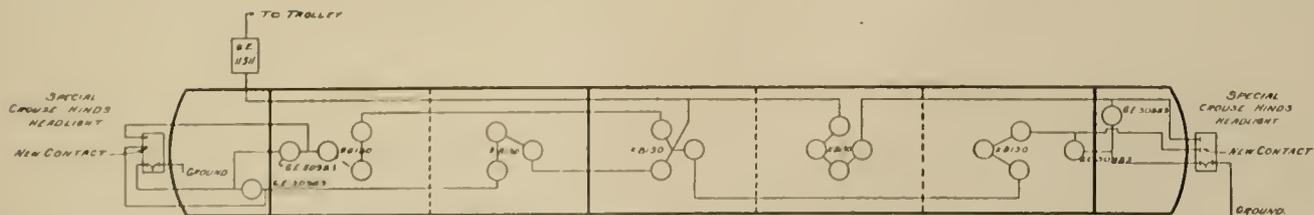


FIG. 25 INTERURBAN LIGHT WIRING DIAGRAM FOR 32 C. P. HEADLIGHTS.

Fisher, general manager; Joseph L. Breen, and H. G. Hinkle, superintendents of construction; John R. Blackhall, electrical superintendent, and Gordon S. Stayman, resident engineer. Legal matters have been in charge of Messrs. Clayton E. Crafts, George M. Stevens and Frank W. Welch. The electrical apparatus was installed by Frederic W. Hill, constructing engineer of the General Electric Co.

The operation, by the Chicago & Joliet Electric Railway Co., of its own lines and those of the Chicago & Des Plaines Valley Electric Railway Co., is under the charge of Frederic E. Fisher, general manager, with W. H. Henn, cashier; Thomas F. Synnett in charge of power stations; William Kelah, maintenance of equipment, and Charles N. Snyder, maintenance of track and line.

chartered to operate a six-mile interurban between Langhorn and Somerton. This road is designed to connect with the lines of the Union Traction Co. in future when that company has decided to build out to Somerton. The rights of way for the new road are all in hand, and Mr. Wm. L'arry, president of the company, has announced that contracts for the construction of the road will be let within a short time. He desires to have all the preliminaries arranged so that there will be no delay in starting the work next spring when the weather opens up. The road will be ready for operation by July next, and it is expected that the Langhorne Electric Light, Heat & Power Co. will furnish the current for the railway.

PENSION AND INSURANCE SYSTEM ADOPTED IN PROVIDENCE.

In November last the United Traction & Electric Co. of Providence, R. I., placed in effect a comprehensive scheme for providing its employes with pensions, sick benefits and insurance, which we believe will be of the greatest interest to other street railways. The plan was proposed by Mr. A. T. Potter, general manager of the company, and embraces the following benefits:

A weekly pension, beginning at age 70 and continuing until death, of the following percentages of the average weekly wages received by the employe during the 10 years previous to attaining age 70.

1.—If his employment has continued for 35 years or more, then 2 per cent of such average weekly wages for each year of such employment, the total, however, not to exceed 100 per cent.

2.—If the employment has been for 30 years, but not so long as 35 years, then $1\frac{3}{4}$ per cent of such average weekly wages for each year of such employment.

3.—If the employment has been for 25 years, but not so long as 30 years, then $1\frac{1}{2}$ per cent of such average weekly wages for each year of such employment.

4.—If the employment has been for 20 years, but not so long as 25 years, then $1\frac{1}{4}$ per cent of such average weekly wages for each year of such employment.

5.—If the employment has been for less than 20 years, then 1 per cent of such average weekly wages for each year of such employment.

Thus, if an employe has been employed 35 years and his average weekly wages for 10 years has been \$15, his pension is 70 per cent thereof, or \$10.50 per week, equivalent to \$546 per annum.

The entire cost of pensioning old employes is borne by the railway company.

As a result of the adoption of this system several of the employes of the United Traction & Electric Co. will go on the pension list at once and a large number will receive its benefits within the next few years. The cost of carrying the old employes under these provisions will become practically a fixed charge against the company's earnings.

The scheme for providing sick and accident benefits and life insurance is on the mutual plan. That is, regular weekly premiums will be paid by all employes, but the Traction company also agrees to make certain contributions to the insurance fund.

The plan for benefits and insurance is as follows:

1.—In the cases of all employes receiving less than \$9 per week, an insurance of \$500, in case of death, and \$4 per week during total disablement by accident or sickness, and if the employe is rendered incapable by accident or sickness of following any gainful occupation, then this payment of \$4 per week will be continued until the age of 70 years, at which time the employe will be put on the pension list until death. The life insurance may be continued at the option of the employe, if he has a wife dependent upon him, his weekly contribution of 10 cents to the insurance fund, as explained later, being deducted from the weekly pension payment.

2.—In the cases of all employes whose wages are \$9, but less than \$12 per week, the insurance is \$750 in case of death, and \$6 per week during total disablement. The weekly payment for continuation of life insurance is 15 cents.

3.—In the cases of all employes whose wages are \$12 or more per week, the insurance is \$1,000 in case of death, and \$8 per week during total disablement. The weekly payment for continuation of life insurance is 20 cents.

Thus the disablement benefits run to age 70, if disablement continue so long, instead of for only 26 weeks, as is customary in companies and societies; then the pension benefits begin.

Time during which an employe is receiving pay for disablement is counted in the term of service entitling him to pension.

The company contributes toward the insurance fund as follows:

1.—\$100 of each \$500 payable at death, \$150 of each \$750 payable at death, and \$200 of each \$1,000 payable at death.

2.—In addition to this, one-fourth as much as the total contributions of the employes. Therefore, under this provision, almost as much more is contributed by the company toward payments at death.

3.—All the expenses of operation.

4.—Any additional deficiency in the funds.

The total contributions of the company, including for pensions, are estimated to more than equal the total contributions of employes on the average.

The contributions of the employes will be as follows:

Employes receiving wages of less than \$9 per week, 10 cents per week.

Employes receiving \$9 and less than \$12, 15 cents per week.

Employes receiving \$12 or more, 20 cents per week.

The company guarantees to pay all expenses of operation and makes the liberal contributions as stated, because the payments of the employes are insufficient in themselves to meet the death and beneficial payments, and it is the desire of the company to avoid making the weekly premiums a burden on any of the men.

In conversation with a "Review" representative, Mr. Potter made the following comparisons between the cost and advantages of the benefits under the company's scheme, and the cost of similar benefits in insurance companies or societies:

"In the company's beneficial department, 20 cents per week secures insurance as follows: Against death, \$1,000; against disability, \$8 per week.

"The disability benefit is payable during the continuance of the disability up to age 70, when the pension begins.

"These benefits would, if purchased from a reliable stock company on an annual premium basis, cost: Life insurance for \$1,000, age 37, per week, 50 cents; accident insurance, \$8 a week, per week, 9 cents; sickness insurance, \$8 a week, per week, 16 cents. Total cost per week, 75 cents.

"The accident benefits would be for 52 weeks only and the sickness benefits for 26 weeks only. The cost as quoted above is 1-52d part of the lowest annual rates for such insurance. Weekly payment rates are always much higher because of the additional expense.

"Thus the lowest cost on weekly payments in reliable stock companies would be as follows: Life insurance for \$1,000, age 37, per week, 95 cents; accident insurance, \$8 a week, per week, 9 cents; sickness insurance, \$8 a week, per week, 16 cents. Total cost per week, \$1.20.

"In this, figures of accident and sickness insurance premiums are given as 1-52d part of annual rates because such insurance in reliable stock companies cannot be had on weekly payments at all.

"The cost of these benefits in mutual societies is variable, and such insurance is also frequently unreliable. The cost might average about as follows: Life insurance for \$1,000, age 37, 30 cents; accident and sickness insurance, \$8 a week, 20 cents; total cost per week, 50 cents.

"This is on the basis of payments being made monthly as in the lodges; weekly payments would surely come higher. The accident and sickness benefits are usually for 52 weeks only, or else continue for reduced amounts.

"The foregoing pension and insurance benefits are under this plan to be given to the present employes of the company, without regard to age or physical condition, the company accepting responsibility for the additional hazard. Hereafter, however, all new applicants for employment will be required to pass a physical examination, and none will be accepted who are more than 35 years of age."

Mr. Potter was asked what might be the legal complications under this scheme, as, for instance, would the company be compelled to pay a judgment secured by an employe for personal injuries, in addition to the benefits he would be entitled to as the result of having paid premiums to the company's insurance department. Mr. Potter replied that this was provided for in a clause of the membership agreement. In the event of accident the employe has the privilege, either of taking the benefits to which he is entitled under the insurance plan, and signing a release, relieving the company of all further responsibility, or else he may bring suit against the company for damages, in which case it is stipulated he forfeits all claim to the insurance fund. The company is liberal in this matter, and even though an injured employe, acting under bad legal advice, commences suit, the company will permit him to retake his privileges under the insurance if he withdraws the suit before it goes to the jury.

These provisions are certainly generous and liberal and the results will be watched with interest. Mr. Potter states that the men themselves have unanimously endorsed the entire scheme, which became operative last November.

THE RAPID TRANSIT PROBLEM IN LONDON.

The advent of American capitalists in the field of electric traction in the city of London has recently called attention to the rapid transit facilities of that city, and a timely article upon this subject by Mr. Frank J. Sprague has been recently published in the *Engineering Magazine*, from which we make an abstract. Mr. Sprague has made an extended study of the problem of rapid transit in London and his well-known ability and experience in this field gives his conclusions special weight. Within 12 or 15 miles of Charing Cross lies an area of 600 square miles with a resident population of nearly 6,000,000 of people, but a little over one-sixth of this area contains three-fourths of this population. The number of people who daily enter and leave London is indicated by the fact that there are no less than 17 main railroad stations within a radius of two miles and over 300 local and suburban stations.

The movement of the traffic in the city of London is suggestive. Although but a square mile in area, with a day population of 300,000 and a night population of but a tenth of this, in a single day over a million and a quarter people and 100,000 vehicles enter and leave its limits. The street traffic is carried on by about 200 miles of tramways, nearly 150 lines of omnibuses and 12,000 cabs. There are also two lines of underground railways with suburban connections and three deep-level roads operated electrically. Two lines are under construction, two more authorized, and parliamentary rights are sought for 13 railways or modifications or extensions thereof. All new applications were recently referred to a general parliamentary committee, which, after three months of inquiry, has referred most of the schemes to select committees with a report containing certain advisory and mandatory restrictions. This report is not considered by Mr. Sprague entirely satisfying, measured by the needs of London. It recognizes the necessity of rapid transit; recommends underground roads which can connect with surface tramways in outlying districts; suggests that they run from centers of traffic to other like centers and to suburban districts; advises shuttle working at the city ends of roads instead of loops, while permitting them at the outer ends; opposes confluent conjunctions and congested stations; endorses the multiple unit system. The most important question is left without action—that is, the placing of the whole rapid transit problem under a permanent board with full power to deal with it in all its aspects, without which no satisfactory solution of the general problem is possible.

The most important of the existing roads for internal traffic, and admitting of the greatest possibilities, are the Metropolitan and the District railways with their extensions, as they hold the key to an immediate improvement in the rapid transit situation in London. These two railways now present one of the strangest anomalies of railway operation, for while each owns independently a part of the circle, and jointly the connecting link, each runs circle trains in one direction only on one track, trains from outlying sections over both tracks, and each must provide way for trains of other companies. The eventual natural solution of the problem, so far as these roads are concerned, is their operation under one management, the abandonment of running rights of other roads over the circle tracks and their equipment with a system which permits of the highest practical schedule, and trains varying in length and frequency according to the service requirements. The circle should be an exclusive highway, not a trunk stem for several railways, especially unless the latter are similarly equipped. The needs of the traveling public as a whole will be much better served by high speed, two-minute service on the circle with exchange of traffic at junction points than by a ten-minute service mixed with a dozen outlying services which must in turn be also subordinated to the exigencies of local trains.

The three deep level roads, the City & South London, the Waterloo & City and the Central London, were built to relieve specific cases of congestion and are of the tubular type. The roads are of standard gage, but the tunnels vary from 10½ to 16 ft. in diameter, the latter being the only one which can take a standard car. All of these offer splendid examples of civil engineering and construction, and the general features of the Central London in particular have been worked out with remarkable care. The electrical equipment on none of these roads, however, is in accord with the latest developments in electric traction, which are contrary to locomotive traction and fixed make-up of trains.

As at present projected, the deep level roads are limited routes

between centers or along routes of congested traffic and means for interchange of traffic between the great railways. Having but two tracks, however, they must always be excluded from express service.

On account of vested interests, however, tubular railways are probably the only ones which will be constructed in London, but no new roads should be authorized except as a part of a well planned general scheme of traffic under the supervision of a central authority fully alive to London needs. The requirements of London rapid transit are the concentrating of masses of people in the morning and distributing them at night as well as providing quick inter-communication. An idea prevails that London conditions imply require transportation between certain centers of activity. This view must be discarded, isolation of districts destroyed and London made a city whose people have a common interest instead of an aggregation of parishes.

Multiplicity of roads, independently run, on limited and competitive routes, forming no part of a well ordered plan and operated under separate management, will add to, not solve, the difficulties of the rapid transit problem.

Every underground railway in London should be operated by a single local corporation with concentration of management and undivided responsibility, aided by the most advanced methods of equipment and transportation. They should form a net work, grid-ironing London, connecting all the important centers at different levels, having common stations except in the city, and in close contact with the stations of existing suburban railroads. Such a system can, by proper parliamentary action, be created by the absorption and harmonizing of the best parts of authorized roads, and the addition of such others as will accomplish the required object without unnecessary duplication of routes. The general plan having been determined upon, as was done in Paris, construction could proceed upon the most important lines, and the less important sections be added later. With well-chosen routes, perpetual franchises and absence of competition, capital would be readily forthcoming for such a system, but it would be preferable to have the construction authorized under some plan of municipal help similar to that given the new rapid transit road in New York. The operation of such a system should be accompanied by radical departures from English steam railroad methods. There should be an abolition of classes and differential fares as well as of the present type of cars. No roads operating for internal and short local traffic are justified in having class distinctions; they might as well be made in the waiting stations and platforms, or in the lifts. On almost all branches there should be free exchange at common stations except where it might be necessary to divert or restrict travel, as is done on the Metropolitan Ry. of New York and on the elevated and surface lines in Boston.

The compartment car is unsuited to traffic of this character, and while easy to unload, it is not as quickly loaded in practice as the corridor type with free access from one car to another. If train lengths are varied to suit the traffic the latter cars load and unload quickly and run more evenly filled than the compartment type. Grade crossings should, of course, be prohibited, and junctions other than end-on ones should be made only where Y's are required to get necessary car movements or where trains can be safely diverted. Most branches should be operated on the shuttle principle and loops avoided unless they are of considerable size and take in new territory with several stations. Where common stations are impracticable the separate stations should be connected by subways, as is so well done at the city ends of the present deep-level roads. That electricity should be the motive power needs no argument. The underground roads are competitive with surface facilities, and that route will command the most passengers which can offer the easiest access, the greatest convenience and comfort, the lowest fares and the most complete and rapid service. The latter can only be had by a special application of electricity.

There are two classes of traffic, one forced and the other coaxed. The latter is generally needed to fill the trains at light hours and is competitive. The most cogent appeal to this class of passengers is promptness, speed and comfort. The ideal service, so far as the passenger is concerned, would be by single cars run at high speeds and following each other at the shortest possible intervals, but the heavy traffic at certain hours prohibits this ideal condition. There must be an expansion of the car into a train varying in length according to the time of day and lengthening of intervals to

meet the requirements of operation at high speed. These requirements have led to a natural and logical development in modern electric traction generally known as the multiple unit system. In this system every motor car is a unit, and any combination of motor cars or trail cars may also be considered a unit, which can be operated from either end and can be joined with other units. Such a system readily lends itself to every condition of congested service. Similarity of equipment insures flexibility of train operation and provides a motive power proportioned to the requirements. Locomotive switching operations are abolished, trains can be reversed at any cross-over and traffic concentrated on any section of the road. With high powered equipments any required schedule up to the maximum becomes possible, and with any given mileage the number of cars in service can be made a minimum. Where a crowded system has main tracks with branches, units for the different branches can be combined on the main line and split up at junctions, and vice versa. The operation of the multiple unit system is the simplest since every unit is self-contained, as is every aggregation of such units. In case of failure of brakes or on slippery rails the machines throughout the entire train can be speedily reversed.

The current in-put to the machines is automatically limited on each one to its safe capacity. In practice train lengths vary from two to nine cars and equipments from an average of 100 to 300 h. p. per car. Tubular roads having 13 ft. diameter permit of the application of the multiple unit system to any extent. Where the diameter is only 11 ft. 6 in., however, as on some of the roads built or projected, then there can be but limited equipments. These roads are built with accelerating and braking gradients so that good schedules require but two motors on half the cars. By having trains made up of two three-car or two four-car units, the first and last car of each unit being equipped with two motors, a special construction of car in even these limited dimensions becomes possible. On such equipments it is the best practice to cut the trains in two for the lighter hours of service and to maintain a high frequency, alternate trains being sent unbroken into the yards.

At certain hours of the day some of the suburban steam lines have already nearly reached the limit of expansion by steam operation on existing tracks and are seriously considering adding to their facilities by construction of tunnels for their suburban lines. Such construction is utterly unnecessary, and if these roads should operate their suburban traffic electrically their capacity could be very largely increased. On many of them there are from 11 to 13 cars in a train even at times of light traffic, when the trains are often an hour apart. With station distances averaging $1\frac{1}{4}$ miles the schedule speed is sometimes as low as 13 miles per hour. On such roads the train movements could not only be greatly increased in busy hours, but traffic can be created at other hours by offering superior facilities in higher speeds, more frequent trains and prompt connections with local feeders which, quite apart from any economies of operation, would insure a large return on the cost of an electrical equipment.

Briefly summarizing, then, rapid transit in London depends upon a widespread and radical application of electricity, and this is of even more importance than the creation of new tunnels. The latter should be built according to well matured plans under a central authority. The roads should form part of a general system under a single management. Classes should be abolished, one regular rate of fare should be established with workmen's fares in limited hours, and free exchange except on limited routes or within two zones. Locomotive practice should be abolished and trains operated in small units which could be combined at will. Electrical trains should be provided in place of many of the buss lines on crowded streets. Every steam railway should equip its suburban service at once with electricity. It needs but a practical survey of all that has been accomplished in the United States to realize the immense benefits possible by an intelligent adoption of electrical propulsion.

The new electric railway between Lancaster, Pa., and Manheim, has been partly completed, and cars are running between Manheim and Petersburg.

The New York & Queen's County Railway Co.'s new line between Long Island City and Flushing was opened for traffic December 15th. The new route reduces the running time between these points by 20 minutes.

BIRMINGHAM, (ALA.) NOTES.

Since the Birmingham Railway, Light & Power Co. has decided to convert the steam line between Birmingham and Bessemer into an electric line the question of securing good current all the way to Bessemer, and especially at the Bessemer end, has been a very important one. Several plans have been proposed and abandoned. The engineers finally decided that to operate the road successfully it would be necessary to have a power station in Bessemer and the management accordingly opened negotiations with the Bessemer Electric Co. for the sale of its plant and the result was the purchasing of the same at \$24,000. The plant will be overhauled and enlarged, and will not only furnish current for the Bessemer end of the electric road, but will furnish current for the lights in Bessemer and the adjacent furnaces. This acquisition of the Birmingham company now makes it owner of one of the largest lighting properties in the south.

This company has recently purchased two blocks of land lying between Third and Fifth Aves. and 10th and 11th Sts. in Birmingham and will erect thereon a first-class barn and machine shop at a cost of \$100,000. The plans are now being prepared by Ford, Bacon & Davis, engineers, and the barn will be modeled somewhat after that of the new Orleans & Carrollton R. R. in New Orleans, only on a larger and more extensive scale. It will be of brick, with a cement floor and iron roof and doors, making it practically fireproof. The capacity of the machine shop will be such that 50 cars may be worked on at once. It is the desire of the company to keep all the cars of the system at this barn and abandon the other small barns. The purchase price of this site was \$25,000.

As a token of the company's appreciation for efficient and loyal service all employes who worked on Christmas day received an envelope containing one day's wages with the compliments of the season from the company. This in addition to their regular wages. All manifested the sincerest appreciation of this gift on the part of the company and it is hoped that the custom will be maintained.

The laying of 70-lb. high T-rail on 21st St. from First to Sixth Ave. has begun and when completed the paving of this street with vitrified brick by the city will closely follow. The overhead construction on this street has already been changed from center to side pole.

Mention was made in the December issue of the "Review" of the form of examination all applicants for position of motormen and conductors were subjected to. The forms mentioned have been supplemented by two books of questions, one for motormen and one for conductors, consisting of 143 questions each, and covering all the principal rules and bulletin orders. These books are all printed with blank lines under each question on which the applicant writes the answers. These examinations are conducted under the direction of the chief clerk to the manager, who examines the answers and marks the men accordingly. On the mark an applicant makes to these questions depends whether or not he is taken into the service.

To facilitate the inspection of the trolley lines the line inspector has been provided with a special car, a vehicle with four rubber tired wheels on which is set the propelling gear of a bicycle. With this the inspector can cover quite a good deal more ground in a day than otherwise. The car is light and easily removed from the track on the approach of a car.

A folding aerial tower wagon has been added to the "trouble department" of the railway and is operated very much like a hook and ladder of a fire department.

The freight traffic on the Bessemer and Birmingham line has increased to such a marked degree that it has been found necessary to purchase a light Baldwin locomotive for this service alone. At the present time mixed trains are run on this line.

The Berlin & Bridgeport Electric Street Railway Co., of Berlin, Ont., has been granted a charter.

The United Railways & Electric Co., of Baltimore, has erected a new building at the park terminal station, to replace that which was burned last spring. The structure is divided into three compartments to be used severally as a waiting room, car dispatcher's office, and lunch room for employes.

The "California" or Combination Car.—I.

BY W. E. PARTRIDGE.

The "California" car has been for years the principal style of street car used on the Pacific Coast. It might almost be termed the only street car of that region. During the last half dozen

they embody the leading characteristic of the type, that of both open and closed portions. So far as the comfort and convenience of the passenger go the two styles are nearly the same, and with

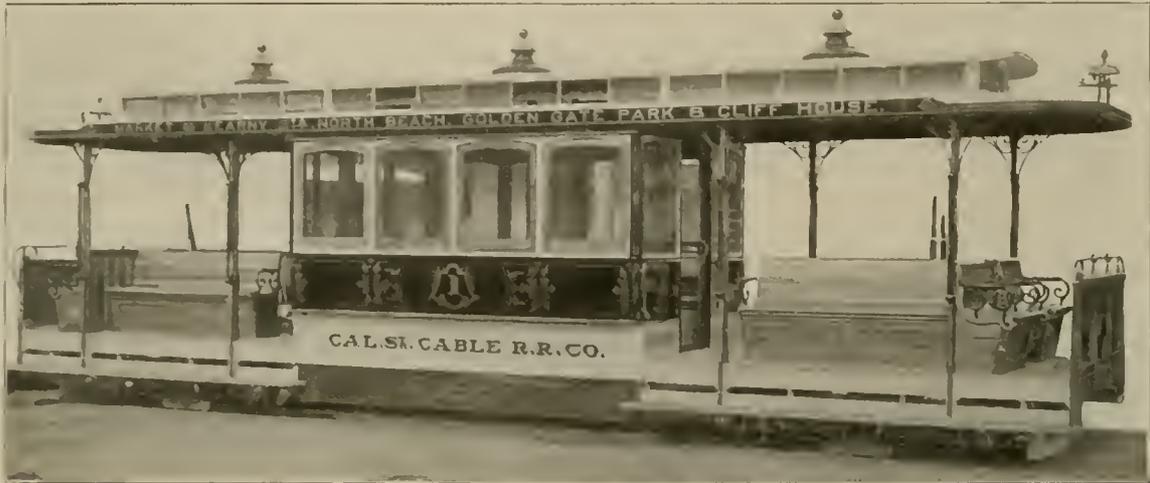


FIG. 1—THE ORIGINAL OF THE "CALIFORNIA" TYPE OF STREET CAR.

years the type has been steadily working its way eastward. Wherever it has been introduced it has encountered strong opposition. The climates of the middle and Atlantic states were said to be

the advantage in favor of the California type. As their usefulness and characteristics are so nearly the same, we may properly consider them together provided we bear in mind the fact that they are by no means identical. In the East nearly everything that runs on wheels and has a combination of open and closed portions is called a "California" car.



FIG. 2 "CALIFORNIA" CAR ON 4-WHEEL TRUCK.

unsuitable for it. But in spite of this and many other objections and prejudices it has won its way, and is in use in considerable numbers as far east as New York. In the milder climates of the middle and southern states it is one of the popular types. In England the car has obtained a considerable popularity. It holds its own well with the double deck car and would probably take the place of that form of construction both in England and on the continent but for the fact that the streets are both narrow and crooked and the double deck car gives a maximum capacity for a given length. As speed is of no importance the slowness of the double deck type is of little consequence.

The first California car which, so far as we can learn, was the first combination open and closed car of any kind, for a street railway, was built by the firm of J. Hammond & Co., of San Francisco, Cal., in 1889. The idea and design originated with Mr. John Hammond who was the founder of the firm. The car went into actual service on the California St. cable road in San Francisco on Nov. 6, 1889. It ran continuously all winter and afterwards the firm built a full equipment of these cars for the road. A patent for the invention was issued to Mr. Hammond in 1892. The type made a decided hit. The public approved of it. The expensive and cumbersome turntables at the ends of the cable roads were no longer necessary and a remarkable step had been made in street railway progress. Fig. 1 shows a view of this first car. A little study of it develops several very interesting points. The design was complete in all its details from the first. There were no

Strictly speaking the California car is one which has a closed body with two open ends or platform, upon which there are seats like those of an open car. Fig. 1 shows the first form in which the "California" car was built. It might be described as a closed body to placed as to occupy the center of an open car making two open ends and a closed or box center. The name has often been incorrectly applied to cars having an open compartment at one end and a closed body at the other like an open and closed car joined. These are not strictly speaking "California" cars, though



FIG. 3 LONG "CALIFORNIA" CAR, MARKET STREET RY., SAN FRANCISCO.

crudities to be corrected later. One important point was that people on the open deck or platform did not tread upon each other's feet in entering or leaving. The car was mounted upon

double trucks and was furnished with track brakes. These are absolutely essential upon the steep grades of the cable roads of San Francisco. The gripman in these cars is placed between the seats where he is out of the way of the passenger and is at the same time not liable to be annoyed by them. It will be noticed that this arrangement of longitudinal seats with the grip or motor man between them is used on all the Pacific Slope cars of the California type.

In a letter to the editor, Mr. E. P. Vining, general manager of the Market Street Railway Co., of San Francisco, throws some light upon the conditions prevailing on his lines and their bearing upon the development of the type. The first cable line began operation in 1870. "The cars used consisted of a closed car much like the horse car previously in use and an open dummy containing the grip."

"When the Market St. cable lines commenced their operation in 1883 the style of combination car still used was adopted. It practically consisted of the closed car and open dummy, formerly



FIG. 4—SHORT "CALIFORNIA" CAR, MARKET STREET RY., SAN FRANCISCO.

used, but consolidated into a single car instead of constituting two separate cars as formerly." The Eastern reader will understand that the dummy was a small open car with longitudinal seats between which the gripman was placed with the levers, brakes, handles, etc.

When the electric cars were introduced in the city of San Francisco in 1893 the electric cars were naturally modelled upon the same pattern as that which had previously given so great satisfaction. In speaking of the combination of open and closed car, Mr. Vining says: "This style of car is peculiarly adapted to the climate of our city. You are aware it is never cold enough here to freeze, and is never oppressively warm, while during a large part of the year we have strong cold winds from the Pacific Ocean. The result is that at all seasons of the year about half of our passengers wish to ride in the open section and about half in the closed section, and our style of car seems precisely to meet the wants and wishes of the public."

Of course this style of construction is not quite so well suited to our eastern climates as to the mild, regular conditions of the Pacific Coast. But we have long summers and cold, raw winds

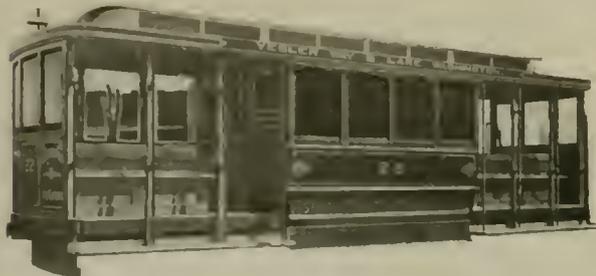


FIG. 5—"CALIFORNIA" CAR FOR SEATTLE CITY RY.

are common. Open cars are called for late in the autumn and early in the spring when only a few of the passengers really care for them. In some of our cities, notably New York, the boards of health order that at least one car in every four shall be closed. This is readily complied with by using a combination or California car in connection with the ordinary open cars.

In the cold, chilly summer evenings common to the Atlantic states a closed car is more comfortable for most people than an open one. With the open types now in uses here there is no protection for the passenger, who shivers, takes cold and makes his complaints, without hope of relief. Many of our eastern car builders have announced that they saw little use for the California type elsewhere than on the Pacific slope. Passengers, however, would welcome such a type on the cold evenings and on those



FIG. 6—"CALIFORNIA" INTERURBAN WITH STRAIGHT SIDES.

raw days which make our climate a terror. It is true combination cars do not answer very well even in New York for a winter service, but they are all right during the season when open cars are used.

Fig. 1, as has been said, is a view of the first California car ever built. It had most of the modern features except the bulk heads at the ends. These have been added in cars built more recently. Fig. 2 shows a late pattern, also built by J. Hammond & Co. The car is much smaller and is mounted on four wheels. It is for electric instead of cable propulsion. Each end of the car is fitted with a bulkhead and drop sash, and there are two steps instead of one. In other respects the car externally closely resembles its larger predecessor of the cable road. The closed body, however, is fitted with cross seats instead of those running longitudinally. A projecting buffer and drawhead protects the dasher. Figures are not at hand in regard to its length, but it is probably but little more than half as long as the earlier car.

Figs. 3 and 4 show two recent cars built by J. Hammond & Co. for the Market St. line in San Francisco. Both are for electric



FIG. 7—SHORT "CALIFORNIA" WITH STRAIGHT SIDES.

traction. Fig. 3 shows an 8-wheel car apparently of about the same length as that shown in Fig. 2, say 40 ft. It has the curved panels of the regular street car pattern. Aside from the different method of propulsion, the cars are much alike. Bulkheads with sash have been added at the ends and the two cross seats with the dasher have been omitted. The closed body is one window longer. There are two steps, a feature found in most of the later cars built by the firm. When a body is of necessity carried high two steps are a great advantage. The passenger easily and quickly gains a footing on the lower step and if this is made of sufficient width the car may be safely started, leaving him to mount to the floor at leisure. Two steps are much safer than the single 16-in. of ordinary four-wheel open cars and very much better than the higher steps found on most open cars mounted on double trucks.

Fig. 4 is a shorter four-wheel car with the details as in the previous figure. In these two Market St. cars the eastern railway man will note with interest the elaborate protection given at the space between the wheels. It would be nearly impossible for a

build a California car with a steam car side and a long body. A car of this style is shown in Fig. 6. It has seven windows upon each side of the closed body. The car is mounted upon double trucks, has the space between them protected with slats and has double steps. The body has a pair of truss rods under the sills and the usual needle beams. This is a high speed suburban and interurban car and is fitted with a trolley pole at each end. A shorter car of the same kind is shown in Fig. 7. It will be noticed that the posts used in the open portions of these cars are of a type quite different from anything of the same sort made in the East. One invention at least seems to be anticipated in the arrangement to carry the drip from the roof gutters down through one of the grab handles.



FIG. 8—40-FOOT "CALIFORNIA" CAR, BUILT BY MARKET STREET RY., SAN FRANCISCO.

person to fall, or be thrown under the car. Wire netting, or slats carried by bars, completely closed the space between the steps. Fig. 5 shows another form of California car built by the same firm for Seattle. As it is to be mounted on a single truck and is carried very low only one step is needed. The space between the steps in this case is guarded by a wire netting.

One position in connection with all these cars is worthy of imitation by street railway men in other parts of the country. All the cars have fenders, but they are all placed so that they are not likely to trip up the pedestrian. They do not project five or six feet in front of the bumper, taking up room and causing more

hood and the sign board are separate and are merely roof members and not a portion of the car framing. Longitudinal strength and stiffness at the posts is secured by large ornamental brackets. Cross brackets are also provided as will be seen by reference to Fig. 9, which shows both the plan and elevation of the Market street line.

The construction shows some peculiar and interesting features. The letter board proper does not extend beyond the closed body. The bow of the

The posts are inserted merely as supports for the roof and to furnish suitable supports for grab handles. They are not intended to strengthen the roof materially against longitudinal or transverse strains. As the seats are longitudinal in the open part there is no way of anchoring them to the sill at the bottom. For this

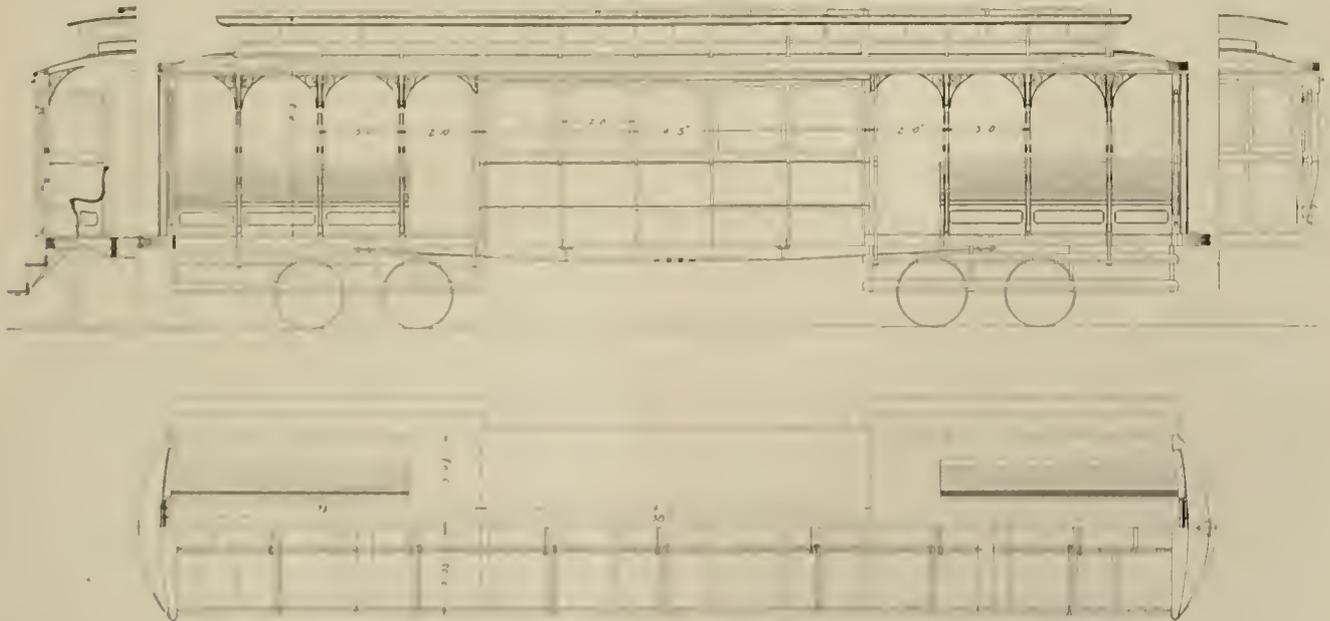


FIG. 9—DETAILS OF "CALIFORNIA" CAR, BUILT BY MARKET STREET RY., SAN FRANCISCO.

accidents than they avoid. Many managers object to such a location because it would be difficult or impossible to change the fender from front to back at each terminus. In Figs. 3 and 4 the slat fenders in front of elastic fender beneath or lack of the crown piece are a very valuable guard.

In addition to the strictly street car type the Messrs. Hammond

reason they are properly made light, as is the whole structure of the roof which covers the open portion.

The flood framing is of great strength. It consists of two side and two center sills. The side sills are of wood in two parts with a 5½-in. channel iron between them. The center sills have an I beam sandwiched between two fillers of wood. The bolsters

are of flat bar iron trussed. There are also truss rods under the side sills extending from bolster to bolster. Numerous "crossings" or transverse timbers are used with tie bolts holding the sills together by pairs. All of the four sills pass from end to end of the car without interruption, thus making a very strong floor. By carrying the body high there is no interference with the wheels and the framing design is not sacrificed to obtain space for the wheels and trucks. The car is about 6 ft. 8 in. wide over the sills and nearly 7 ft. wide over the widest part of the body. The lower step has a projection of about 16 in. The monitor is built with the glass in two sections, making the monitor side 15 in. high. In all the cars illustrated the gong is placed on the roof. This is the natural position and with the cable cars the most convenient, since the gripman always had a hand at liberty. With the advent of electricity the motor man has both hands occupied and the foot has been called into use to sound the gong, often very much to the discomfort of the passengers. Heavy "kicking" is one of the nuisances which passengers in New York and Jersey City at least can often complain. The overhead position has the advantage of being out of the dirt and of giving the sound clearly without obstruction.

These cars are of especial interest as showing the California type in its original form. Other builders while retaining the leading features, have made wide departures from the forms shown. These we shall speak of at another time.

NEW YORK-NEW JERSEY TROLLEY TUNNEL.

Plans were made public last month for the completion of the old Hudson River tunnel connecting 15th St., Jersey City, with Morton St., New York. Mr. David Young, general manager of the North Jersey Street Railway Co., has stated that his company has made arrangements to run its cars to a point near the mouth of the tunnel where passengers will be transferred to the tunnel cars. Similar connections will be made with the cars of the Metropolitan Street Railway Co. on the New York side. The tunnel company will run its own trolley lines through the tunnel and these cars, owing to the size of the tunnel, will be smaller than the usual trolley cars.

Considerable work was done on this tunnel several years ago. The old plans contemplated a two-tube tunnel and enough work is finished, according to the statement of the engineers in charge, to prove that it is unnecessary to sink supports to the bed rock as it is planned to do in the case of the Pennsylvania Railroad tunnel. On the north tube, 4,000 ft. on the Jersey side and 200 ft. on the New York side were completed 8 years ago and on the south tube, 600 ft. on the Jersey side were finished at the same time. Of this work, 1,500 ft. on the Jersey end of the north tunnel are of modern construction, that is, cast iron tubing, the rest, which was put in many years previously, is constructed of brick and thin steel. The tubes are 18 ft. in diameter.

The Jersey City terminus of the tunnel is covered by a large temporary building in which machinery is installed for building the tubes, and includes the air pumps, water pumps, etc. For several years an engineer and a fireman have been stationed at this building and the tunnel has been kept free from water and the air in it has been constantly renewed. There has been no work done on the approach to the tunnel which is entered at present by a perpendicular shaft.

The new company which is to finance the tunnel project has among its incorporators, F. B. Jennings, of New York, and John Young and Horace C. Golding, of London. The company is capitalized at \$5,000,000 common and \$3,500,000 6 per cent cumulative preferred stock, and \$7,000,000 first mortgage 5 per cent bonds. Neither of the trolley companies in Jersey City or New York will assume any financial obligations in regard to the tunnel, their only connection with it being an agreement for the transfer of passengers between New Jersey and New York. It is also stated that the Jersey City, Hoboken & Patterson Street Railway Co. will carry passengers to the mouth of the tunnel.

The Market Street Railway Co. of San Francisco, has selected a site on which to erect new machine shops. The company proposes hereafter to construct its own rolling stock, and will give employment to a large force of mechanics.

ANNUAL BANQUET AT LANCASTER, PA.

Nearly 400 employes of the Lancaster County Railway & Light Co. were tendered a complimentary dinner on the evening of January 2d, which was given as an expression of the company's appreciation of the faithful work of the employes during the year. Nearly every one of the employes of the Conestoga Traction Co., the Edison Electric Illuminating Co., the Lancaster Gas, Light & Fuel Co. and the Columbia Electric Light Co. was present. The occasion demonstrated the cordial relations existing between the employes and the company. The dinner followed close upon the announcement that the wages of the conductors and motormen would be increased 10 per cent after January 15th, and both were greatly appreciated by the men.

A year ago Mr. W. B. Given, president of the company, inaugurated the custom of giving a dinner to the employes. The success of the first banquet led him to promise at that time that the dinner would be repeated annually. Since last year several new corporations were merged under the management of the traction company, but the company's hospitality was extended to all the employes of all the consolidated companies.

The operation of the entire street car system was suspended from 9 to 12 o'clock in the evening and substitutes were engaged to take charge of the power house, gas plant, etc., in order that every employe might attend.

At the close of the dinner a number of speeches were made, President Given first addressing the men. After complimenting them on their efficient, competent service of the past year, he stated that as long as they served the company with fidelity and the public with courtesy, their positions were as sure as the rock of Gibraltar; no political or other influence could affect them. The benefit association organized by the men was commended and Mr. Given, on behalf of the directors of the company, presented it with a purse of \$100.

Mr. F. S. Given, general manager of the company, next addressed the men. He is very popular among the employes and was extended an ovation. The other speakers were C. Edgar Titzel, superintendent of the lighting department; Oscar M. Hoffman, treasurer; Thomas P. McManus, one of the oldest conductors on the road; W. W. Hensel, general counsel; B. F. Zook, foreman of the carpenters; Edward A. Reist, manager of the Conestoga Park theater; Major B. Frank Breneman, who presented the benefit association with a \$100 bond of the first street railway line in the city, worth about \$110, and W. M. Franklin. The banquet came to a close at 12 o'clock, at which time President Given extended an invitation to the men to a similar dinner the following year.

THEY WERE SHORT.

The Washington correspondent of the St. Louis Globe-Democrat tells the following story on Senators Hanna and Lodge: "They got on the car together the second day of the session. The two chatted about the events of the day, and seemed oblivious of the fact that the conductor of the car was standing patiently in front of them waiting for his fare. Lodge was first to realize it. He started to feel first in one pocket, then in another. Senator Hanna pulled back the capacious skirts of his Prince Albert and began a search of himself. Hanna found a rough looking jack-knife and four rubber bands. Lodge brought out a gold match safe and a nail file. Then Hanna looked at Lodge, Lodge looked at Hanna, and both continued the search. Eventually they produced 7 cents between them.

"The conductor, noting their silk tiles and the distinguished appearance of Lodge, hesitated, but finally reached for the 7 cents, with the comment, 'I'll remember you, Judge, and you can pay me the other three the next time you ride.'"

The Fond du Lac & Oshkosh (Wis.) Electric Railway Co. was incorporated December 13th, with a capital stock of \$100,000 and projects an interurban electric line between the cities named in the title. Passengers, mail and express will be carried.

The Catawissa (Pa.) & Bloomingburg Electric Railway Co. has been granted a franchise for the construction of a line through the borough of Catawissa.

THE BUFFALO HIGH-TENSION CABLE DISTRIBUTION SYSTEM.*

BY HAROLD W. BUCK.

In the development of the electrical transmission of power many propositions are being presented of a water power or coal mine situated within such a distance of a city that it is cheaper to transmit power from the mine or waterfall than to generate it by steam in the city itself. In such systems three engineering elements must be considered: first, the generating plant; second, the transmission line, and third, the method for distributing the power at the end of the transmission line. Electrical generating plants and transmission lines have been the subject of many discussions, but the terminal arrangements for transmission lines are newer in their development, and it is the object of this paper to bring the matter before the members of the Institute for discussion, the problem presented being the best method of distributing the power throughout a city after a point has been reached in the transmission line where it is no longer safe to carry the power overhead at the transmission voltage. Such limitations exist on the outskirts of all cities.

In order to serve as a basis for discussion and to point out the various considerations which enter, a brief description will be given of the method which has been adopted for the distribution of Niagara power at Buffalo.

Fig. 1 shows a map of the Niagara-Buffalo transmission line indicating the relations between the overhead circuits and the circuits of distribution within the Buffalo city limits, the numeral 3 on the map indicating the terminus of the 22,000-volt overhead three-phase lines. At this point the three overhead circuits, each having a capacity of 10,000 h. p. at 7 per cent line loss, enter a terminal house, and are connected, as shown in Fig. 2, through circuit breakers, selector switches, bus bars, etc., to the 22,000-volt primaries of the step-down transformers. These transformers have a capacity of 3,000 h. p. each, and are of the oil-water cooled type. The secondaries of the transformers are wound for 11,000 volts, making the ratio of reduction of voltage 2:1. The secondaries of the transformers are connected through selector switches and two sets of bus bars to the underground cables, each of which is connected through an air-break circuit-breaker. With the arrangement shown, the Buffalo system can be operated in two sections if desired, and an overhead circuit or any cable connected

from one to another and for cutting out damaged sections of a cable by means of section switches, so that the entire length of cable from the terminal house will not have to be cut out of service. Special attention is called to these section switches, which are shown in Fig. 4. They are of the triple-pole, single-throw type of oil-break switch, with a waterproof hood of iron bolted to the top of the switch frame for the protection of the cable heads and leads. These switches are installed in vaults under the city streets, placed at convenient intervals. Some of the vaults are as large as 10x12 ft. The switches are absolutely waterproof and could be submerged if necessary without danger, and will open the circuits under heavy loads without difficulty. They have proved of great convenience at times when repairs have been made necessary on sections of cables, and for locating faults without the necessity of cutting the cable. I believe that underground section switches of this kind would prove of great service to all high-tension cable

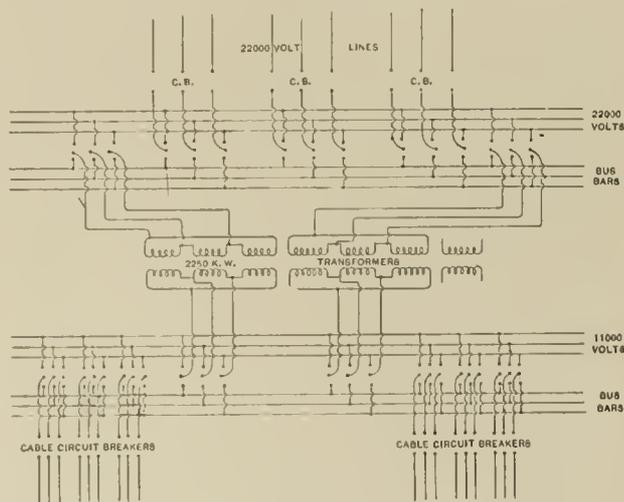


FIG. 2—CONNECTIONS, BUFFALO TERMINAL HOUSE.

systems, and believe that the design shown is entirely safe for service at 11,000 volts.

In all, seven sub-stations are supplied with power at 11,000 volts, three-phase, distributed as follows with reference to Fig. 3:

Station No. 4—2,000 h. p., for railway purposes, transformed from 11,000 volts to 360 volts and fed to four 500 h. p. rotary converters. 1,000 h. p., for general power distribution on a tertiary system at 2,200 volts, three-phase, the voltage being lowered from 11,000 volts by three 250 kw. transformers. This 2,200-volt distribution is partly overhead and partly underground.

Station No. 5—1,500 h. p., for railway purposes, transformed from 11,000 volts to 360 volts and fed to three 300 h. p. rotary converters.

Station No. 6—1,000 h. p., for railway service, as in Station No. 5.

Station No. 7—5,000 h. p. is transformed from 11,000 volts to 360 volts and fed to the plant of the Buffalo Lighting Co. in an adjacent building. 1,000 h. p., transformed to 2,200 volts, three-phase, for general power distribution on the tertiary system.

Station No. 8—2,000 h. p., transformed from 11,000 volts to 2,200 volts, three-phase, for power distribution on the tertiary system.

Station No. 9—1,500 h. p., transformed from 11,000 volts to 360 volts, for supplying power to three 500 h. p. rotary converters for railway purposes.

Station No. 10—1,000 h. p., for railway purposes, as in Station No. 9.

It might be asked why the power is not transmitted from Niagara Falls at 11,000 volts and distributed through the underground cables without transformation. It will be found, however, that the saving in copper on the transmission lines by the use of 22,000 volts more than pays for the transformer installation in the terminal house, and that the saving in line loss is greater than the loss introduced by the step-down transformers. The longer the transmission line the greater would be the proportionate saving. It may also be asked why, if the overhead lines are to be operated at 22,000 volts, the transmission cannot continue at this voltage

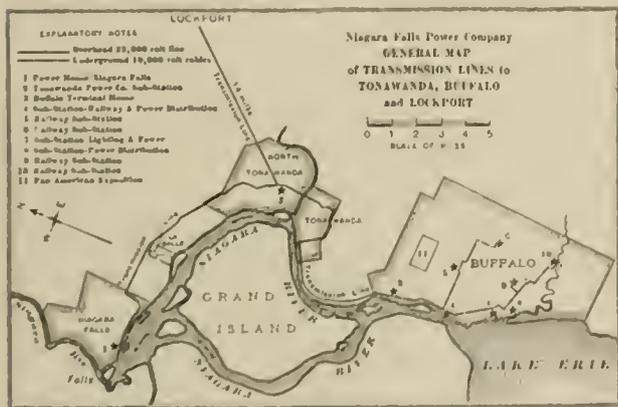


FIG. 1.

to either of the banks of transformers. The 11,000 volt cables supplied from the secondaries of the terminal house transformers are drawn through tile ducts under the streets in the usual manner, and carry the power to the various sub-stations throughout the city of Buffalo. At present there are five feeders, each consisting of No. 000 triple-conductor lead covered cable. Two of these have 9 32 in. rubber, two 8 32 in. rubber and one 6 1/2 32 in. paper and 4 32 in. paper over all. The lead in all cases is 3/8 in. thick.

Fig. 3 shows the general arrangement of cables throughout the city, with the various methods which are used for transferring

*A paper read at the 15th meeting of the American Institute of Electrical Engineers.

throughout the cable system in order to avoid the use of step-down transformers. It is true that there have been examples of successful operation of underground cables at voltages even higher than 22,000 volts, notably the transmission from the plant of the St. Croix Power Co., but obviously, what can be done on a through trunk line cannot be safely done on a network, and the Buffalo underground system is essentially a network. It has many lateral connections, frequent joints, section switches, cable heads and switchboard connections, and under these conditions, which are probably no different from the requirements of other cities, I believe that 11,000 volts is, in the present state of the art at least, the highest voltage that should be considered. The success of the Buffalo power distribution at 11,000 volts, which has covered a period of about four years, has, however, demonstrated the safety and feasibility of using a potential as high as this, provided the greatest precautions are taken in the selection and installation of cables, and in the insulation of all terminal appliances. It seems to show that there is no longer any reason for fixing the prevailing voltage of 6,600 volts as the safe limit for underground work and for paying for the extra copper and ducts required by the lower voltage.

In cases of short-circuit in the cables, practically no damage is done at 11,000 volts on account of the small current. Short-circuits have occurred on these cables, which have had the whole of Niagara power back of them, and it has been found, after locating the fault, that the lead was barely melted off around the fault. At 6,600 volts such a short-circuit would undoubtedly blow the cables to pieces, on account of the greater current, the heat energy at the fault being nearly four times as great. This is a practical advantage, for it reduces the risk of damage to adjacent cables and ducts.

In the city of Buffalo, then, we find a distributing company called The Cataract Power & Conduit Co., purchasing power from the Niagara Falls Power Co. at the Buffalo city line, at the trans-

which consumers power is supplied from the tertiary system mentioned at 2,200 volts, three-phase, from sub-stations owned and operated by the Cataract Power & Conduit Co.

From a business as well as an engineering standpoint it is believed that the methods used in Buffalo as described are very sat-

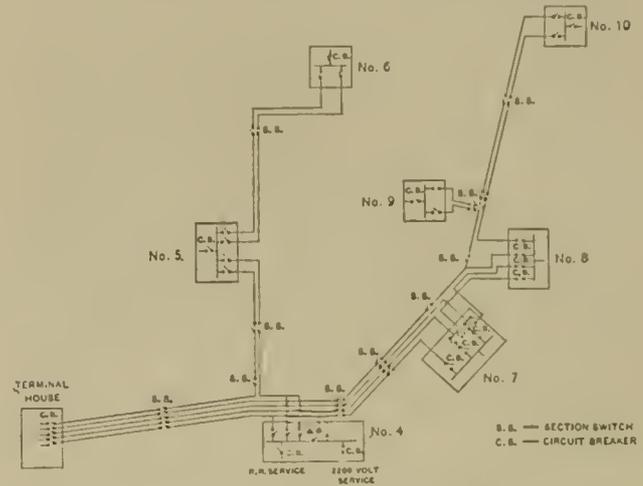


FIG. 3—BUFFALO 11,000-VOLT CABLE SYSTEM.

isfactory and economical. The primary company, viz., the Niagara Falls Power Co., confines its attention to the generating plant and transmission line, the distributing company to the delivery of three-phase 25-cycle alternating current power, and the railway and lighting companies to the interests of their own circuits. This separation of responsibilities is entirely logical and most conven-

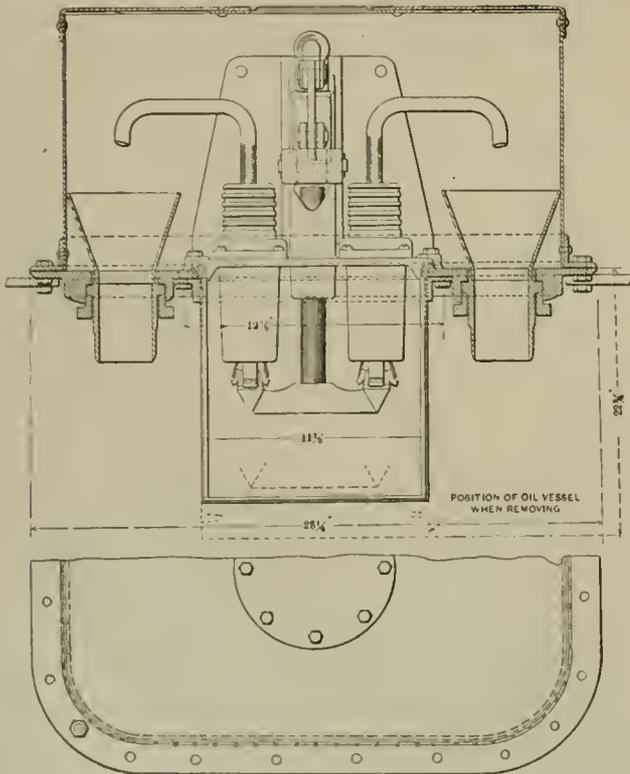
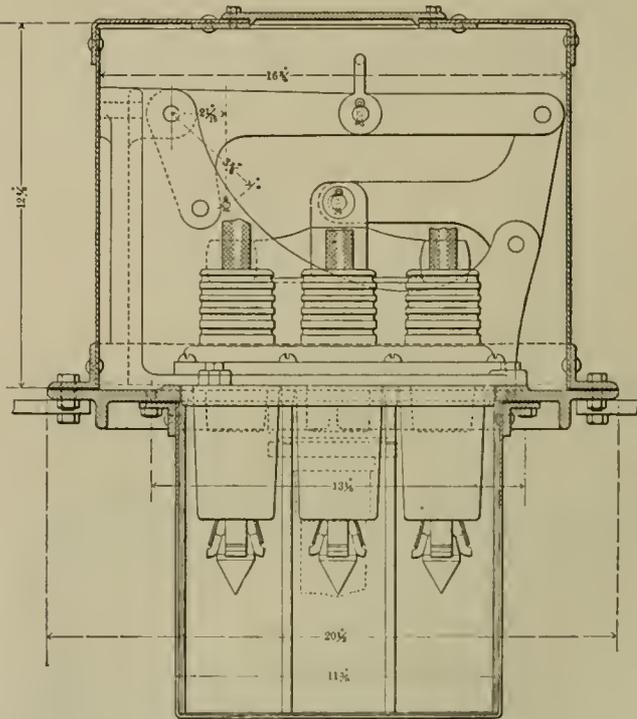


FIG. 4—UNDERGROUND SWITCH.

mission voltage, lowering it to 11,000 volts, three-phase, 25-cycles, and distributing it as raw material in this form as dealers in power. To the railway company it is delivered for transformation and conversion for use on their own direct current circuits, to the lighting company for conversion into the various forms in which they redistribute it to small consumers, and it is also delivered to various factories using power in quantities from 75 h. p. and upwards, to



ient. It would be still better if the Cataract Power & Conduit Co. could confine itself to the delivery of power at a single voltage, viz., 11,000 volts, but the tertiary distributing system at 2,200 volts is necessary, for the reason that it is obviously not safe to supply small consumers of power, such as small factories, with connections at so high a voltage. By transformation to 2,200 volts the numerous "grounds" which occur on these circuits are made in-

dependent of the main cable system, and the introduction of the transformers adds to the self-induction of these circuits and limits the violence of short-circuits which occur upon them.

The transformation of voltage at the city line from 22,000 volts to 11,000 volts, beside being necessary, is also a positive engineering advantage, for the reason that it renders the 11,000-volt cable system independent of "grounds," and high voltage disturbances from lightning, resonance, etc., which occur at times on the transmission line, since there is no electrical connection between the two. Although there have been several instances of rises of potentials on the overhead line far above the normal, resulting probably from resonance, no rises of voltage have been noted as having been transmitted to the cables by induction through the cores of the step-down transformers.

It is believed that the methods here described are practicable and convenient, and can be safely followed in principle by those who are planning similar systems of distribution.

MILFORD & UXBRIDGE ROAD OPENED.

December 20th the Milford & Uxbridge Street Railway Co. opened its line to the public and the initial trip over the road was made by a large party in charge of Mr. W. E. Goss, general manager of the company. The car was decorated with flags and was greeted with the greatest enthusiasm by the residents all along the line. The road passes through Mendon, which has heretofore been without street railway facilities. At Lake Mendon, which is a short distance from the latter city, a rustic waiting room has been built. The storage battery station of the road is also situated on the banks of this lake. At Uxbridge where the road terminates the party disembarked and spent a short time in examining the handsome new public library which was recently presented to the town.

The return trip to Milford occupied nearly an hour, as no attempt at fast time was made, and the officers of the company were heartily congratulated by the party on the opening of the road. The line passes through a region of beautiful scenery and bids fair to be well patronized. Since the opening, regular hourly trips have been made.

About 15 acres of beautiful wooded territory on the line of the road has been purchased and is to be fitted up as a summer park, which has been named by the company Lake Mendon Park. It is designed to make this a popular place for pleasure seekers next summer as a boat house has been erected and other buildings planned, including a large pavilion, several small ones and a theater. These will be constructed in time for the early opening of Lake Mendon Park in the spring. A number of boats and launches will be placed in commission on the lake which is a beautiful sheet of water covering about 100 acres.

Wauhaicum Park, at South Framington, is another pleasure ground supported by this company. These two parks are about 16 miles apart and it is not believed that the attractions of either one will detract from the public interest in the other. No admission is charged to the park for either trolley riders or those who come in carriages.

The company has already a number of open cars, but the additional business expected on the opening of the summer parks has resulted in the placing of orders for a number of new ones. Five new cars are now building at Worcester, and several more have been ordered from other makers. The large double truck closed cars of which the company owns several, have a seating capacity of 50 passengers. The company also owns five large snow plows and two more have been contracted for. All the large cars of the company are equipped with air brakes with axle driven compressors. Whistles are used instead of gongs where compressed air is available.

The officers of the company are: John T. Manson, president; Arthur R. Taft, vice-president; E. W. Goss, treasurer and general manager; Maxham E. Nash, superintendent.

The Toledo, Bowling Green & Southern Traction Co., of Findlay, O., is building an addition to its car house at Bowling Green. The structure will be 90 ft long, with a capacity for storing 10 cars. It will be used for housing the new rolling stock which is to be put in commission as soon as the line to Findlay shall be completed.

NOTES FROM BINGHAMTON, N. Y.

Announcement was made last month of the consolidation of the Binghamton Railroad Co. and Binghamton, Lestershire & Union Railroad Co. with an authorized capital of \$1,500,000. The new corporation will be known as the Binghamton Railway Co. The new company plans to construct a system of suburban roads which will embrace many miles of new track and connect that city with Main, Little Meadows, Pa.; Owego, Halstead, Great Bend, Pa., and other suburban towns. Financial provisions have been made for a complete power house equipment necessary to the efficient operation of the prospective system.

Mr. G. T. Rogers, president of the Binghamton Railroad Co., reports that the consolidation is by no means a new idea, but has been effected after carefully considering the plan for several years. The city system and the Union extension are now both upon a sound financial basis and their full earning capacity has been determined.

An additional power plant with a substation at Union and a new car house will be built as soon as possible. All the extensions will be constructed for both freight and passenger traffic, and it will be the aim of the company to furnish Binghamton and its vicinity with a first-class system of interurban roads and to provide them as soon as they can be built.

The issue of \$1,500,000 of bonds is to be secured by a mortgage of \$2,500,000, the remaining \$1,000,000 of bonds to remain unsigned and unexecuted until the issue thereof is duly authorized by the Board of Railroad Commissioners. The latter sum can only be issued in any case for certain purposes prescribed in the mortgage. The sum of \$1,150,000 is to be held in escrow to redeem the underlying bonds of the two parties to the consolidation. The remainder of the \$1,500,000 issued is to be applied to improvements and extensions.

A suit brought against the city of Binghamton and the Binghamton Railroad Co. to compel the city to collect from the company the expense of paving between the tracks and 2 ft. outside has been dismissed. The suit was brought two years ago by an abutting property owner and the railroad company became a party to the case, its defence being that it had a contract with the city under which the railroad company was only required to pay one-fifth of the expense of paving between the tracks. A decision on this case was rendered in favor of the company two years ago and an appeal was taken to the Appellate Court, which ordered a new trial. The railroad company has already paid the one-fifth which it claims was due the city, and it was accepted by the city. The court holds that it would be an absurdity to claim that the common council of the city of Binghamton had done an illegal act in this case when under the statute the council could, by resolution, authorize the particular act complained of.

The tracks of the company's Ross Park line are to be moved from the south side of Park Ave. to the center of the street. This is the result of an amicable settlement between the railroad company and committee of common council. It has been agreed that the company will make the change requested in case the city will grant it a franchise for a double track over Park Ave., if the property owners will consent to this franchise and if the company is given at least a 40-ft. roadway for these tracks. The council committee which investigated the matter before compelling the company to make the change claimed that the tracks were on the public highway, while on the other hand, the company claimed a private right of way on the strip occupied by its tracks and, therefore, that it could not be forced off. There are no papers or records that can be found to establish or disprove this claim, and as both sides wished to keep the matter out of the courts the above settlement was reached.

COST OF RAILWAY STRIKE.

Albany County has closed its account with the Albany Trust Co., which advanced the money to defray the expenses growing out of the strike of the employes of the United Traction Co. in the spring of 1901. The account shows that the calling out of the troops which were required to maintain order in the city, their transportation, maintenance, etc., cost Albany County \$34,111. During the strike there was nearly 3,000 checks drawn on the Albany Trust Co. by the county treasurer.

Express Service in Detroit.

The electric express service has developed rapidly and grows in popularity as the possibilities in the way of frequent communication, quick delivery of express and light freight between cities and the suburban towns in the adjacent territory become better appreciated. Detroit furnishes a striking example of what can be done in this line. There are now 15 electric express cars, each from 35 to 40 ft. long, on the electric railways which center in Detroit and serve the territory within a radius of 60 miles, giving all the various towns in that territory from one to three deliveries per day. Were the express handled by the steam roads the shipments would be one or two days later, and naturally the trolley service with delivery assured the day of shipment, is appreciated by patrons, especially as the charges are almost at freight rates.

As before stated, some of these towns have two and three deliveries a day. The number of deliveries is in accordance with the amount of traffic to go forward. For instance, shipments out of Detroit for Mt. Clemens, a point located on the Rapid Railway, are forwarded three times a day—at 10 a. m., 3 p. m., and 7 p. m.; freight for Algona, New Baltimore, St. Clair and Port Huron, but once a day, at 3 p. m.; for Royal Oak, Birmingham, Circle and Pontiac, twice a day, at 1 p. m. and 8 p. m.; for Delray, Wyandotte and Trenton, twice a day, at 8:20 a. m. and 2:20 p. m., and for Rochester, Washington and Romeo, once a day, at 1 p. m.

These departures being so arranged, so as to cover points en route oftener than the steam roads, still further give perishable goods, if any, immediate despatch, thus avoiding loss through delays.

On the several divisions of the Detroit properties, agents have been placed at principal points. Some on a salary, others on commission, this depending in a measure on the size of the town and prospective business in sight. Still further, experience has demonstrated, better results can be obtained on the salary basis. Where it has been found necessary to establish agents, they have been started on commission, the change to salary being made when the agency has been developed to a certain standard. Where no agents are located, such as prepaid stations, small combination express and waiting room shelters have been erected, where the express and freight can be placed under cover until such a time as owners call

The milk business has also grown rapidly, and in order to properly handle it, it has been found necessary to operate special milk cars on the several divisions, which cars leave the outer terminal of the line the first thing in the morning, and pick up milk all the way into Detroit.

In the beginning the company had much difficulty in the handling of express and light freight because of the careless handling by



TEAM TRACK—DETROIT FREIGHT DEPOT.

car crews and incompetent agents; but this has been remedied and now no agent or conductor is appointed unless he has had some preliminary training along this line. Express must be handled by experienced men; otherwise the earnings will be depleted through the payment of claims resulting from overs, shorts and loss and damages, due to nothing but careless checking and handling.

At Detroit the most important thing to contend with has been



EXPRESS SERVICE IN DETROIT—TRACKS FOR CARS ON EAST SIDE OF DEPOT.

for it. All shipments for these prepaid stations are accepted entirely at owner's risk of delivery, and so receipted for. The idea is to relieve the electric road of all responsibility for delivery after freight has reached its destination.

the expense of handling, which prior to the consolidation of the electric lines by the Everett-Moore syndicate was cared for through three separate depots. For instance, express from the Rapid Railway was handled through one depot; that from the Detroit &

Pontiac, Detroit & Wyandotte, Detroit & Northwestern and the Detroit, Rochester, Romeo & Lake Orion roads through another depot, and that express for the Detroit, Ypsilanti, Ann Arbor & Jackson Railway through yet another. This entailed an expense for each depot of an agent and staff, which since last September

16 in. This way-bill is the same as express and railroad way-bills, forwarding point, destination, date of shipment and way-bill number showing in proper places. The way-bill numbers are arrived at by commencing with number one the first of each month and numbering them consecutively until the end of the month. This



INTERIOR OF ELECTRIC EXPRESS DEPOT, DETROIT.

has been changed and the stations consolidated in one large, joint depot, located on the corner of Fifth and Congress Sts., in close proximity to depots of steam roads, also navigation companies, thus also decreasing cartage expense where interchange is necessary. Still further, the location of this depot is such that it is easy of access by all important wholesale and retail stores and commission houses in case any of them desire to take advantage of quick service.

The building is 45 ft. by 195 ft. On one side is the team track or driveway where freight is received and delivered. Our illustrations give a fair idea of the traffic handled. On the east side of the shed there are double tracks with accommodations for four cars on each track, with ample room for switching.

The interior of the shed is clear of all posts, thus giving ample floor space necessary for the prompt receiving, sorting and loading the express and freight. Comfortable offices for the agent and staff are at one end. There is also cold storage for the protection of perishable goods.

For use in connection with this service the company has a full set of blanks which have been designed with care. The shipper fills in the receipt showing the date, from whom received, to whom consigned, destination and a complete list of all articles making up the shipment. This receipt is made in duplicate, a carbon copy being taken. The Detroit United Ry. receives the property "subject to the condition on the back hereof," which are in the form usually adopted by common carriers, and exactly similar to those printed in the "Review" for April, 1900, page 204.

When express is received at the depot it is checked in on this shipping bill, or that part of this form marked "Duplicate." If the shipment agrees with the shipping bill, the original is receipted by the checker signing agent's name with the checker's initial. This receipt is retained by the shipper, and the duplicate is kept by this company and the shipment re-checked into car, thus giving the company a double check on each shipment. Any exceptions as to shipment being in bad order, etc., are noted on these shipping bills, thus enabling the company, in case of claim, to know the exact condition the goods were in when received and forwarded.

After goods have been received and loaded into express cars, they are then billed out on a way bill, this form being printed in three sizes, quarter-sheet, half sheet and full sheet, the latter being 12½x

way-bill number is used as reference in all correspondence relating to any matter coming up in regard to any shipment covered by this particular way-bill. The facts shown on the way-bill are designated by the headings of the various columns, which include consignor, consignee, number of packages, description, weight, rate, charges, advances, amount prepaid and total to collect.

The rate is taken from the company's regular express tariff, which is governed by the rules of the Official Classification. The rate on



INTERIOR VIEW.

the different commodities handled are according to the value, dimensions and weight of each article; for example, shipments of glassware, furniture or any articles liable to damage from breakage are given a much higher rating than articles that are packed in such a manner as to occupy less space in the express car and which will weigh more than the articles first mentioned.

After this way-bill is complete it is then copied in a tissue book,

This ticket is printed, showing the point of shipment, destination, shipper and to whom consigned, this information being on both portions of ticket, eliminating the possibility of errors in delivery of cans when either filled or empty. These tickets are charged for at so much per ticket, according to the distance the milk is to be hauled.

This system for the express service on electric lines radiating from Detroit was adopted with a view to handling express, and all accounts relating thereto in as simple, practical and systematic man-

SAN ANTONIO TRACTION CO.

The present system of the San Antonio (Tex.) Traction Co. consists of a consolidation of all the separate lines formerly operating in that city. These companies are the San Antonio Street Railway Co., the Edison Electric Co., the Alamo Heights Railway Co. and the West Side Electric Railway Co. The latter company had previously absorbed the old West End Street Railway Co., and the Edison company had absorbed the Citizens Electric Co.

Report of Express Forwarded and Received at

Station for Month of

190

EXPRESS RECEIVED				STATIONS	EXPRESS FORWARDED			
WEIGHT	EXPRESS CHARGES	ADVANCE CHARGES	PREPAID CHARGES		WEIGHT	EXPRESS CHARGES	ADVANCE CHARGES	PREPAID CHARGES

FIG. 5.

ner as possible. Being handicapped in various ways, it is impossible to put into successful operation a more intricate system; hence the adoption of the foregoing simple, yet practical methods, which, nevertheless, are working to the satisfaction of all concerned.

The express department, except for the Detroit, Ypsilanti, Ann Arbor & Jackson Railway Co. is under charge of Mr. George W. Parker, lately connected with the Grand Trunk Railway system at



G. W. PARKER.



A. EASTMAN.

Pittsburg, who is general express and passenger agent, and Mr. Albert Eastman, who has had considerable experience with the Grand Trunk and Michigan Central roads and who has recently been appointed travelling express agent. The electric express depot at Detroit has been placed under the supervision of Mr. A. R. Patterson as joint express agent. Mr. Patterson has had years of experience in local office work with the Michigan Central and consequently he is well fitted for the management of this depot.

CHICAGO CAR BARN BURNED.

December 15th, fire destroyed nearly 200 cars in the barn of the Chicago Union Traction Co. at Lincoln and Wrightwood Aves. The fire was discovered about five o'clock in the morning and it was noon before it was subdued. The loss to the company is estimated between \$125,000 and \$135,000. Nearly all of the cars used on the Lincoln Ave. line were destroyed. There was great difficulty in handling the fire, owing to the extreme cold weather, as all the hydrants in the neighborhood of the barns were found to be frozen when the firemen attempted to connect onto them.

It is supposed that the fire originated from an overheated stove in one of the cars in the barn. The company's loss is partly covered by insurance. The building was entirely destroyed, only the north wall adjoining the power house was left standing when the fire was finally extinguished.

The Cleveland Electric Railway Co. has purchased 90 new cars, which will be added to its service.

The beginning of street railway operations in San Antonio was in 1875, when the San Antonio Street Railway Co. was organized. The late Augustus Belknap was chiefly instrumental in the organization and construction of the first road. This was a 3-ft. gage road operated by mules and was less than 2 miles in length.

The first electric street railway line in this city was known as the Citizens' Electric Street Railway. This was succeeded in 1895 by the Edison Electric Co., which built an opposition line and eventually absorbed the Citizens' company. The original San Antonio Street Railway Co. discarded its mule service in 1891 and was converted into electric operation, and the other companies have consolidated from time to time until the present system of 45 miles is operated by a single company.

The equipment of the present company includes 60 electric motor cars, of which 40 are in regular daily service. On all divisions of the system cars are run from 6 o'clock a. m. to midnight, on schedules varying from 10 to 20 minutes. Much of the improvement in the system is due to the management of Mr. E. H. Jenkins, president of the San Antonio Traction Co., who took charge of the service in 1899. At that time the condition of most of the roads was extremely poor and the service was entirely inadequate to public demands. A large part of the roadbed has since been rebuilt with as much rapidity as possible and the number of cars operated was considerably increased. Mr. Jenkins erected a car shop at San Pedro Park station in which for the past 18 months the building of new cars has been carried on continuously. During this time 18 closed and 12 open cars have been built and there are at present 6 cars about completed. The new cars have all been built to replace those formerly in service. An electrical repair shop has also been erected near the car shops in which all electrical repairs for the car equipment and power house are made.

A commodious building near this shop has been erected for the use of the motormen and conductors as well as passengers. One portion is used as a waiting room for passengers and the other is, a reading room for motormen and conductors when off duty. This room is 18 x 30 ft., is neatly furnished and contains an abundant supply of reading matter. The building also contains a shower bath room paved with asphaltum for the use of the employes, which is much appreciated.

A universal transfer system has been inaugurated by the new management which is very complete. It is arranged so that passengers can transfer from one line to any other running in the same direction, and during the first year the transfer system has been so enlarged as to now embrace 22 transfer points in the city.

The officers of the company are: E. H. Jenkins, president; J. J. King, secretary and treasurer; D. D. Midis, general superintendent; Thomas C. Brown, superintendent of transportation.

The Ottumwa (Ia.) Traction & Light Co. is considering building an interurban electric line between Ottumwa and Oskaloosa.

All but two of the conductors and motormen employed by the Butler (Pa.) Passenger Railway Co., went out on strike, December 7th, the cause being the refusal of the company's officials to recognize their union. Pending the settlement of the difficulty, cars were operated on a reduced schedule and without disturbance.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ATTEMPTING TO CROSS TRACKS WHERE CARS RUN CLOSE TOGETHER.

Legare v. Union Railway Co. of New York City (N. Y. Sup.), 70 N. Y. Supp. 718. May 17, 1901.

The fire appellate division of the supreme court of New York says that whether or not a person crossing a street in the city of New York, occupied, as most of them are, by cars propelled by electricity or cable, and often running at a high rate of speed, is guilty of contributory negligence, where there is evidence which would justify a finding that the company was negligent, must usually be for the jury; for, in a case where a car can be controlled so as to avoid running down a person crossing the track, it cannot be said that it was negligence as a matter of law for the person to attempt to cross the track. In many of the streets, during the busy portion of the day, these cars are running constantly, within a few feet of each other, and if a person about to cross the track is to wait until no car is in sight the track would be impassable, except at the risk of the pedestrian's being guilty of contributory negligence. The right of a railroad company to use the public streets is conditioned upon the right of the public to also use them in the ordinary way, and no railroad company has the right to so block the streets that the public are excluded from crossing them, except at the risk of being run over. It cannot, therefore, be contributory negligence as a matter of law for a person to start to cross a track when the car is at such a distance that the motorman can prevent it running down a person crossing the track, if attending to his business, and operating the car in a careful and prudent manner. Here, two boys started to cross a track and the court holds that they had a right to suppose, seeing a car 75 feet away, and crossing in plain view of the motorman, that he would hold the car in control so as not to run them down. They certainly had a right, it says, to assume that he would not put on power to increase the speed of the car. But there was evidence that when the car was about 15 feet from the boys he put on additional current, and also evidence that would justify a finding that, if he had checked the car when the boys started to cross, they could have both crossed in safety, whereas one was fatally injured. Wherefore, the court affirms a judgment for damages against the company, holding that, on the whole case, the question of negligence and contributory negligence, was for the jury.

WATERING OF STREET COMPELLED BY INJUNCTION

Newcomb et al., Selectmen, v. Norfolk Western Street Railway Co. (Mass.), 61 N. E. Rep. 42. Sept. 3, 1901.

This suit was brought to compel the street railway company to water a street through which its track ran, and the supreme judicial court of Massachusetts has ordered an injunction therefor. It holds that the requirement in the grant of location to the company that it should water the street over a portion of the way between certain dates was a lawful restriction within the provision of the statutes allowing selectmen to grant a location "under such restrictions as they deem the interests of the public may require." The well-known effect of running cars is to raise a dust, and the requirement, although affirmative in form, in substance, it says, restricts the company to running cars in such a way as not to raise a dust. And it holds that the restriction is a regulation which it is given power to enforce, by virtue of a statute empowering it to compel the observance by street railway companies of all laws applying to them and the regulations of the selectmen. It is true, it says, that the statute stated in one place that the power was given "according to the usual course of chancery proceedings," and that it might be argued that this restriction should not be enforced because it is not the usual course of chancery proceedings to compel the specific performance of continuous acts or duties for an indefinite time. But the court is of the opinion that, in view of the obvious purpose of the statute that such regulations should be enforced specifically, it ought to go further than ordinary practice might lead it to go in the absence of legislation, and to do all that it can to see that the requirement is performed. And it thinks that some confirmation of this view is derived from the fact that regulations concerning the

removal of snow and ice were before the mind of the legislature when it gave the court the power mentioned. Moreover, it says that, practically, there will be no difficulty in the specific performance of the street watering. When it is decided that the company is bound, probably there will be no further trouble, especially as the location provides a domestic tribunal by requiring the work to be done to the satisfaction of the superintendent of streets.

STATE MAY REQUIRE ADDITIONAL SAFEGUARDS AT CROSSING, WITH STEAM RAILROAD, WHEN NEEDED, IMPOSING THE EXPENSE ON BOTH ROADS.

Detroit, Ft. Wayne & Belle Isle Railway v. Commissioner of Railroads (Mich.), 86 N. W. Rep. 842. July 2, 1901.

When the joint use of a crossing is obtained, is the position tenable that, because one road is older than another, the junior road must not only compensate the senior road for its present damage before it can cross, but for all time it must bear any additional future cost which may be made necessary by the erection and maintenance of appliances for the safety of the public, resulting from the increased use of the crossing? The supreme court of Michigan thinks that this question must be answered in the negative. It holds that when the right to use the crossing is once acquired, the right of the several corporations to this use is reciprocal, so far as is consistent with the kind of use made of the crossing by them. Again, it says that new dangers upon the public streets require new safeguards in the interest of the safety of the public. It is a matter of common knowledge that where electric cars run at frequent intervals, across a railroad over which trains are frequently run, it is a place of unusual danger, not only to the passengers in the steam cars, but also to the passengers in the electric cars. This danger is occasioned, not by the steam road alone, nor by the electric road alone, but by both of them. And the court declares that it has no doubt that under such circumstances the state, in the exercise of its police power, can take such steps as will minimize the danger, and can impose the expense of so doing upon the corporations causing the danger; has no doubt of the right of the legislature to authorize the railroad commissioner to order the construction of additional safeguards at crossings and apportion the expense incident thereto between the companies affected. Or, in the language of Mr. Justice Grant, who dissents, the court, holds that when a steam railroad company has condemned a right of way, and extended its tracks across a street or highway, on which is an existing street car line, and at the time the public travel upon the street or highway was not such as to require the erection of gates, etc., for the protection of the public, but subsequently, owing to the increase of population, the increase of tracks and trains by the railroad company, and the increase of travel upon the street or the highway, the erection and maintenance of such safeguards becomes essential for the protection of the public, the street railway company can be required to pay a portion of the expense.

LIABILITY FOR INJURY OF ONE PASSENGER BY ANOTHER, ESPECIALLY AFTER THE LATTER HAS ONCE BEEN PUT OFF THE CAR.

United Railways & Electric Co. of Baltimore v. State (Md.), 49 Atl. Rep. 923. June 13, 1901.

It is not because a particular passenger is known by the carrier's servants to be in peril of injury at the hands of a fellow passenger or stranger that a failure to use the means at command to protect him will be actionable negligence; but, the court of appeals of Maryland says, it is because there is a known or discoverable danger that an injury may be done to some passenger, and because no effort is made to avert that injury from all the passengers, that the carrier is liable if an injury is inflicted on one of the passengers when it could have been prevented. It is just as incumbent on the carrier to protect all his passengers from assault by a fellow passenger, when his servants have knowledge or the means of knowing that an assault on some one is imminent, and when they have time and the

means to avert it, as it is to protect all his passengers from injuries likely to result from defective means or methods of transportation.

Consequently it will not do to say, after an assault has been made, that the servants of the carrier did not know or could not have foreseen that the particular individual who was assaulted would be injured by an assault, if they were apprised, or with proper care could have known, of circumstances which indicated that some one would be injured unless the disorderly passenger or stranger were ejected or controlled. In short, if there is danger of any one being injured, and the employes fail to remove, subdue, or overpower the turbulent individual, after knowing that there is danger, or after they ought to have known that there was danger, if they had exercised proper care, that failure is negligence, for the consequences of which the company is answerable.

Moreover, the court holds here that if a certain passenger, who had assaulted another passenger before he was ejected from the car, and who was drunk, disorderly, and turbulent, was properly put off the car because his presence was a menace to other passengers, then it was the plain duty of the employes who put him off, to have kept him off. They demonstrated their ability to keep him off by having put him off, and there being equally sufficient reason for keeping him off that there was for putting him off the car, the failure to keep him off was an act of negligence. If, on the other hand, every effort was made by the employes to avert the injury, but was made without success, then the company would not be liable. It was a question of fact for the jury, and the jury having returned a verdict against the company, the court affirms a judgment for damages for the injury caused by the passenger just referred to after his return to the car, assaulting another passenger, without the slightest provocation, striking him a vicious blow in the eye, which caused the rupture of a cerebral blood vessel, and thereby produced paralysis and ultimately death.

RIGHT TO CROSS RAILROAD TRACKS AT POINT OF SOME DANGER—COMPARED TO RIGHT OF BUS LINE.

Louisville & Nashville Railroad Co. v. Bowling Green Railway Co. (Ky.), 63 S. W. Rep. 4. May 7, 1901.

The weight of authority, the court of appeals of Kentucky says, is to the effect that there is no jurisdiction in equity to enjoin a street railway from crossing a steam railroad's track at grade in a public street unless such jurisdiction has been conferred by statute or some constitutional provision. The court, however, declares itself unable to find anything in the constitution of that state to exclude street railroads from the operation of section 216 thereof, which provides: "All railway, transfer, belt lines and railway bridge companies shall allow the tracks of each other to unite, intersect and cross at any point where such union, intersection and crossing is reasonable or feasible." It says that the language of the section is broad enough to cover all railways. The provision that crossings shall be allowed when reasonable or feasible is necessarily a restriction of the right to such as are reasonable or feasible. To hold that the section only applies to crossings of the right of way, and not to crossings in streets, would be to add to the section an exception which the general words used do not justify.

Then the court takes up the question of whether the crossing in contest was reasonable or feasible. It was shown by the railroad company that trolley wires overhead would be a source of danger in the operation of its trains; also that electric cars were liable to stop from failure of the current, and that this might occur on the crossing; and that the passage of the regular train on the railroad would delay the street cars. But the court answers that all these objections would exist at any grade crossing, and if they were sufficient it would follow that there could be no grade crossings of such a railroad by the street car line. Such a rule it does not think would be in keeping with the constitutional provision. Then, recurring to the particular crossing in question, it says that the number of tracks to be crossed, and the number of trains passing (something like 40 or 45 a day) presented a state of case where, if the crossing were not in a street, it would have great doubt if it should be allowed. For instance, if a crossing was allowed over the railroad company's tracks and yards on the square north this would destroy the yard. But the public had

a right to the use of the street, as well as the railroad company. It had no right to make an unreasonable use of the street. A part of the testimony as to the dangerousness of the crossing and the length of time it was obstructed by the trains might, to some extent, grow out of the use by the railroad company of its tracks at this point in switching and making up its trains. While it was entitled to a reasonable use of the street for the passage of its trains, it had no right to make an unreasonable use of it.

And as the public had the right to cross, subject to the reasonable use of its tracks by the railroad company, the court says that it is unable to see that the addition of the street car line would so materially change the situation that the crossing should be declared unreasonable or not feasible. To illustrate: If the street railway company had undertaken to run a bus line from the landing on the river to the central part of the city, crossing the railroad at this point at regular intervals, just as the street cars would do, clearly the railroad company could not have enjoined its operation. Again, it was shown that the street was a narrow one, and that when the gates were down it frequently became congested with vehicles. But a street car in addition, the court says, would add little more to the congestion than a bus would. A flagman was maintained at the crossing. It appeared from the proof that an approaching train could be seen for some distance on either side, and, if this space were built up, the flagman, with his gate, would give warning of danger. It was true, the flagman might be negligent; but this might occur anywhere, and the danger to the car was no greater than to other vehicles on the street.

AUTHORITY TO GRANT FRANCHISE—TO INDIVIDUAL—ASSIGNMENT TO COMPANY—MAY TAKE PRIVATE PROPERTY—CANNOT BE ENJOINED UNTIL DAMAGE IS PAID—NOR AS A NUISANCE—NOR WHERE CHARTER IS AS RAILROAD.

Watson v. Fairmont & Suburban Railway Co. (W. Va.), 30 S. E. Rep. 193. June 18, 1901.

When the legislative act incorporating a city provides that "the council of said city shall have power to grant and regulate all franchises in, over and under the streets, alleys and public ways of the said city, under such restrictions as shall be provided by ordinance, but no exclusive franchise shall be granted to any individual or corporation," the supreme court of appeals of West Virginia holds that the legislature thereby delegates to the council of such city authority to pass an ordinance granting to an individual or a corporation the right to construct and operate a street railway in the streets of such city. And, although such franchise is usually conferred upon a private corporation, it may be granted, the court holds, to an individual, and, with the consent of the council, having such delegated power over the subject, he may make a valid assignment of the same to a private corporation organized for the purpose of constructing and operating such street railway.

The holder of such franchise, although privately interested in the enterprise thereby provided for, the court further holds, is nevertheless an agency or instrumentality in the hands of the public authorities for the accomplishment of public purposes and benefits, and subject to their control, and private property may lawfully be taken and damaged in the execution of the ordinance, subject to the provisions of the constitution and statutes that just compensation shall be paid to the owner of the property so taken and damaged. But an abutting property owner whose property is not to be taken or destroyed, and thus virtually taken in the construction and operation of the road, but only injured and damaged cannot, under the laws of the state, the court holds, enjoin its construction until his damages are ascertained and paid. Nor, the execution of the work having been authorized by the legislature, as above stated, can an individual enjoin it upon the ground that it is a public nuisance and specially injurious to his property, even in a case in which he might do so had such authority not been given.

Again, when the certificate of incorporation of a railway company states that the purpose of the corporation is to construct and operate a railroad, designating certain points as termini of the proposed road, and that it is to run through a certain city, and said company lawfully acquires a franchise to construct and operate

a street railway in said city, and, in pursuance of the ordinance granting the franchise, is proceeding to build its track in one of the streets of said city, the owner of real estate adjoining said street, the court holds, cannot enjoin the company from so doing, whether the charter of the company authorizes it to construct and operate a street railway or not, unless, upon the ordinary principles of equity jurisprudence, he has grounds for equitable relief against the company. If it be true that the corporation is exceeding its corporate powers, that fact is not alone sufficient ground for equitable interference at the suit of a person who is not a member of the company.

SUPERVISORY POWER OF COURT THAT APPOINTS COMMISSIONERS.

In re Nassau Electric Railroad Co. (N. Y.), 60 N. E. Rep. 279. Apr. 30, 1901.

The "determination" referred to in section 94 of the New York railroad law, which closely follows the language of the state constitution where it provides that the "determination" of the commissioners appointed when property owners do not consent to the construction of a street surface railroad, "confirmed by the court, may be taken in lieu of the consent of the property owners," the court of appeals of New York holds, means a determination not only that is in favor of the road, and hence there is no express authority for action by the appellate division of the supreme court (the appointing court) when the report is unfavorable. However, it does not follow from this, it goes on to say, that the supreme court has no authority to set aside such a report for fraud, mistake, or gross irregularity; for the statute does not prohibit such action. The power of the court to appoint commissioners implies power to supervise the conduct of the persons appointed,—at least, to the extent of seeing whether they disobeyed the statute which called them into existence, or acted corruptly, or failed to comply with the order appointing them, by publishing and serving the notices specified therein. The commissioners are not appointees of the legislature, but of the court, pursuant to the provisions of the constitution, to decide a certain question "after a hearing of all parties interested." They are not a distinct tribunal, for they are appointed by the court, and report to the court. If they refuse to hear the parties in interest, the court can set aside their determination and appoint new commissioners to do what the law requires, in the manner specified, after due notice and an opportunity to be heard. While not bound to strict compliance with common-law evidence, or to any particular method of procedure, except as specified by statute, their action is judicial in character, and must, to a reasonable extent, conform to judicial methods; for, by command of the constitution, a "hearing" is to be had, and a "determination" made. A substantial departure from what is fairly to be implied from the use of the words "hearing" and "determination" in the fundamental law authorizes the court which appointed the commissioners to set aside their action and proceed anew. If, for instance, they state in their report that their only reason for deciding that the road ought not to be built was some fact utterly immaterial, or if they show conclusively that they exercised powers they did not possess, or failed to exercise the powers they did possess, because they thought the law withheld them, it is clear that their decision would not be a determination, within the intent of the law. If, through misconduct, palpable error, or accident, they fail to make such a report as the law contemplates, it is the duty of the appellate division, upon proper application, to set their report aside and appoint other commissioners, or remit the matter to the same commissioners with proper instructions. Unless the appointees of the court keep within the law, as well as its own order, it necessarily has power to interfere, not by way of review as upon appeal or certiorari, but in the exercise of original jurisdiction flowing from the power to appoint, as otherwise the object of the appointment would be defeated by the misconduct of the commissioners. When the commissioners make a favorable report, their judgment and that of the appellate division must concur, before the report can become final and effective; for confirmation is expressly required. When they make an unfavorable report, no confirmation is necessary; but the commissioners are not a law unto themselves, and their determination, when made in violation of law, is not such a

determination as the court is obliged to accept from its own appointees. So the court holds that in this case, where an unfavorable report was made, that it was the duty of the appellate division either to exercise its discretion, and refuse to hear the application to set aside the report and appoint new commissioners because no grounds or reasons for interference were specified in the notice of motion therefor, or to examine the record and decide whether the methods pursued by the commissioners were substantially within the law.

VALIDITY AND APPLICATION OF ACT GIVING COMMISSIONER SUPERVISION OVER CROSSINGS. III. POWERS—REQUIRING OVERHEAD BRIDGE—THE EXPENSE—WHAT COURT MAY REVIEW.

Jackson & Suburban Traction Co. v Commissioner of Railroads (Mich.), 87 N. W. Rep. 133. July 19, 1901.

The supreme court of Michigan holds constitutional the act of 1893 entitled "An act to regulate the construction of the tracks of railroads and street railroads across each other, and the stringing of wire, electric or other, over railroad tracks, and relative to the maintenance of such tracks heretofore so constructed and wires heretofore so strung," which was, in 1897, made a part of Act No. 35 of the Laws of 1867, by an amendment which provided that all street railway corporations organized or doing business under this act shall be subject to the supervisory control of the commissioner of railroads as provided by the above act of 1893, etc.

The court does not decide whether the act can be applied to rights which vested previous to its passage. But it holds that a company which has acquired its rights since the passage of these laws takes its rights subject to a condition that at crossings of steam roads it shall comply with the requirements of the state, to be determined by the railway commissioner, as to the method of crossing, and the expense of the same. It was competent, it says, for the state to forbid any crossing at grade, and the law indicates an intention to do so in all cases where it is reasonably practicable to avoid grade crossings. A railroad company is not in a position to say to the state: "It is true you have imposed conditions that we cannot or will not comply with; therefore we propose to build a road in a place and in a way that you have not authorized." The state is not obliged to authorize the building of railways in the streets; hence, if it chooses to do so, it may impose conditions.

Continuing, the court says, with regard to this case, where the commissioner of railroads determined that the crossing by the traction company of a steam railroad should be by overhead bridge to be at least 22 feet above the surface rails of the tracks crossed, after those tracks had been lowered at least 3 feet, that if there was authority for the claim that the exercise of the right of eminent domain was necessary before the traction company could construct the road which it was authorized to construct, manifestly it would have to wait until provision could be made for it. It could not do an unauthorized thing, merely because the authorized one was not feasible. So, if it was true that it could not build an overhead crossing until it had secured rights from abutting proprietors, which it had no power to condemn, it would have to acquire them in some other way, or not build the road where contemplated.

Again, the court says, the character of the crossing required, or its cost, might not meet the traction company's approval, but the determination by the railroad commissioner was one of the conditions imposed. If by the fact that the act gave it the right to except to the ruling of the commissioner it was meant (which the court does not say) that this court would review his discretion upon the facts, it could, at the most, the court says, be in a case where there was a clear abuse of discretion, and it would be necessary for the court to have the facts clearly before it to do that. But in this case no evidence was returned, and there might not have been any taken, for the commissioner returned that he viewed the premises, and satisfied himself, in ways not formally judicial (as he might lawfully do, the court says), of the circumstances and conditions upon which his action was predicated. No issue was made in this court, and, it says, it must take his return as true.

But the court does not understand it to be the duty of the com-

missioner to order overhead crossings in all cases, or to impose all burdens arising from the separation of grades upon the applicant in all cases. In this case he did it, so far as the bridge was concerned, but not as to the lowering of the steam roads. He determined the height to which the traction company must construct its bridge, but it did not devolve upon it to lower the steam-road tracks. They would omit obedience at their peril, and the traction company need not be concerned about it.

Last of all, the court says that whether or not it is reasonably practicable to separate grades is a question of judgment. The law does not mean that it shall be done in all cases where it is physically possible. Any reason that shows the unfitness of a separation of grades is sufficient to warrant a grade crossing. Nor is the court prepared to say that the expense might not be taken into consideration, as well as the effect upon abutting property.

**RIGHTS AND LIABILITIES OF TOWN AND TRACTION
COMPANY RESPECTIVELY WHERE A TRAVELER
IS INJURED BY A DEFECT IN THE
HIGHWAY DUE TO THE COM-
PANY'S NEGLIGENCE.**

Town of Waterbury v. Waterbury Traction Co. (Conn.), 50 Atl. Rep. 3. Sept. 27, 1901.

A traveler on a raised highway fell down a bank on the side thereof where there was no railing, and was injured. He sued the town for damages, and, after he had recovered a judgment against it, the town sought to recover over against the traction company that used the highway, charging that the latter had taken down the railing and had negligently suffered it to remain down.

A notice was given by the town to the traction company almost immediately after the action was brought against the town, and long before the trial of that case, which informed the traction company of the pendency and character of the action, of the reason why it was claimed to be ultimately liable, and in effect requested it to take part in the defense. This notice the supreme court of errors of Connecticut holds, was not insufficient because in it the town did not offer to surrender the entire defense of the case to the traction company. The traction company was not entitled to assume the defense to the exclusion of the town from the case. To render the judgment binding upon the company, it was only necessary to show that it had received fair notice and information of the pendency of the suit and of its claimed liability, and been offered such an opportunity to participate in the defense for the protection of its interests as it would have had if it had been a party of record. Had it desired, it could have been made a party upon its own application to the court. Had it chosen to take a more active part in the defense, either as a party or otherwise, the town would still have been entitled to remain in the case, both for the purpose of showing that it was not liable in the action and for the protection of its claim, which was adverse to that of the traction company, that, if liable, it was upon a ground which gave it a right of action over against that company.

Then the court holds that if the evidence showed that the injury was produced by the alleged wrongful act of the traction company, the fact that the town failed to perform its duty in not seeing to it that the traction company put up the railing again, and that by such negligence on its part it became liable for the injury to the traveler, did not deprive the town of its remedy over against the traction company. The town and company were in that case to be considered as in equal fault, and the principle that there can be no contribution between joint tortfeasors or wrongdoers did not apply. As between it and the public it was undoubtedly the duty of the town in such case to properly protect travelers against the danger which the traction company had created, and by its failure to do so it became liable in damages to the one injured. But the primary cause of the accident was the act and fault of the traction company in taking down the railing and failing to restore it, assuming that it took it down as alleged. As between the town and the company, there was no co-operation in the act of negligence which caused the injury. The town did not permit the company to leave the railing down. If the company took it down it promised impliedly, if not expressly, to do so in a way not to endanger public travel, and to put it up again. If it failed to keep that promise, it could not justly charge the town

with negligence either in having relied upon such promise or in having failed to compel its performance. If the traction company removed the railing, and left it down, as alleged, the fact that the town had knowledge of the defect, and neglected to repair it, although it had a fair opportunity to do so, would not prevent a recovery by the town against the company in this action.

**POWER OF CITY TO REQUIRE SUBSTITUTION OF
GROOVED RAILS—ORDINANCE CONSTRUED—
"FIXTURES" DEFINED.**

City of Kalamazoo v. Michigan Traction Co. (Mich.), 85 N. W. Rep. 1067. May 7, 1901.

The supreme court of Michigan says that it is essential that municipalities retain that control over the public streets and highways which is necessary for the protection and proper use of the public. Courts will jealously guard the right of such control. It must be a very plain provision, indeed, in a contract, which will justify the courts in holding that this power has been conveyed away. Where doubt exists, such contracts will be construed against the surrender of such power. Again, it says that it is too late now to question the rule that street railway corporations may obtain contractual rights in streets and public highways which the municipality cannot repudiate or annul, when such rights are not inconsistent with the ordinary uses of streets and highways. That rule is settled. The authorities do not, however, go so far as to hold that the grant of a right to use a certain kind of rail is irrevocable. On the contrary, the conclusion seems to be that, when the use of another kind of rail becomes necessary for the protection and safety of the public, the right to use the specified article must give way to the necessities and requirements of the public. Such contracts must be liberally construed in favor of the municipalities.

Here, a city ordinance granting authority for the construction and operation of an electric street railway provided: "All track hereafter laid, either for extensions or for the purpose of relaying present track, may be of the style known as 'T rail,' or 'girder rail,' at the option of said grantee, its successors or assigns; but, whatever style of rail is used, the same shall not weigh less than forty pounds to the yard if 'T,' and not less than fifty-two pounds to the yard if girder, rail." It also provided: "The city council may from time to time require the said grantee, its successors and assigns, to use such fixtures and appliances upon its said road, plant, and cars as may be deemed necessary to the public safety in the operation of said road," and it reserved the right "to make such further rules, orders, and requirements as may from time to time be deemed necessary to protect the interests, safety, welfare, and accommodation of the public in relation to said railway, not inconsistent with the provisions of this ordinance," excepting to reduce the rate of fare or alter or repeal section 1 containing the grant of authority.

Now, this ordinance, fairly construed, the court declares, could not be held to mean that the company, in the construction of its roadbed in accordance with the provisions of the ordinance, obtained the right, during the existence of its franchise, to maintain its roadbed and rails in the same condition as when laid. The ordinance contemplated improvements which experience might show to be essential, in the growth of the city, for the convenience, welfare, and safety of travelers upon its streets, and the right to compel such improvements was reserved. The words "fixtures and appliances" as used must be given some force. The right to compel their use was clearly reserved. The term "fixtures" does not refer to movable things; it refers to things that are fixed. Trolley poles, overhead wires, rails, and ties are fixtures. But what the court more particularly holds is that the city had power to require the company to substitute a grooved rail for a T rail when it decided to change the paving of the street from wooden blocks to brick, the stipulated facts showing that a brick pavement and the T rail could not be used together without leaving the surface of the street not only rough, uneven, and inconvenient, but dangerous.

The Pittsburg, McKeesport & Connellsville Traction Co., has extended its service to Scott Haven, a mile and a half distant from the former terminus at Boston. A 15 cent fare is charged for the through trip.

EDWIN REYNOLDS.

Mr. Edwin Reynolds, who was recently elected president of the American Society of Mechanical Engineers, is eminently fitted for this position by reason of his well known and excellent work in the field of engineering, and his election to this office not only fittingly honors Mr. Reynolds, but will also prove an honor to the society.

Mr. Reynolds was born in Mansfield, Conn., March 23, 1831. On his father's side he is descended in direct line from William Reynolds, who came to America from Gloucestershire, Eng., and settled in Providence, R. I., in 1637. His mother was Clarissa Huntington, whose family was among the first to settle in Norwich, Conn. He lived with his parents, doing farm work and attending district school until he was 16 years old, at which age he went to work as a farm hand, under a six months' contract, at \$11 per month. Before the expiration of the six months he had an offer of an apprenticeship with Anson P. Kinney, of Mansfield, for three years in a general machine shop. This he accepted after arranging with his former employer to shorten the time of his contract. During his apprenticeship his wages were \$30 and board for the first year, \$45 and board for the second year and \$60 and board the third year. After completing his apprenticeship he worked for one year as journeyman with Smith, Winchester & Co., South Windham, Conn., manufacturers of paper machinery. He then went as journeyman with the Woodruff & Beach Iron Works, at Hartford, and during his connection with this firm Mr. Wright became chief engineer of the works. It was here that the first Wright engine was built. This company also manufactured machines for dressing stone, and in these Mr. Reynolds became particularly interested. For six or seven years he took charge of the building of these machines as well as their setting up and outside operation.

In 1858 he accepted an offer from Steadman & Co., of Aurora, as superintendent of the company's shops. This concern was engaged in building plain slide-valve engines, farming machinery, saw mills, etc. During his connection with this concern Mr. Reynolds designed pumps for drainage and irrigation purposes and made a number of experiments in this field in which no thoroughly satisfactory machinery had previously been built.

The outbreak of the Civil War seriously interfered with Steadman & Co.'s business, and Mr. Reynolds returned east, going to Boston, which he made his headquarters for several years. While here he took charge of a machine shop for George T. McLaughlin, of Boston, and at the same time became interested in the development of a number of special machines. He spent about six years in Boston and in New York, during which time he was constantly employed as an expert in perfecting all manner of mechanical devices. His sound judgment on all engineering matters became well recognized and he was thus connected with the early development of a number of industries which have since grown to large proportions.

In 1867 Mr. Reynolds was employed by the Corliss Steam Engine Co. of Providence, R. I., as a general engineer and salesman, the company having always made a practice of selecting good engineers for salesmen. After 4½ years in this position he was promoted to general superintendent of the company, a position which he retained until 1877. In that year he associated himself with the late Edward P. Allis and began the development of his own inventions. His reason for making this change is somewhat obscure, as his position with the Corliss company was considered one of the most prominent in the engineering field at that time, and he had not been without numerous offers from other prominent concerns of positions which seemed to be far more eligible than that of superintendent of the Allis works which had failed the year previous. The attitude of Mr. Corliss probably had much to do with Mr. Reynolds leaving that company; Mr. Corliss thought that the Corliss engine was practically perfect and that no chance existed for further improvement. Mr. Reynolds, however, believed that the engine could be greatly simplified and improved, and his future work with the E. P. Allis Co. proves that his belief was well founded.

When he entered the Allis company, Milwaukee was considered the far west as a manufacturing point and the facilities of the works for manufacturing engines were extremely limited. The foundry was fitted up for a pipe foundry and the machine shop contained a rather meagre number of machines which were suited to the manufacture of saw mill and flour mill machinery. Mr. Reynolds succeeded in putting the business on a paying basis almost at once

by the production of his first Reynolds-Corliss engine, which he designed on the back of an envelope during a three hours' railway journey from Milwaukee to Chicago. This engine was designed not as he would have done had he been free to attack the problem purely from the standpoint of machine design. Instead of this he produced an engine which could be built in the Allis shops exactly as they then stood. The frame of the engine was cast in two parts because the foundry could not handle it in one, and it contained only one core and that of the simplest form possible. In a short time the demand for large engines grew faster than the facilities of the shop, and to meet the crowded condition of the foundry Mr. Reynolds brought out the wrought iron frame engine, a type which was built in sizes that it would have been impossible for the foundry of the Allis shops to produce. Finally the time came when Mr. Reynolds could design an engine as he wished it, unfettered by any considerations of the shop equipment, and he brought out the "Reynolds 1890" engine, which has been accepted as perfectly adapted to this work and largely copied by engine builders both in this country and abroad.

The distinctive feature of all Mr. Reynolds' engineering work is the deep study of the fundamental engineering features of the work he has in hand and his rigid adherence to the lines indicated by this study. This has often led to a wide departure from current engineering practice of the period, and the success of Mr. Reynolds' methods have usually led to the revolution of methods in the lines of engineering on which he worked and gave the E. P. Allis Co. a world-wide reputation.

An example of Mr. Reynolds' originality of design is shown in the case of his first blowing engine built for the Joliet Steel Co. The president of that company had designs prepared by his own engineers and also had competitive designs submitted by experts in this line of work both from this country and abroad. Mr. Reynolds submitted a design which was a radical departure from current practice, but which was so clearly an advance over the methods in general use that he was granted the contract. Before this engine had been running a month Mr. Carnegie saw that its effect was revolutionary and ordered one like it. This order was followed by upwards of \$5,000,000 worth of business for the company, and after 20 years of effort to improve on this machine its essential features remain unchanged today and it is still the standard type of blowing engine. A similar case was that of Mr. Reynolds' steam ore stamp. His rigid adherence to the fundamental principles, in the face of great opposition, resulted in increasing the capacity of the original stamp mill by 50 per cent.

Mr. Reynolds was a pioneer in the development of the modern pumping engine, and practically all of the recent high duty engines in this country closely follow the lines of the machines built by the Allis Company. The huge screw and centrifugal pumping engines designed by Mr. Reynolds for draining land and handling sewage are amplifications of the designs produced by him during his connection with Steadman & Co. Mr. Reynolds has also been a leader in the introduction of compound and triple expansion engines of low speed for direct connection to electrical generators. These are now manufactured in units of 10,000 h. p. and upwards and weigh approximately 1,000 tons. The case of the Manhattan Elevated road illustrates the confidence with which engineers regard Mr. Reynolds' work in steam engine design. These engines are of a new type, yet an order for them involving \$3,000,000 has been placed with the company before the engines had ever been tested.

On the death of Mr. Allis, Mr. Reynolds became, through his will, one of the trustees of his estate, and when the business was re-organized Mr. Reynolds entered his present position as second vice-president and superintendent of the company. In addition to the duties of this position, Mr. Reynolds has taken an active interest in the business life of Milwaukee. He is a stockholder and director in several manufacturing companies, is president of the German-American Bank, the Milwaukee Boiler Co., the Central Improvement Co. and the Badger State Long Distance Telephone Co. He has received the honorary degree of LL. D. from the University of Wisconsin, which has recently further honored him by placing his name in the frieze of its new engineering building. Mr. Reynolds is a modest man of charming personality and is most approachable in his manner. He is very considerate of the feelings and welfare of those under him, which is manifested in the respect and affection shown him by the workmen, with many of whom he has come in direct contact for a quarter of a century.



Yours Truly
Edwin Reynolds

Re-arrangement of Power Generating and Distributing Scheme at Worcester, Mass.

Questions Involving the Relative Economy of Alternating and Direct Current Transmission—Utilizing Present Power House Equipments—Output, Capacity and Car Miles Run.

A street railway operating expert of wide experience when asked recently what in his opinion was the most serious question confronting the street railway fraternity today, replied, "The problem of economically and properly distributing power over street railway systems formed during the past two or three years by the evolutionary power of consolidation is bothering more street railway managers at this time than any other one difficulty." He then went on to explain that if the problem were merely one of distributing a given current throughout a designated territory without regard to investments previously made in power house property,

The Fitchburg & Suburban Street Ry., with one power station located at Fitchburg and about 7 miles of track from Fitchburg to Leominster.

The Leominster & Clinton Street Ry., with one power station at Leominster and about 12 miles of track from Leominster to Clinton.

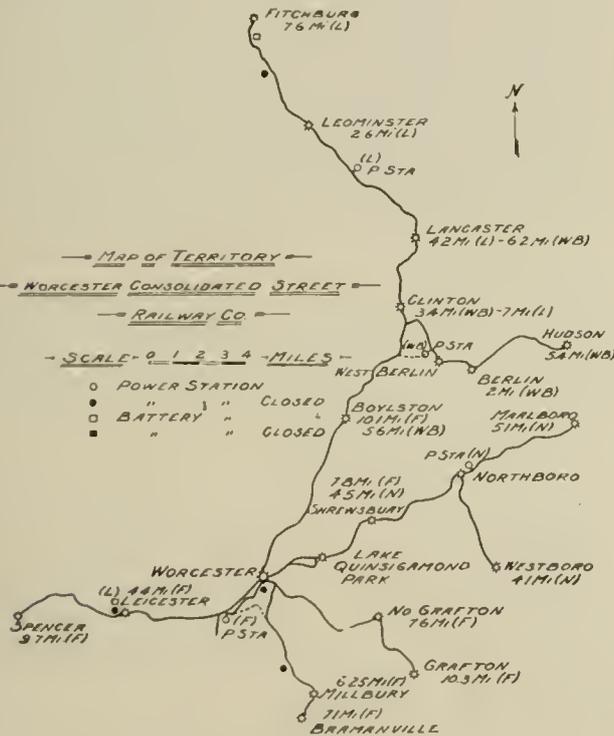
The Clinton & Hudson Street Ry., and the Worcester & Clinton Street Ry., both operated from one power house located at West Berlin, and comprising jointly about 23 miles of track running from Clinton to Hudson, and from Clinton to Worcester. A portion of the Worcester & Clinton road was supplied with power from the Worcester station of the old Worcester Consolidated Street Ry.

The Worcester & Marlboro Street Ry., with one power house at Marlboro, and about 18 miles of track from Marlboro to Worcester, with a branch from Northboro to Westboro.

The Worcester & Suburban Street Ry., with two power houses, one at Leicester and one at Millbury, also a 450-ampere hour storage battery at Leicester and a 240-ampere hour storage battery sub-station at the junction of the two lines in Worcester. This company operated about 19 miles of track from Spencer through Worcester to Millbury.

The old Worcester Consolidated Street Ry., operated from one central direct current power station in Worcester and owning about 50 miles of track in the city of Worcester and its suburbs.

When the plans for re-arranging the power scheme to suit the new conditions of the united property came up for discussion, the situation at first glance seemed to be an ideal one for high tension alternating current generation and distribution. The preliminary calculations seemed to bear out this conclusion but after carefully analyzing the figures, differentiating the costs and savings incident to and resulting from both the alternating and direct current schemes involved, it was found the conditions were such that by making certain changes, and with a comparatively small outlay in additional direct current machinery and copper feeders (most of this new copper would have been required with the high tension



station equipment and copper lines, the obstacles could be easily surmounted by the aid of certain more or less well proved theoretical deductions, and latter day knowledge would probably dictate high tension alternating current distribution from a central power house with transforming and converting sub-stations near the centers of the outlying loads.

Unfortunately this previous investment is the one factor in the situation that can not be disregarded. In the case of several of the largest cities developments in the art have made it possible by installing alternating apparatus throughout, to offset losses on the original investment by computed savings to be made in operating and maintenance charges and the old direct current apparatus has been scrapped. But instances in which the traffic will warrant the entire abandonment of old power houses are few and in most cases the situation has resolved itself into finding a solution for the query, "What can we do with what we have?"

Apropos of this subject recent decisions made by the management of the Worcester Consolidated Street Railway Co., of Worcester, Mass., will be regarded with interest.

On March 1, 1901, the present management found itself in possession of the Worcester Consolidated property which had just been formed by the merger of seven companies operating an aggregate of 130 miles of electric railway track in and about the city of Worcester.

These companies were as follows, and in this connection attention is called to the accompanying map:



AFTER A HEAVY SNOW AT WORCESTER.

system) it would be feasible to shut down three of the steam generating stations, these stations incidentally being the ones at which coal cost the most money. The question as regarded alternating current transmission then resolved itself into the question of the relative cost of operating, including fixed charges, one or more alternating generating stations with rotary sub-stations in place of the four remaining direct current generating stations. The company's engineers have as yet been unable to compute any saving with alternating apparatus, but state, however, that with the expe-

rience of the coming winter and a more accurate knowledge of the load conditions and cost of operation of the combined properties it is possible a saving will be evidenced.

The first move made toward the consolidation of power houses was the shutting down of the 240-ampere hour storage battery in the city of Worcester. This battery was in the office of the old Worcester & Suburban Co. and when the office was abandoned it became necessary to either shut the battery down or maintain an attendant. Inasmuch as the station was near the main Worcester power house it was not deemed essential to keep the battery at this point and recently this entire battery plant has been moved to Fitchburg, near the terminal of the Fitchburg line and at the top of a 13 per cent grade, 7 miles from the generating station.

The next move was to shut down the Leicester station of the Worcester & Suburban Co. As this plant adjoined a car barn and sufficient copper was erected, it simply meant a proper arrange-



HARRINGTON CORNER, OPPOSITE CITY HALL, WORCESTER.

ment of the feeders and making connection with the large station at Worcester. By reason of the high speeds required on this line, it was decided to maintain the storage battery formerly at this station in place of the abandoned generating station. One No. 0000 wire was provided joining the battery station and the Worcester power house, and the battery is charged from an ordinary booster at the last named plant.

Owing to an existing contract the company is obliged to furnish current for street lighting and house service in Leicester and the adjoining towns. To take care of this lighting one of the M. P. 90 generators formerly at this station is utilized as a motor, and taking current from the line through the battery drives by belt one of the old generators removed. This improvised lighting set works very well when the load is not too great for it.

The next move was to shut down the Millbury power house which meant simply the erection of additional copper and some rearrangement of the old feeder lines.

These changes have practically wiped out the generating plants of the old Worcester & Suburban road.

In the meantime the company had decided to install additional equipment at the Leominster power house, move the storage battery from Worcester to Fitchburg and shut down the Fitchburg plant. Accordingly one of the generators and a condenser have been moved from the Fitchburg station to the Leominster power house, and the Fitchburg station has been abandoned. The Leominster power house is operated by water power and additional water wheels have been put in to run the added apparatus. This change also involved an increase in copper feeders on this line. It might be remarked here that in making the changes and additions in the feeder lines at this and other places on the system, the management has kept in view the possibility that future developments may bring about a substitution of alternating apparatus for the present direct current distribution, and the new copper has been so placed as to be best utilized if the changes to alternating trans-

mission is ever made. In the particular instance of this Leominster plant, the fact that it is run by water power would probably insure that the station equipment be kept practically its present form, even if a central alternating station were erected at Worcester.

As the last step in these alterations the company has purchased one new 3,000-h. p. Allis vertical engine to be erected in the main power house at Worcester. This will be direct connected to a new 2,000-kw. General Electric direct current generator. The steam equipment of the Worcester plant has also been increased by 1,800 h. p. in the new water tube boilers, and a 5,000-h. p. twin vertical condenser.

Until this new unit is completed the abandoned stations will be kept in readiness for emergency service, as the present capacity of the Worcester station is hardly sufficient to depend upon in case of snow storm or breakdown. It is anticipated the new machinery will be running by July, 1902.

It should be added that the several stations are all tied together by copper feeders so that they can help each other to the best advantage. Near the midway points in the feeders, where the loads of any two stations merge, fuse switches are placed to avoid damage to either one of the stations should a short circuit in the territory of one plant throw all the load suddenly onto the other.

For additional detail reference we append a summary of the apparatus at each of the several stations on the system:

EQUIPMENT OF POWER STATIONS

Main Power House at Worcester (Fremont St.)

Engines and Generators.—One 1,000-h. p. vertical cross compound Green-Wheelock engine, with cylinders 30 and 64 in. by 48-in. stroke, direct connected to a 1,600-kw. General Electric generator turning 100 r. p. m. One 1,200-h. p. vertical cross compound Lake Erie engine, with cylinders 25 and 50 in. by 36-in. stroke, direct connected to one 850-kw. General Electric generator, turning 108 r. p. m. Four 450-h. p. vertical cross compound Lake Erie engines, with cylinders 14 and 28½ in. by 24-in. stroke and running 156 r. p. m., each belted to a 300-kw. General Electric generator, running at 400 r. p. m.

Boilers.—Three 150-h. p. horizontal tubular boilers. Nine 125-h. p. horizontal tubular boilers. Boilers are operated at 125 lb. per sq. in. Station is equipped with full complement of condensers, feed pumps, etc.

Booster-Motor, M. P. 4. 118-h. p., 750 r. p. m. Generator, M. P. 4. 80 kw., 750 r. p. m. Rated at 200 amperes, voltage from 0 to 400.

There is now being added to this station one new 3,000-h. p. Allis vertical engine, direct connected to a new 2,000-kw. General Electric generator. Also 1,800 h. p. in new water tube boilers, and a 5,000-h. p. twin vertical condenser.

Northboro Power Station.

Engines and Generators.—Two 450-h. p. simple Green engines, with cylinders 20x42 in. One 350-h. p. simple Green engines, 18x42 in. One 225-kw. General Electric generator. Two 325-kw. General Electric generators.

Boilers.—Five 150-h. p. horizontal tubular boilers. Condensers, pumps, heaters, etc.

West Berlin Power Station.

Engines and Generators.—Two 400-h. p. Filer & Stowell engines, with cylinders 20x42 in. Two 225-kw. Walker generators.

Boilers.—Three 125-h. p. horizontal tubular boilers. Condensers, pumps, heaters, etc.

Leominster Power Station. (Combined Steam and Water Power.)

Engines, Turbines and Generators.—One 450-h. p. Slater twin engine with cylinders 18x36 in. Two pairs 27-in. McCormick turbines, each pair rated at 160 h. p. One 90-kw. General Electric generator which is run as a booster. Two 150-kw. General Electric generators.

Boilers.—Two 200-h. p. Manning type vertical boilers.

The height of water fall is 19 ft. 2 in.

There is being added to this station one 200-kw. Westinghouse generator to be coupled to one pair of new Hercules turbines rated at 260 h. p.; also a condenser. This additional equipment was originally at the Fitchburg station which has been abandoned.

Abandoned Stations.

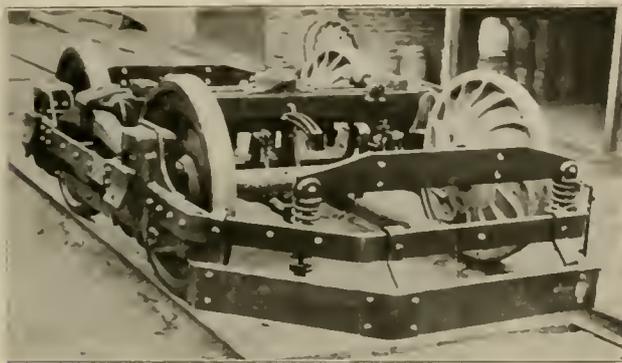
The Fitchburg station contained two 250-h. p. high speed engines, two 200-kw. Westinghouse generators, and four 125-h. p. Phoenix

boilers. As stated, one of the generators has been removed to the Leominster station and the remaining apparatus will be sold.

The Millbury station contained two 250-h.p. Armington & Sims engines, four M. P. 90 generators, and five 125-h. p. horizontal tubular boilers. All this apparatus will be sold.

The Leicester station contained two 450-h. p. Cooper engines driving one 500-kw. generator, one M. P. 80 generator and three M. P. 90 generators. There is also a 150-h. p. Ball engine direct connected to a 130-kw. Wood generator made by the Fort Wayne Electrical Corporation. This equipment will be sold.

This station also contains a 450-ampere-hour storage battery



STANDARD DOUBLE TRUCK.

of 264 "Chloride" accumulator cells which will be retained. As before stated this battery is charged from the main Worcester power house.

In addition the company owns a 240-ampere-hour storage battery which has been previously mentioned. This has been moved to a point near the Fitchburg terminal.

OUTPUT CAPACITY OF STATIONS.

As an indication of the work done by the power houses on the Consolidated system, we append a table showing the results for the month of August, 1901. Owing to the transitory conditions reliable data for a later period are not available, and it will also be noted that the capacity figures will be materially changed when the additions and alterations as outlined in this article have been made.

Location of Station.	CAPACITY				Tons Coal Consumed.
	H. P. Boilers.	H. P. Engines.	Kw. Generators.	Car Miles Run.	
Worcester	1,575	4,900	3,650	340,348	1,005,625
Northboro	750	1,250	875	30,798	166,635
West Berlin	375	800	450	29,796	112,612
Leominster	400	600	300	26,588	31,183
Fitchburg	500	500	275	10,738	59,663
Total	3,600	8,050	5,550	438,268	1,465,118

OTHER IMPROVEMENTS AT WORCESTER.

In addition to the erection of a new car barn and the alterations in its various power houses, the Worcester Consolidated Street Railway Co. has been overhauling changing and improving its track and overhead work, its rolling stock, its maintenance and repair methods, and in fact every department of the property.

In track work the company has built several miles of extensions and has relaid over 11 miles of track, replacing 48, 50 and 85 lb rails with 95 lb, 9 in. girder rails, Pennsylvania Steel Co. section. Over \$2000 has been spent in new special work, all of which has been supplied by the Wharton company. Thousands of dollars are being expended in new feeders and in rebonding and improving the return circuit.

In the renewed track the 95 lb. girder rail has been laid on chestnut ties, 7 ft x 6 in x 6 in placed 30 in c to c, with tie plate. Each joint has two "Protected" rail bonds and the rails and both tracks are cross bonded every 500 ft.

To relieve the congestion at the "Corners" where the interurban

cars connect with the city cars, the circle around the Commons has been double tracked, with curves in both directions.

On the 30-mile line to Fitchburg the roadbed has been filled with gravel and small stone and practically rebuilt.

The company has bought sixteen 14-bench open cars and fourteen 25-ft. closed cars of the Bradley Car Works, of Worcester. These have a special seating arrangement and were fully described in the last issue of the "Review." They are mounted on Laconia No. 8-B high speed double trucks with patented swing bolster made by the Laconia Car Co., of 50 State St., Boston, and Laconia, N. H.

This is a pivotal double truck and is especially designed to be used on roads where short radius curves are unavoidable, the wheel base being 4 ft 4 in. The design provides for center bearing elliptic springs; outside motor suspension, allowing for either two or four motors to car; inside hung brakes, with either adjustable or solid brakehead, a brake mechanism that is very powerful and at the same time simple in construction. All parts of the truck are exceptionally simple and strong, and when worn out can easily be replaced. Either electric or steam car journal bearings are used. The main feature of the truck is the patented "Perfectly Cushioned Swing Bolster," which is designed to prevent the car from receiving any shock while rounding curves at a high rate of speed.

This type of truck is made with any length wheel base required, and although it has been on the market but two years, it has met with great success, and is used on many of the large street railway systems of the United States.

The company uses three types of heaters made by the Simplex Electric Co., the Consolidated Car Heating Co. and the Gold Street Car Heating Co.

All the interurban lines of the Worcester Consolidated Street Railway Co. are to be protected with the United States Electric Signal Co.'s signal system.

The officers of the Worcester Consolidated Street Railway Co. are: President, F. H. Dewey; vice-president, A. G. Bullock; secretary and treasurer, J. W. Lester; general manager, R. T. Laffin; superintendent of motive power and machinery, William Pestell; division superintendents, H. E. Bradford, J. B. Gorman and G. H. Burgess; superintendent of car shops, J. H. McMullin; pit foreman, R. P. Tisch; superintendent of line and tracks, Geo. B. Shapley.

Mr. R. T. Laffin, general manager of the Worcester Consolidated Street Railway Co., received most of his railway training with the Boston Elevated Ry. He held the position of superintendent of division No. 6 of the Boston "L." for 18 or 19 years, this division constituting one of the busiest sections of the system, and being



F. H. DEWEY.



R. T. LAFFIN.

practically in itself a complete street railway system. Mr. Laffin went to Worcester in 1901 and at once assumed charge of the new Consolidated property. Under his management, as outlined in this issue, work has rapidly progressed in the direction of unifying, improving and extending the roads, consolidating the different departments under single heads and placing the operation of the property on a conservatively economical basis.

Mr. F. H. Dewey, president of the Worcester Consolidated Street Railway Co., is a capitalist and financier of prominence in eastern Massachusetts. He is associated with several industrial enterprises and a director in a number of banking institutions.

EVERETT-MOORE SYNDICATE.

January 2d the affairs of the Everett-Moore syndicate were placed in charge of a committee of Cleveland bankers which issued the following statement explaining this action:

"It became apparent some time ago to some of the members of the Everett-Moore syndicate, so-called, that on account of the tight money situation in the different centers where they were financing some of their enterprises, that, although in their opinion they owned several million dollars' worth of property over and above their liabilities, that they would be unable without temporary assistance to meet their obligations which were about to become due, and the obligations of some of the corporations controlled by them.

"Many of these obligations arose from the fact that the syndicate was engaged in the construction of a number of enterprises which were not yet fully completed, requiring large amounts of money to pay for labor and materials in the construction.

"The syndicate were also recently disappointed in being unable to complete the negotiations for the raising of a large sum of money upon certain bonds and stocks belonging to them which would have furnished them with ready funds, and which negotiations they had reason to believe, until ten days ago, would result favorably.

"Some of the members of the syndicate, when it became apparent to them that many of their liabilities, which were coming due about Jan. 1, could not be met, called together some of their personal advisers to advise with them as to what was best to be done.

"These men examined fully into all of the affairs of those composing the syndicate, and were furnished with full and complete information.

"They found further from their investigations that in the telephone situation, while among its different elements it had many companies that had fully completed their equipment, and were on a paying basis, that there were others that needed material assistance.

"They also found that so far as the personal affairs of the members of the syndicate were concerned that their equities were in their opinion largely in excess of their liabilities, and that in their judgment all of the personal creditors could be paid without doubt from the assets, and several hundred thousand dollars put into the completion of the properties.

"They found that there were in Cleveland upwards of thirty banks that were their creditors, and that these banks held the choicest of the securities and the most equities.

"Messrs. Everett and Moore stated that they were perfectly willing to turn all of their matters and properties over to a committee that should be appointed to handle them in connection with themselves to preserve the most equities, with the belief that when their properties were developed and creditors paid there would be a substantial amount to return to them.

"The personnel of the committee is as follows: H. R. Newcomb, Myron T. Herrick, J. J. Sullivan, Calvary Morris, Kaufman Hays, E. C. Tillotson, and W. C. Mather. These gentlemen were selected, not especially on account of any interest directly involved, but because of their well-known ability and integrity.

"At the meeting held, at which Messrs. Everett and Moore were present, more than five-sixths of all of the Cleveland indebtedness was represented. The parties attending the meeting expressed themselves unanimously in recommending to their institution that they should extend the indebtedness of the Everett-Moore syndicate and its allied interests for a period of not exceeding eighteen months, conditioned upon the committee named having entire charge of all of the affairs connected with the syndicate and their various interests.

"Papers have been drawn looking toward such extension and the empowering of the committee to act, and they have been executed by the members of the Everett-Moore syndicate and are now being executed by the Cleveland banks as rapidly as possible. All other creditors are to be asked to unite with the Cleveland creditors in granting the extension."

The "Everett-Moore interests" include about 1,300 miles of electric railways in operation, some 500 miles of roads under construction or projected, and telephone properties included in the Federal and the United States telephone companies operating in Ohio, Pennsylvania, West Virginia, Kentucky and Michigan.

January 6th William B. Strang, of New York, filed a lien against the Erie Construction Co. for materials and labor furnished for the Detroit & Toledo Shore Line R. R., and the Ohio Savings Bank & Trust Co., and David B. Cunningham, of Detroit, were appointed receivers for the Detroit & Toledo company.

January 10th the Euclid Avenue Trust & Savings Co., of Cleveland, made an assignment. It was announced that the troubles of the Everett-Moore syndicate were not responsible for the bank failure, though the condition of the local security market brought about by the former had added to the difficulties of the bank.

The Painesville Savings Bank, of Painesville, also made an assignment on January 11th.

January 10th Albion E. Lang, president of the Toledo Railway & Light Co., was appointed receiver for the Lake Shore Electric Railway Co., this step being deemed best for the interest of all parties.

TO RELIEVE CONGESTION ON BROOKLYN BRIDGE.

On January 7th, as a result of a conference between Bridge Commissioner Lindenthal, Chief Engineer Martin, of the Brooklyn Bridge, and President Greatsinger, of the Brooklyn Rapid Transit Co., means were decided upon which it is believed will lessen the crush at the Bridge entrances. A new schedule will go into effect at once, in which the number of hours recognized as the "rush hours" will be increased and the "rush" schedule will be extended so that persons will find very frequent trains both earlier and later than the present schedule calls for. It was suggested that many people would arrange to make their daily trip to and from Brooklyn a little earlier or a little later if they could be sure of catching good trains, and so the volume of travel during the morning and evening rushes would be distributed over a longer period of time, avoiding much of the present congestion and confusion. The idea seems plausible and will be tried for two months.

The new schedule provides that between 6:30 and 7:10 a. m. trains will run over the Bridge on 1¼ minute headway; between 7:10 and 8:55 a. m., 55 seconds headway; between 8:55 and 9:10 a. m. 1 minute headway; and between 9:10 and 9:40 a. m. 1¼ minute headway. In the late afternoon the intervals between trains will be: 4:30 to 6:45, 55 seconds; 6:45 to 6:50, 2 minutes; 6:50 to 8:30 2½ minutes.

In addition to this service through trains on the Fifth Avenue, Bath Beach and Brighton Beach lines will be run between 10 a. m. and 4 p. m. and between 7 p. m. and 1 a. m. It was also decided to do away with the railings on the Manhattan end of the Bridge dividing the local from the through passengers.

PECULIAR DERAILING ACCIDENT.

On December 29th last an electric car at Northampton, Mass., suddenly left the track apparently without cause. The several passengers were badly shaken up but no serious injuries resulted. Excavation was made for the inspection of a culvert at the place where the car left the rail, and a small cavity was found immediately below the track. It is now supposed the ground over the culvert settled, allowing the crust to yield sufficiently when the car passed to throw it from the rails.

The Cincinnati Traction Co. has completed arrangements for the construction of a handsome new office building at the corner of Fifth and Walnut Sts., Cincinnati, at an early date. The demolition of the old buildings on this site will commence February 1st and the present tenants have been notified to vacate on or before that date.

Merchants of Huntington, Ind., reaped large profits from the Christmas trade by the judicious use of tickets over the Fort Wayne & Southwestern Traction Co's. new line between Fort Wayne and Huntington. Several hundred dollars' worth of the tickets were distributed along the line of the interurban, and the plan was successful in attracting a holiday trade which well repaid the investment.

THE STANDARDIZATION OF ENGINES AND DYNAMOS.

The committee of the American Society of Mechanical Engineers on standardization of engines and dynamos has completed its labors and submitted a report of which the following comprise the principal points:

1. Standard size of units recommended.
2. Corresponding revolutions per minute for these units.
3. The size of shafts for the two classes of center crank and side crank engines.
4. The entire length of shaft required for the generator.
5. The height of axis or shaft over top of sub-base.

a permissible variation of speed of 5 per cent either way from the figures recommended. It is believed that these speeds are practically the same as those of all machines which may be considered as standard makes at the present time. The shaft diameters were also determined after careful examination of existing practice. The permissible deflection was the determining factor in regard to diameters.

The question of the length of the generator along the shaft could not be reduced to a single dimension owing to the large variation in the length of generators of the same output, and for this reason it was necessary to make provision for two classes which have been called "long" and "short" generators. For these varying lengths of generator and shaft the engine builder has to provide

SIZES, SPEEDS AND STANDARDIZED DIMENSIONS OF DIRECT CONNECTED GENERATING SETS.

Capacity of Unit, Kilowatts.	Revolutions per Minute.	ARMATURE BORE.		DIAMETER OF ENGINE SHAFT AT ARMATURE FIT.		SPACE OCCUPIED ON SHAFT BETWEEN THE LIMIT LINES.		B. Length of Extension Pieces, Inches.	C. Height of Axis of Shaft above Top of Base, Inches.	R. Inches.	D. Width of Top of Sub-Base, Inches.	KEY (A FEATHER)				HOLDING-DOWN BOLTS.	
		Centre Crank Engines, Inches.	Side Crank Engines, Inches.	Centre Crank Engines, Inches.	Side Crank Engines, Inches.	Long Class A, Inches.	Short Class A, Inches.					Width, Inches.	Thickness, Inches.	Depth in Shaft at Edge, Inches.	Projection above Shaft at Edge, Inches.	Diameter, Inches.	Number.
25	310	4	4½	4 + 1/1000	4½ + 1/1000	30	25	5	23½	Flat.	48	1	¾	¾	¾	1	4
35	300	4	5½	4 + 1/1000	5½ + 1/1000	33	28	5	25	Flat.	54	1	¾	¾	¾	1	4
50	290	4½	6½	4½ + 1/1000	6½ + 1/1000	37	31	6	28	Flat.	60	1½	¾	¾	¾	1	4
75	275	5½	7½	5½ + 1/1000	7½ + 1/1000	43	37	6	31	Flat.	66	1½	1	¾	¾	1½	4
100	260	6	8½	6 + 1/1000	8½ + 1/1000	48	42	6	34	Flat.	72	1½	1	¾	¾	1½	4
150	225	7	10	7 + 1/1000	10 + 1/1000	51	45	6	37½	41½	84	1½	1½	¾	¾	1½	4
200	200	8	11	8 + 1/1000	11 + 1/1000	54	48	6	42½	47½	96	2	1½	¾	¾	1½	4

NOTE 1.—Five per cent. variation of speed permissible above and below speeds in table.

NOTE 2.—Distance from centre of shaft to top of base of outboard bearing may be less than C (to suit engine builder), though not less than possible outside radius of armature.

6. The width of top of sub-base.
 7. Armature fit.
 8. Overload capacity of engines and generators.
 9. Brush holders.
 10. Holding-down bolts, keys and outboard bearings.
- The committee endeavored to reduce the number of standard units to the fewest sizes. This will commend itself to a large number of manufacturers as it reduces the great number of patterns

different lengths of sub-base, but patterns for the latter can be made so that one end can be made adjustable with a standard addition for each unit.

In regard to the armature fit the committee obtained opinions from manufacturers in respect to the allowance to be made for pressed fit and found that .001 in. for shafts of from 4 to 6 in. and .002 in. for shafts 6½ to 11 in. represents the best practice.

As it is evident to every engine builder that to provide an engine

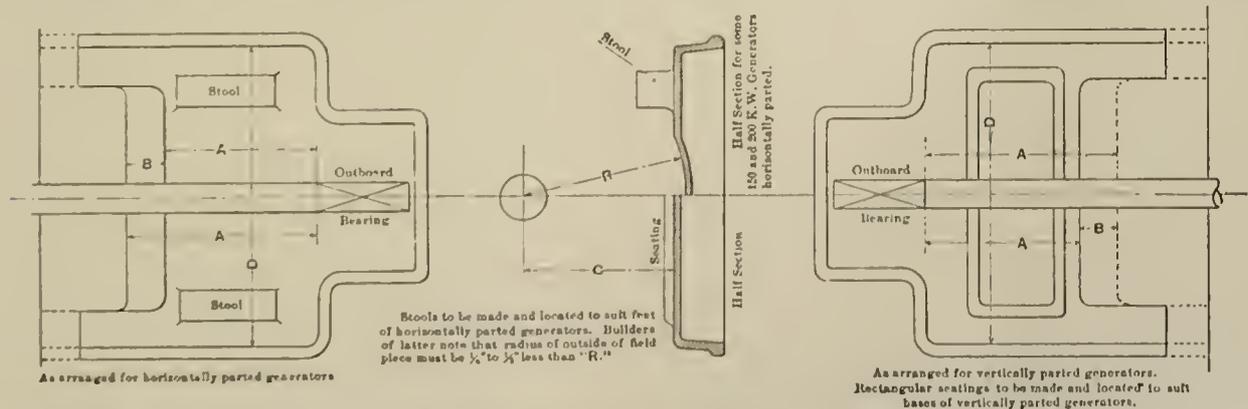


DIAGRAM SHOWING DIMENSIONS REFERRED TO IN TABLE.

required to be kept on hand. The report only covers direct current generators.

The accompanying table will show, in connection with the diagram which follows, the sizes, speeds and standard dimensions of direct connected sets as recommended by the committee. The standard speeds were chosen after investigation of the practice of all the engine and generator builders in the country. These provide for

large enough to drive a generator with from 50 to 100 per cent overload gives an unreasonably large engine for the rated load, the committee was led to recommend that the standard overload rating of the direct connected unit should not in any case exceed 25 per cent of the rated capacity. It was also recommended that the brush holder rigging for dynamos should be supported upon the generator frame making the electrical part of the unit entirely

have swing joints at their fixed ends, and by raising the free ends the flow is reduced by reducing the "head." These lift pipes are controlled by a float in the hard water box, so that the chemicals will be governed by the amount of raw water entering. A valve in the main supply pipe is controlled by a float in the top of the tank, resting upon the treated water, this serves to regulate the inflow of hard water according to the amount of softened water



KENNICOTT WATER SOFTENER.

being used. At the bottom of the settling cone and the lime saturator the sludge is removed by valves opening into a drain.

While the apparatus as described is intended for the treatment of cold water, there is no objection to using hot water.

This apparatus is known as the Kennicott water softener and is made by the Kennicott Water Softener Co., 3567 Butler St., Chicago. It is the practice of the company to make an analysis of the water to be treated and then offer a definite proposal for installing a softener, specifying that in this water the scale forming ingredients shall be reduced to a certain number of grains per gallon at a cost not exceeding a fixed sum per thousand gallons, and guaranteeing the results.

The Steubenville, Mingo & Ohio Valley Traction Co. has recently been purchased by the Wheeling Traction Co., of Wheeling, W. Va., and it is the intention to construct a line from Brilliant to the southern terminus of the Steubenville line at Martin's Ferry by parties closely allied with the Wheeling Traction Co. This will open a through trolley communication between Wheeling and Steubenville, a distance of about 26 miles.

The Westinghouse interests in London have organized the Traction & Power Securities Co., Limited, with a capital of \$5,000,000 to handle the security and agency business of the Westinghouse concerns in England, of the same order as those of Westinghouse, Church, Kerr & Co. of New York. When a railway or other corporation desires to pass an order for Westinghouse equipment and proposes to meet payment by debenture or similar, the new company in London will finance the transaction and pay cash to the producing interest.

CORRESPONDENCE

TESTS OF MECHANICAL STOKERS AT THE GENERAL ELECTRIC WORKS, SCHENECTADY, N. Y.

Editor "Review": There appeared in the Engineering News for Nov. 7, 1901, an article, which consisted of extracts from the report of a series of tests made by Prof. J. E. Denton and Mr. George H. Barrus, representing the American Stoker Co., and Messrs. Deane and Main, Boston, representing the General Electric Co. Owing to the manner in which these extracts were presented by the Engineering News and the absence of reference to several important facts connected with the tests, the article in question does not present the case in a manner equally fair to all parties concerned.

As stated in the report, these tests were conducted for the purpose of determining whether the American Stoker Co. had fulfilled certain guarantees in its contract with the General Electric Co. On account of a clause in the contract, in which the American Stoker Co. guaranteed to "generate a net horse power of steam as economically as the Roney stoker," the engineers decided to test one of the Babcock & Wilcox boilers equipped with the Roney stoker, which had been installed in 1898 and which had been in operation continuously, day and night, for over two and a half years.

The position was taken by the engineers, that as the tests were to be conducted for the purpose of determining whether the American Stoker Co. had fulfilled its guarantees, the manufacturers of the Roney stoker had no interest or part in the matter, their stokers having been accepted and paid for several years before. Under this ruling the Roney stoker was brought into a competitive test in which the makers were not permitted to direct its operation and were not represented except by an erecting superintendent who was allowed to witness the final test but not to give directions. One of the results of this ruling is shown in that part of the report regarding "Labor required for operating the stokers," where the report states that—"in the Roney stokers, according to the practice of the fireman during the test, there was continual attention and exertion required," etc. This method of handling the stoker was contrary to the instructions for operation which are furnished with the Roney stoker and was the result of inexperience, the fireman having never fired on a test before. If the manufacturers had been permitted to direct the operation of the stoker, this unnecessary labor would have been avoided.

Under the paragraph "Comparative Economy of the American and Roney stoker," various costs of operation are summed up as follows

Costs per h. p. per year.	---AMERICAN STOKERS.--- Repairs according to 3 mos. record on log book.	Repairs guaranteed in contract.	Roney stokers.
Cost of coal	\$34.95	\$34.95	\$35.76
Cost of repairs ..	0.77	0.12	0.48
Wages of fireman and helpers...	1.44	1.44	1.44
Interest and depreciation	0.38	0.38	0.38
	\$37.54	\$36.89	\$38.06

In this table, it seems rather illogical from an engineering standpoint to credit the American stoker repair account with the excess over 5 per cent which the maker under its contract assumed for a period of two years. The question of financial liability will not be apt to have much effect on the actual deterioration of the stoker.

As the report assumes that this table demonstrates that "the cost of steam is less with the American stoker than with the Roney stoker," it is but fair to call attention to some facts not brought out in the report which bear on the other side of the question.

The principal item in the table is "Cost of coal" per horse power per year. This is obtained by dividing the amount of water required per horse power for 360 days of 24 hours each by the net

evaporation from and at 212 degrees F. per pound of coal. This method of determining the efficiency of the stoker by means of the boiler performance is manifestly an improper one. The condition of the boiler or the arrangement of the heating surface may be such that its inability to properly absorb heat will neutralize the most perfect combustion obtainable in the furnace. If in these tests the boiler evaporation was to be assumed as the standard of stoker efficiency, the boilers should have been of the same type and the heating surface and settings in the same condition. The Babcock & Wilcox boiler and Roney stoker had been in use over two and one-half years and had never had the fire sides of the tubes cleaned except by blowing from the outside and the setting was more or less cracked, while the Stirling boiler with American stoker was new and recently put in service. A contract test was made some six months after this Babcock & Wilcox boiler and Roney stoker were put in service, at which an evaporation of 12.66 from and at 212 degrees F. per pound of combustible was obtained, exceeding any of the results obtained by either stoker in the series of tests under consideration. Substituting this evaporation for that obtained on June 18, 1901, when the boiler was old and dirty, would make the cost required per h. p. per hour \$34.08 instead of \$35.76, as given in the above table. If the table be corrected to make the "Cost of coal" correspond with what it was when the boiler was new and clean the "Cost per h. p. per year" of operating the Roney stoker would be \$36.40 per h. p. instead of \$38.06, as given in the table and less than either of the amounts given as "cost of operating" the American stoker.

The "Cost of repairs," namely, 48 cents per h. p. per year, is excessive on account of the fact that the draft of the Babcock & Wilcox boiler was only .15 to .16 of an inch in the furnace, due to insufficient chimney. These boilers and stokers are operated with natural draft and the poor draft caused high temperature in the ashpit and excessive repairs. The records of many large plants show that the cost of grate bar repairs for the Roney stoker with proper draft conditions should not exceed 12 cents per h. p. per year.

A stoker does not evaporate water; its function is to burn coal, and the measure of its efficiency is the ability to produce good combustion as shown by the analysis of the flue gases and not the amount of water evaporated per pound of coal by the boiler to which it is attached. The record of the analysis of flue gases from the Roney stoker shows an average of 14.2 per cent CO₂, 4.67 per cent O, 0.29 per cent CO. This is as good combustion as has ever been obtained, and the fact that the evaporation from and at 212° F. per pound of coal by the Babcock & Wilcox boiler and Roney stoker was 11.69 instead of 11.7 as obtained when the same boiler was new and clean, simply shows that the difference is due to the fact that the boiler was not in condition to absorb the heat generated by the stoker. The heat balance given in the report shows that the Stirling boiler absorbed 77.1 per cent and the Babcock & Wilcox boiler 72 per cent of the heat of combustion. Or, in other words, judged by the ability of the boilers to absorb heat, the Roney stoker was handicapped by a difference in boiler efficiency of 7 per cent. This is more than double the amount given in the table quoted above as the difference between the two stokers in "Cost of steam per h. p. per year," and completely reverses the statement in the report that—"In point of relative economy the guarantee of the American Stoker Co. is fulfilled." It is most important in comparing these tests, to remember that the boiler to which the Roney stoker was attached was old and dirty and that the combustion was of the best. In comparing the economy of the two stokers the operation of the boilers should have been eliminated and the efficiency of the stokers determined by their ability to produce good combustion. To be consistent, the experts should have considered the results of the tests from this standpoint. Had they done so their conclusions would obviously have been different.

New York, Dec. 18, 1901.

William R. Roney.

Mr. T. Fitzgerald, superintendent of construction of the Fairmont (W. Va.) & Clarksburg Street Railway Co., has recently purchased a large consignment of material in Pittsburgh. Cars are now running at both ends of the line; 30 miles of the road have been completed, and the entire route will be opened in the early spring.

PENNSYLVANIA RAILROAD TUNNEL PLAN.

The plan of the Pennsylvania Railroad Co. for an underground line from New Jersey across Manhattan Island to Long Island, which was mentioned in the "Review" for December, is estimated to cost in the neighborhood of \$40,000,000, and it is thought that, barring accidents, the work will be completed in about three years. Some official statements of the details of this work have been recently given out and plans and maps of the underground system have been filed in New York together with articles of incorporation of the Pennsylvania-New York Extension Railroad Co., which is to build and operate the tunnel. These plans include two single track steel tube tunnels supported upon piers which will reach down to bed rock. These tubes will extend from the Jersey terminus to Eighth Ave. and 32d St., Manhattan. At the latter point there will be built an extensive underground passenger station out of which will run three single tunnels a block apart to the East River and beneath it to Long Island City. The tunnels will converge at a point near Thompson and Purves Aves., about a quarter of a mile from the river, where the Long Island Railroad owns a large tract of land.

* One of the principal features of this underground construction will be the large station in Manhattan at Eighth Ave. from 31st to 33d Sts. The plans show 25 tracks in these blocks which will run from Tenth Ave. to Seventh Ave. Across these tracks a bridge 100 ft. wide will run from 33d to 31st Sts., from which stairways will reach to the platforms between the tracks. Midway, stairways and elevators will be erected to take pedestrians down to the bridge. Another station is to be erected at Fourth Ave. where the three tunnels will cross the line of the rapid transit subway. The two stations will be connected by stairways and elevators.

A new feature in engineering is said to be included in the enterprise of tunnelling the North River, the bed of which is composed of mud and clay for 100 ft. below the river bottom. This is the erection of piers from the tubes down to the bed rock under the river in order to support the tunnel and make it sufficiently strong to stand the weight of the hundreds of heavy cars which will operate through it.

Mr. A. J. Cassatt, president of the Pennsylvania, is reported to have stated that after years of exhaustive study the conclusion has been reached that a tunnel line operated by electricity is in every way the most practical economical and the best both for the interests of the railroad company and of the city. As the railroad will be wholly underground and operated electrically, in the same manner as the recently constructed Orleans Railroad Extension in Paris, it will not be objectionable in any way. There will not be any smoke, dirt or noise, and as all the surface property may be built upon after being utilized underneath for railroad purposes, the neighborhood of the station will be improved instead of marred.

Immediately upon the necessary authority being granted the work of construction will be commenced and the whole line be put in operation as soon as possible. Both the Long Island Railroad and the Pennsylvania Railroad express trains will all pass through the central underground station in Manhattan. Officials of both the Pennsylvania and Long Island roads are interested in the Pennsylvania-New York Extension Railroad Co.

The directors of this company are A. J. Cassatt, Thomas De Witt Cuyler, Clement A. Griscom, John P. Green, Charles E. Pugh, Sutherland M. Prevost, W. H. Barnes, Samuel Rea and William H. Baldwin.

Mr. Alfred Noble, of Chicago, who was a member of the Isthmian Canal Commission, has been appointed chief engineer.

The Cortland County Traction Co., Cortland, N. Y., was robbed of 1,000 lb. of copper wire from its interurban line between Cortland and Homer on the night of December 10th. A reward of \$50 has been offered for the conviction of the thieves.

The Indiana Railway Co., of South Bend, on December 24th increased the wages of its conductors and motormen by 2½ cents an hour. This is equivalent to an advance of 25 cents per day in the wages of employes on all branches of the company's 43-mile system.

HENRY C. PAYNE.

The appointment by President Roosevelt of Mr. Henry C. Payne of Milwaukee as postmaster-general to succeed Mr. Charles Emory Smith, resigned, has been received with general satisfaction, and is most warmly approved by those who have been associated with him. Mr. Payne is widely known as one of the ablest and most successful street railway men in this country. He has been vice-president of the Milwaukee Electric Railway & Light Co. since that company succeeded the Milwaukee Street Railway Co.; the old company was organized under his supervision and the system equipped for electric traction. Mr. Payne was president of



HENRY C. PAYNE.

the American Street Railway Association in 1893-94 when the annual meeting of the association was held in Milwaukee and was receiver for the Northern Pacific R. R. during 1893 and 1894. He was postmaster of Milwaukee for 10 years and has been a member of the Republican National Committee since 1880.

Mr. Payne was born at Ashfield, Mass., Nov. 23, 1843, and his early education was gained at the school of that village and in the Shelburne Falls Academy. After graduating from the latter he went into business in Northampton, Mass., at the age of 16 years. In October, 1863, he moved to Milwaukee, where he has since resided. He organized the Young Men's Republican Club of Milwaukee, in 1872, and later this became the Republican Central Committee of Milwaukee County.

TRIBUTE TO W. KESLEY SCHOEPF.

A unique demonstration in honor of Mr. W. Kesley Schoepf was given by the employes of the Consolidated Traction Co., of Pittsburg, on the night of December 30th. A procession of 1,500 motormen, conductors and office employes left the Oakland St. car barn and marched to the Hotel Schenley, where it took possession of the big banquet hall. The line of march was marked by special illuminations and burning of red lights. A committee was appointed to bring Mr. Schoepf into the banquet hall at 2:30 o'clock in the morning and when the retiring manager made his appearance the band played "Hail to the Chief."

Maj. S. E. Moore, comptroller of the company, acted as master of ceremonies, and Mr. George W. Wilson, in a brief speech presented Mr. Schoepf with a handsome clock, for the purchase of which every employe had contributed. In accepting the gift Mr. Schoepf spoke of the kindly spirit exhibited toward him by the employes and said that during the two years he had been in charge of the company's affairs in Pittsburg he had done all in his power to improve the condition of his subordinates. Everything possible to add to their comfort and at the same time keep the service up to its high standard, had been done. He had always tried to be just and could bear witness that during his incumbency there had been few causes for complaint. He thanked the men for the gift

and the sentiment it disclosed, in the most cordial terms. At the conclusion of his remarks he was handed a book by Major Moore containing the autograph of every one of the employes of the Consolidated company.

On the same day he received a surprise from the Consolidated Company Employes' Relief Association, who presented him with a handsomely engrossed set of resolutions adopted by the association, expressing regret at the retirement of Mr. Schoepf.

Another gift received by Mr. Schoepf was from Mr. Joshua Rhodes, president of the Consolidated Traction Co., and consisted of a loving cup of solid silver bearing the date Dec. 25, 1901, and the names of the donor and recipient. Mr. Schoepf may well feel proud of the ovation received from all of the men in the company's employ, as it was a spontaneous token of the hearty respect and general good feeling in which he is held by them.

During his short career in Pittsburg he has introduced many needful improvements in the service of the traction company, and has won the admiration and confidence of his business associates as well as the cordial esteem of the entire community.

OHIO NOTES.

The merging of the Canal Dover & New Philadelphia Street Ry. and the New Philadelphia & Urichsville company under the name of the Tuscarawas County Traction Co., was one of the recent eastern Ohio traction deals of importance, and is considered an important step towards a Cleveland-Wheeling line. These properties passed under the control of the Mandelbaum-Pomeroy syndicate of Cleveland. The new company was capitalized at \$350,000.

Cars are now run hourly between Bucyrus and Crestline by way of Galion over the line of the Central Ohio Traction Co., which thus becomes a rival of the Pennsylvania and Big Four railroads between those points.

A bill will be introduced in the legislature to abandon the Miami & Erie canal as a waterway, sell the water for power and lease the banks for a double-track electric railway from Cincinnati to Toledo. It is estimated that the canal costs the state \$15,000 annually over and above the receipts and it gets \$45,000 per year for water power. If the boats were taken off the canal this could be raised to \$135,000 per year.

The Columbus, London & Springfield Ry. opened its new line to Morgan Station, 18 miles southwest of Columbus, on January 8th. Cars will leave the city every 75 minutes until 7 p. m. The company has also ordered two new 62-ft. parlor cars for the spring traffic; these are to be furnished with an observation platform that will accommodate 20 people.

Another electric line is projected into Columbus from the south. It is known as the Ripley, Georgetown, Hillsboro & Columbus Railway Co. and has just been incorporated with a capital stock of \$10,000. The incorporators are M. McKeehan, G. Baumbach, A. M. Kantz, W. J. Marshall, O. E. Bare and J. R. Moore. The proposed line extends through the counties of Brown, Highland, Fayette, Pickaway, Madison and Franklin.

The Columbus, Buckeye Lake & Newark Traction Co. has arranged for a bond issue of \$1,500,000. The bonds are to run 20 years and bear 5 per cent interest. The officers of the company are given as S. Reed Anthony, president; Chauncey Eldridge, treasurer; Fred Gore King, secretary, and Fred L. Eldridge, first vice-president, all of Boston.

A new line is projected from Springfield to Sidney by way of Piqua, by the Springfield, Piqua & Sidney Traction Co. Rights of way have been secured a large part of the way. It is intended to build a line also from Piqua to Troy.

The new line between Columbus and Delaware is nearing completion, much of the work being already finished. It is the intention at present to have cars in operation by April 1st.

An attempt to wreck a car on the lines of the Toledo, Bowling Green & Southern Traction Co., near Bowling Green, O., was made early in the morning of December 28th. The car, containing 20 passengers, was running at full speed when it collided with an obstruction of boards across the track, at a point where the track runs along a deep gully. Fortunately, the car did not leave the rails, and no injuries resulted.

BROOKLYN BRIDGE TERMINAL PROBLEM.

The recommendations of the committee of engineers appointed to formulate plans for the relief of the congestion of traffic on the Brooklyn bridge, an outline of which was given in the "Review" for November, have been reported upon by Mr. C. C. Martin, chief engineer of the bridge, who endorses the greater part of the recommendations. The proposal to build a cross-town elevated road along Park Row crossing Broadway and through Vesey St., to the North River is not endorsed by Engineer Martin. In condemning this extension his report states as follows:

"I would recommend that the Vesey St. line be omitted. If it were constructed and trains were run on a headway that would be at all satisfactory on that line and on the Center St. line at the same time, there would be a series of grade crossings with loaded trains where the two lines came together, which in my judgment could not be permitted if the safety of passengers were to be considered.

"If the Center St. and Vesey St. lines were built, the connections at the bridge terminal would be so complicated that it would be impossible to retain the present tail switching tracks, and this I consider vitally important. It is proposed to run through trains on 45 seconds headway; I do not think this is practicable or possible, and hence I desire to retain the tail switching system, so that if at any time through trains cannot be run on the specified headway they can be supplemented by local bridge trains as is now done during the evening rush, and in case of an entire blockade of through trains on the elevated roads connecting with the bridge the entire traffic could be taken care of by local bridge trains."

The report favors the system of elevated railroads designed to eventually form an endless track over which trains will pass across all of the new bridges now proposed south of Delancey St. The principal involved in this system is practically to distribute the taking-on places for passengers over a wide area rather than permit passengers to jam and crowd in a single spot as is now the case at the bridge entrance.

Subject to the sanction of the Board of Estimate and Apportionment an elevated road will be built at an early date from the Park Row end of the bridge to run up Center, Marion, Spring and Delancey Sts. to the Manhattan end of the new East River bridge which already spans the river. Where the new bridge at the foot of Canal St. has been completed it is further recommended that a branch be built running from a station on Canal St. of the proposed new road down Canal St. to connect with bridge No. 3 which has not yet begun. Mr. Martin also recommends that the new road run through Grand St. beyond the Second Ave. trains so that connections can be made with the stations of both the Second and Third Ave. roads. Mr. Martin's recommendations, with the exception of the cross town elevated road suggested, are identical with the report of the expert engineers.

CHANGES AT ROCHESTER.

In reply to an inquiry, Mr. T. J. Nicholl, vice-president and general manager of the Rochester (N. Y.) Railway Co., sends us the following statement concerning the improvements his company has been carrying into effect:

About 17 miles of track have been electrically welded and bonded, and about an equal amount of new rail has been laid. The Lorain Steel Co. is doing the electric welding, and not only are the rails welded at the joints but the company is also successfully welding the copper bonds to the steel rails, enabling the return current to be carried under all special work or where the need of replacing worn frogs, mates and switches makes it undesirable to weld the joints. Mr. Nicholl states he has found this welding process eminently satisfactory. Nearly \$50,000 has been spent in new special work.

About 50 per cent of the cars owned by the Rochester Railway Co. have been rebuilt and lengthened to 28 ft. and supplied with new equipments. New shops of capacity to accommodate the new rolling stock have been built and are now being occupied.

At the power house the company is installing a new Hooven, Owens & Renschler, Hamilton-Corliss engine, direct connected to a 1,050-kw. General Electric generator. This new unit will make possible improved service on all the lines.

The work of renewing and bettering the property will be con-

tinued during the first half of the present year. About 17 miles more track will be electrically welded, new special work put in, and the company expects to lay from 10 to 15 miles of new rails. This, together with the completion of the rebuilding and lengthening of the cars, will put the Rochester Ry. property in very satisfactory shape.

Early this month four of the 100-kw. generators at the Rochester power house, owing to some unknown cause, burst out at one time, giving rise to several sensational newspaper stories. Mr. Nicholl advises us that these reports were greatly exaggerated, the damage amounting to just the loss of the armatures and a temporary suspension of service on one or two of the lines.

TO LOCATE INSULATION FAULTS.

One of the most troublesome faults for the street railways engineer to locate is the deterioration of the insulation on the coils of the electric motor. When such deterioration has taken place either from the motors being overworked or otherwise, the trouble manifests itself by "bucking" or fuse blowing, or if the trouble is not as far along as this there is an increase of power consumed that is expensive aside from the damage it will eventually cause by baking the insulation of all the coils.

The Conant coil testing instrument, which is the invention of Mr. R. W. Conant, 28 William St., Cambridge, Mass., locates these defects by comparing the magnetic strength of the winding, this method being far superior to measuring the resistance, as it is not affected by the temperature of the motors, and the coils often appear perfect if tested cold.

The method is so simple that the carhouse foreman has no difficulty in applying it, and the instrument is especially designed to meet the severe use that it receives in this class of testing. It has been adopted by some of the most prominent roads in the country after thorough tests, a complete record of which will be gladly furnished on application to Mr. Conant.

MALTBY-HORNADAY CO.

The Maltby-Hornaday Co., comprising C. S. Maltby, formerly of the Stamm Machine Works, of Aurora, Ind., and J. P. Hornaday who for several years has been connected with large southern corporations, has organized a new banking and brokerage business, with headquarters in the Union Trust Building, Cincinnati. The purpose is to incorporate and finance corporations; buy and sell municipal and industrial stocks and bonds; reorganize old companies and to act as agents in securing the most favorable locations for prospective industries.

So many applications have been received by the Maltby-Hornaday Co. from manufacturing establishments asking for desirable cities in which to locate, that a special department has been organized to take care of this branch of the business. The clientele of the new concern at present includes principally street railway, mining, oil, timber and telephone companies. One of the largest street railway projects of Kentucky will be financed by Messrs. Maltby and Hornaday, and from the present outlook promises a successful issue.

Mr. Maltby is secretary and treasurer of the company, while the legal department is in charge of Mr. Hornaday, a corporation lawyer of ability and experience. Correspondence is solicited, and circular matter and rates will be furnished upon application.

SNOW BLOCKADES IN MASSACHUSETTS.

The severe snow storms which prevailed in eastern Massachusetts for several days early in December caused an almost total suspension of the trolley service of several Massachusetts cities. The town of Millbury was entirely isolated from Worcester and the other points reached by the cars of the Consolidated company, and for one or two days all efforts to clear the road by means of snow plows were unavailing. The Blackstone Valley line was also practically tied up for a number of hours. Snow plows were put to work to relieve several cars which were stalled in Millbury and the opening up of the line for a distance of six miles was only accomplished after 10 hours work with the plows.

CANADIAN NOTES.

Mr. Holman, manager of the Chaudiere Electric Co., on behalf of a company composed of himself and some other well known gentlemen, has made a proposition to the town of Levis for the construction of an electric railway at that place. The company wants certain conditions granted, including exemption from taxes for a period of 25 years.

Mr. R. M. Horne-Payne, managing director of the British Columbia Electric Ry. Co., makes the statement that it is the intention to double the present capacity of the power house at Vancouver and to put in one of the most complete lighting plants on the coast. Altogether they propose spending a large amount of money in improvements.

The Toronto Suburban Electric Railway is now pushing the survey for the extension of its lines from Lambton Mills to Hamilton.

The St. Thomas Electric Railway Co. has given notice of an application to the Legislature for permission to extend its line south to Port Stanley and eastwardly through the townships of Malahide and Yarmouth to the town of Aylmer and northerly to London.

Mr. H. J. Cloran, of Hawkesbury, Ont., has patented a device for improving navigation, which he says will do away with the necessity of buoys, lighthouses and pilots along the St. Lawrence River. His idea is to lay a cable at the bottom of a navigable channel and raise from it attached wires with floats bearing lights.

The earnings of the Toronto Street Ry. Co. for 1901 have been given out, and they show an increase of \$152,263 over 1900, the total being \$1,636,861. The greatest monthly earnings were those of September, but the greatest increase in any one month were in October, \$25,973, which is attributed to the visit of the royal couple. The company will have a surplus of \$150,000 after paying fixed charges and the 5 per cent dividend.

Paris, Ont., has granted a 50-year franchise for an electric railway to Dr. Ickes and J. C. Wallace, who represent the Von Echa Co.

Mr. G. G. McPherson, K. C., representing a syndicate, is applying to the council of Stratford, Ont., for a franchise for an electric railway from here to Mitchell.

The following names appear on a notice of application for letters patent to incorporate the Manitoba Water Power Electrical Co.: Henry Burkholder, of Chicago, and N. G. Leslie, W. Georgeson, W. W. McMillan, I. M. Ross and H. Cooper, of Winnipeg.

E. C. Hawkins, who recently resigned as general manager of the White Pass & Yukon Railway, will at the close of navigation when he vacates his position with the company, begin the construction of a radial system of electric railways to the principal surrounding mining districts, following the new government wagon roads along Bonanza Creek to the Dome. Mr. Hawkins, who is an experienced railroad man, is confident that an electric railway from Dawson along the ridge between the Klondike and Bonanza and the Dome will prove the most profitable. This line will also be utilized for freight and will thus supplant a most inadequate team service.

A case affecting the rights of passengers on street railways was decided at the Court of Sessions in Ottawa recently. Wm. Porter sued the street railway company for \$200 damages because one of its conductors would not accept a transfer which he tendered. Porter got a transfer to a Banks St. car, but alighted at Sussex St., five blocks east of Banks St. He called at a hotel, remained there two or three minutes and then returning to the corner of Sussex St. and boarded a passing Banks St. car. The conductor refused the proffered transfer ticket, stating that it was good only at proper point of transfer, and placed his hand on Porter's shoulder with an intimation that he must either pay or get off the car. Porter paid under protest, and the jury awarded him damages, \$100 for assault, and 5 cents the price of his fare.

It is reported that the Peterborough Hydraulic Co. which is controlled by the Quaker Oat Co. is endeavoring to secure control of the Peterborough Light & Power Co.

The company represented by Mr. J. G. Gould, Hamilton, Ont., proposes to build a line from Hamilton to Caledonia and Lake Erie. In the city the cars will run over the tracks of the street railway company, providing a satisfactory arrangement can be

made. The proposed cost of the road will be about \$300,000, of which a considerable amount has been subscribed, and the promoters want the city to take stock to the extent of \$25,000.

It seems that there is still a demand in Paris for Canadians who have a practical knowledge of the street railway business. The latest appointment is that of Mr. A. J. Gadoua, formerly chief of the St. Denis St. station for the Montreal Street Ry. to a responsible position with the East Paris Tramway.

Application has been made to Parliament for an Act to incorporate the Morrisburgh (Ont.) Electric Railway Co., with power to construct and operate a system of electric railways beginning at some point in or near the village of Morrisburgh, and continuing through the Townships of Williamsburgh and Winchester, to the village of Winchester, and a branch line to the villages of Chesterville and Morewood in the Township of Dundas, with power to construct and operate telegraph and telephone lines and electric lighting and power stations along and in connection with said lines and for all other power necessary for the purpose aforesaid.

Those interested in the development of power at Lac de Bonnet, Man., propose building an electric railway from Winnipeg to that place, a distance of 62 miles, at a proposed cost of \$1,000,000. Large pulp and carbide mills, to be run by electric power, are, it is expected, to be built at Lac de Bonnet, and the road will be utilized for both freight and passengers. Mr. Wm. Burkholder, of Chicago, is largely interested.

The construction of the road for which the Provincial Legislature granted a charter to the South Essex Electric Railway Co., will be commenced without delay, the city of Windsor having granted permission for the use of the city streets. The City Clerk, Windsor, will furnish all desired information concerning proposed work upon inquiry.

An unusual number of bills affecting electric railways, showing a remarkable development in this direction, are before the Legislature, and from present indications there will be quite a boom in electric railway construction during the present season. The last issue of the Official Gazette contains notice of applications for some seventeen charters, the most extensive of which is by the Ontario Electric Co. This company seeks incorporation and power to construct and operate a railroad operated by electricity, compressed air or any motive power other than steam, from a point at or near the city of Cornwall, to a point at or near the city of Toronto, a distance of some 250 miles, and also from a point at or near the city of Ottawa to a point at or near the city of Brockville, with power to build branches from these main lines not exceeding 30 miles in each case. The applicants in this case are Sir Richard Cartwright, Ottawa; Albert L. Jewell, Boston; C. Birmingham, Kingston, Ont.; Horace M. Smith, Salem, Mass.; Robert J. Carson, Kingston, Ont.; George Smith, Boston, and John Carson, Kingston. Other applicants are the St. Thomas Electric Railway Co. for power to extend its lines to Port Stanley, Aylmer and London, The Sandwich, Windsor & Amherstburgh Ry., power to issue bonds and debentures to the extent of \$1,000,000 and to extend their lines to Harrow and Tecumseh. The Port Dalhousie, St. Catherines & Thorold Electric Street Ry. seeks power to amalgamate with any other electric company whose lines join its own. The Rapid Electric Ry. asks for incorporation and power to construct and operate a line between Hamilton and Port Dover, passing through several towns. In addition to the above there is a project on foot, headed by Henry T. Thurber, of Detroit, who is representing an American syndicate, for the construction of a line of roads radiating from Hamilton in three sections, Hamilton to Waterloo, Galt to Guelph, and Hamilton to Guelph. This would tap one of the richest and most thickly populated sections of Ontario, and would without doubt handle a large business should the lines be built. The syndicate are applying to the Ontario Legislature for incorporation under the name of the Hamilton Suburban Railway Co. The Port Stanley road also wishes permission to extend to London, and to be granted the power of disposing of its charter if desired.

M. J. Kennedy, general superintendent of the Montreal Street Ry. and the Montreal Park & Island Ry. and will have charge of the traffic arrangements of both systems.

An order placing the Montreal Street Ry. and the Montreal Park & Island Ry. under the charge of one general superintendent,

and the creation of the office of assistant to the general manager, together with other changes and promotions is announced as follows: D. Robertson, assistant to the general manager, carrying out such duties as may be from time to time assigned to him.

W. Punt, assistant superintendent under Mr. Kennedy.

H. R. Lockhart, superintendent of power stations and overhead work on both lines.

J. S. Vindin, engineer in charge of permanent ways, buildings and bridges on both systems.

H. G. Taylor, mechanical superintendent of both systems and is given full charge of all shops at Hochelaga.

OFFICERS OF THE PHILADELPHIA CO.

According to the plans of the consolidation outlined in the "Review" for December, the Philadelphia Co. on January 1st took charge of all the traction lines in Pittsburg and its vicinity. Mr. Callery, who was formerly president of the Union Traction Co., and the Allegheny County Light Co., has been chosen president of all the lines of the Philadelphia Co. The list of other officers who have been chosen up to the present time is as follows:

James H. Reed, vice-president; S. LaRue Tone, assistant to the president; John Murphy, general superintendent; Charles Fitzgerald, superintendent of the Union Traction Co. lines in Allegheny and the Birmingham and Southern systems; P. J. Callihan, superintendent of the Consolidated, Monongahela and Second Ave. lines; R. G. Clark, superintendent of motive power and master mechanic; W. B. Carson, secretary; C. J. Brown, jr., treasurer, and C. S. Mitchell, auditor. The various lines will have division superintendents as formerly and the present officers in charge will be retained. There will also be no changes in the power house and operating forces.

LUMEN BEARING CO.

In December last the Bierbaum & Merrick Metal Co., of Buffalo, N. Y., announced to the trade that the company would on and after Jan. 1, 1902, transact all business under the name Lumen Bearing Co. The new name was considered more comprehensive owing to the fact that the company's principal business consists of the manufacture of "Lumen" bronze bearings. At the same time a change took place in the personnel of the company, Messrs. Bierbaum and Merrick giving up all interest in the management, which is now conducted by William H. Barr, general manager, and Edward P. Sharp, manager of the street railway department.

Last April this company owing to its increasing business found it necessary to move from the old plant to one of a much larger capacity which is now being taxed to its utmost to keep up with their increasing business. "Lumen" bronze bearings have been widely used by the leading builders of street railway trucks, and by a number of the large street railway companies throughout the United States. The General Electric Co. is using Lumen for the bearings of the new equipment which it is making for the Manhattan Elevated of New York.

The Lumen Bearing Co. also makes "Ideal" trolley wheels which are rapidly working their way into favor with the street railway trade. The wearing contact rings of these wheels are made of pure lake copper, cast and hammered, giving them the consistency of dropped forged copper. This construction is possible only in a composite wheel, and its wearing qualities are demonstrated by the high mileage records these wheels are making.

CHANGES IN JOHNS CO.

The H. W. Johns Manufacturing Co., of New York, and the Manville Covering Co., of Milwaukee, each company having heretofore handled the goods manufactured by the other, have consolidated their interests. This consolidation took effect January 1st.

The new company, whose capital stock will be \$3,000,000, will be known as the H. W. Johns-Manville Co. The officers of the new company are: President, T. F. Manville; vice-presidents, C. B. Manville and George W. Gladwin; treasurer, F. R. Boocock; secretary, H. E. Manville. James G. Cannon will be chairman of the board of directors. C. R. Manville will be manager of the West-

ern department, and he, with C. B. Manville will remain in Milwaukee. T. F. Manville and H. E. Manville will remove to New York.

The new company is rapidly completing a plant at Milwaukee for the manufacture of carbonate of magnesia and mineral wool. When this plant is completed, the company will be prepared to furnish a most complete line of all grades of steam pipe and boiler coverings and asbestos goods of all descriptions.

THE NEW EAST RIVER BRIDGE.

Work on the new bridge over the East River which is to relieve the old New York and Brooklyn bridge of much of the enormous daily traffic to and fro between Brooklyn and New York is progressing rapidly. The approaches are nearing completion and the four main cables which support the central span will soon be ready for the preliminary work of the sub-structure.

As is generally known the contract for all the steel cables, wires and ropes that enter into the construction of the bridge, involving about 5,000 tons of steel wire, was let to the John A. Roebling's Sons Co., of New York and Trenton, which we believe to be the largest maker of steel wire and cables in the world.

The new East River bridge differs from the old Brooklyn bridge in that only the central or main span is suspended from the four cables, the shore spans being carried on trusses independent of the cables. In the Brooklyn bridge the shore spans are supported from the same cables that carry the center span. In the old bridge the towers and approaches were masonry work, but in the case of the new structure they are made up of steel girders and trusses.

The four main cables are not strung in their completed form, but are built up or practically made after the first or foundation wire has been swung into place. Each cable consists of 37 strands bound together, each strand being composed of 282 separate steel wires, 0.16 in. in diameter, making 10,434 wires in each of the four main cables. The work of assembling the strands and binding the strands together is conducted from a temporary wooden foot bridge suspended in the vertical plane of each cable for its full length.

The contract for the steel approaches was awarded to the Pennsylvania Steel Co. There will be about 12,000 tons of steel in the Manhattan approach, and 6,000 tons of steel in the Brooklyn approach.

The bridge is 7,200 ft. in extreme length; 118 ft. extreme width; and the roadway is 135 ft. above mean high water at the center. The towers are 335 ft. above the water. It has accommodations for four surface railway tracks, two tracks for elevated trains, two roadways for vehicles, two footways for pedestrians and two bicycle paths.

ACCIDENTS OF THE MONTH.

Six persons were killed and several injured on December 23d on the trolley line between Allentown, Pa., and Coopersburg, by reason of an electric car jumping the track at a sharp curve at the foot of a steep grade. The accident was due to wet rails and snow. The motorman was unable to check the speed of the car on the steep grade and as it struck the curve it swung against a guy pole which tore off one side of the car and the car roof. The Coopersburg line on which this accident occurred was opened to the public only a few days previous to the accident.

A head-on collision occurred December 23d on the East Lake line of the Chattanooga Electric Ry. in which the two cars which came together were badly wrecked and a number of passengers received serious injuries none of which, however, proved fatal. One of the cars was heavily loaded with passengers and the other was running empty. There was a dense fog at the time of the collision and the accident occurred on a heavy grade while one of the motormen was running his car rapidly in order to make a switch ahead of the other car. As neither motorman was able to see the headlight of the approaching car they crashed together without warning.

The St. Joseph (Mich.) & Benton Harbor Electric Railway & Light Co., owing to the scarcity of coal, was for a few days last month put to the necessity of using old ties for fuel.

TRACK CONSTRUCTION AT SCRANTON, PA.

The Engineering News for December 26th contains a description of street railway track construction at Scranton, Pa., which has been carried out in a very substantial manner with the object of securing economy both in the maintenance of the track and of the adjacent pavements. This construction includes a concrete base, T-rails, steel ties and reinforced joints, with brick and asphalt paving.

This work was fully described and illustrated in the "Review" for November, 1899, page 744, but the present article includes the following data on cost which may be of interest to our readers. The statement was prepared by Mr. E. D. Reed, the engineer on the work, and represents the actual cost in one of the streets of the track laid with 65-lb. rails on a 6-in. concrete base and paved with vitrified brick.

COST OF STREET RAILWAY TRACK CONSTRUCTION AT SCRANTON, PA.

Material:	
1 ft. track rails (33 1-3 lb.) at \$42.10 per gross ton.....	\$0.8147
Joint plates, \$1.97 per 30-ft., per ft. track.....	.0660
Joint rail, \$1.73 per 30-ft., per ft. track.....	.0576
Tie rods, 34 cts. per 10-ft., per ft. track.....	.0340
Iron rivets, 2 cts. per lb., per ft. track.....	.0071
Copper rivets, 18 cts. per lb., per ft. track.....	.0060
Total	\$0.9854
Labor:	
Cost of tearing out old single track, hauling same away, hauling new material, drilling and punching all tie-rods and rivet holes, cutting and drilling steel ties, assembling work ready for concrete and bonding with copper rivets, complete, per ft. of track.....	0.4870
Paving:	
Cost of 1 ft. of track graded, rolled, concreted, and paved with brick, at \$1.97 per sq. ft.....	\$1.0933
Extra concrete at joints and ties, at 72 cts. per sq. yd. ....	.0746
Total	\$2.6403
Add 1.5 cts. per ft. of track for fuel, tools, etc.....	.0150
Total	\$2.6553

Note:
 Average haul of material, 2 miles.
 Brick next to rail is of a special grooved shape.
 Measurements for pavement is taken from outside to outside of head of rail.
 These figures include the installing of one turnout.
 Extra concrete is as follows:
 2 ft. x 5 ft. x 6 ins. under joints.
 1 ft. x 6 ft. x 6 ins. under ties.
 The steel ties are made of old 4-ft. girder rails, and no value is placed on them in these figures.
 The cost of grading and rolling is included in cost of pavement.

A NEW COAL BELT RY.

The Coal Belt Electric Ry., which is projected to connect Herrin, Carterville, Carbondale and Johnson City, in Southern Illinois, has been in operation for about four months for a distance of eight miles out of Herrin. Thus far the business of the road has been confined to passenger service, a large per cent of the passengers carried being coal miners, but it is proposed to inaugurate a freight service in the spring and to make the transportation of coal a leading feature. Rails are being distributed for an extension to Carterville, and other extensions are under consideration which will give the road a total length of 20 to 25 miles, the route paralleling for a part of the distance the Chicago & Eastern Illinois and the Illinois Central Railroad.

The St. Louis & Illinois Suburban Ry., which was described in the "Review" for November, page 868, is now making surveys for an extension of its freight line through the coal belt to a point within eight miles of the Carterville, and it is thought that connections will eventually be made between the St. Louis & Illinois

Suburban and the Coal Belt Electric Rys., which will undoubtedly result to their mutual advantage. As yet, however, no steps have been taken toward the accomplishment of such an arrangement.

The Coal Belt Electric Ry. has its headquarters nominally at Herrin, its officers, however, being residents of Chicago. Mr. F. P. Read, of the Peabody Coal Co., 215 Dearborn St., is president, and Mr. Arthur W. Underwood, Marquette Building, secretary. Mr. Frank Peabody is also interested.

ELECTRIC STORAGE BATTERY CO. SECURES INJUNCTION.

In a suit recently brought by the Electric Storage Battery Co. against Eugene W. Belknap, the American Bicycle Co. and the National Battery Co., a decision was rendered by Judge Cox, of the United States Circuit Court, sustaining the validity of the Brush storage battery patent, owned by the plaintiff, and granting an injunction against the manufacture and sale by the defendants of the battery manufactured under a patent granted to Elmer A. Sperry. The Electric Storage Battery Co. is the owner of a patent granted to Charles F. Brush in 1886 for improvements in secondary batteries and the question before the court was solely one of infringement. At the argument it was conceded that if the complainant's affidavits correctly described the defendants' electrodes, infringement was established. The defendants, however, produced a number of affidavits contradicting those of the complainant, tending to show that their electrodes were made by the forming process described in an Italian patent granted to Brush, which has expired.

The decision states that the concessions at the argument limited the controversy to a single proposition, namely "Is the defendants' electrode the one described in the expired Italian patent?" The Brush invention covered by the patent in suit includes the supporting plate or grid the active material mechanically applied thereto, active material held to the plate by pressure or by sheets of porous non-conducting material.

The combination of these elements in the formation of the secondary batteries is the means by which Brush produced his first commercial storage battery. The claim of the defendants is that their plates after leaving the molds are put through a long preliminary forming process where the plates are formed similar to the Planté process, after the manner described in the Italian patent. The court holds, however, that this electrode has each of the features described in the complainant's patent and that the forming process of the defendants is simply an unnecessarily prolonged charging process. The defendants' electrode was declared to be a plain infringement than other types which have heretofore been held in the courts to be infringements. An order restraining the defendants from the manufacture and sale of the infringing plates was therefore made.

AUTOMOBILES IN STREET RAILWAY SERVICE

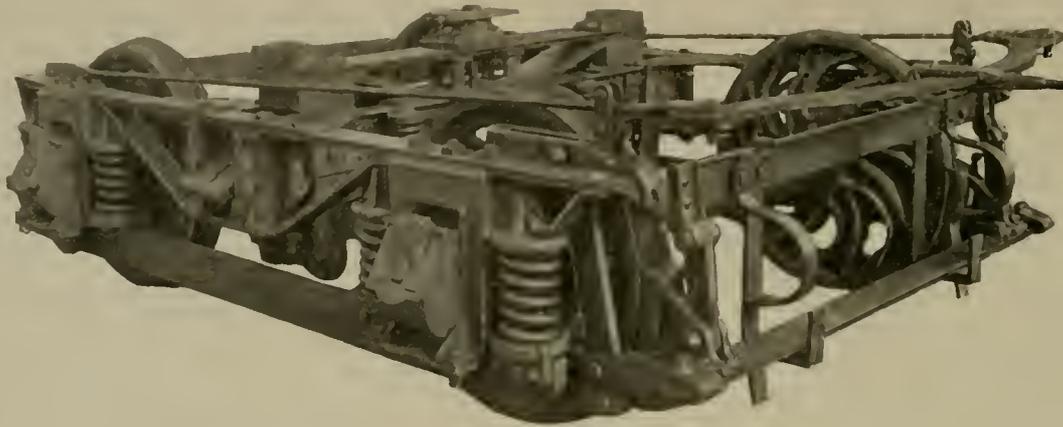
An injunction suit has been brought to stop the operation of the Millereck Valley Traction Co. through the city of Hamilton, and Mr. Wagenhals, manager of the company, states that if the injunction is granted that preparations have been made to operate a line of automobiles through Hamilton to connect with the company's lines which reach the city limits. It is expected that the Circuit Court will hand down its decision in this case within a short time and if the decision is in favor of the company it will at once proceed to build its tracks and operate its cars through Hamilton. If the decision is adverse, an order for a large number of automobiles will at once be placed and the line will be put in operation within a very short time.

The Elgin (Ill.), Aurora & Southern Traction Co. has decided to manufacture its own cars in the future. A 40-acre site for a factory has been selected at Wayne.

The Montreal (Que.) Street Railway Co. distributed Christmas turkeys and plum puddings to its 1,500 motormen and conductors. The women clerks in the office of the company were also appropriately remembered on Christmas eve.

NEW HIGH SPEED TRUCK.

Our illustration shows the improved pivotal motor truck "Criterion No. 18," which is offered by the Dörner Truck & Foundry Co., of Logansport, Ind., as the result of 15 years' experience in this business. The truck is heavy and strong, is designed for high speed and is built as near the M. C. B. specifications for steam railroads as it is possible to make a motor truck. The top frame is made of 4 x 1 in. iron and is continuous, having no splice. The ends of the frame are half turned making them vertical, this form being patented. The transom of the trucks is formed by two 1½ x 8 in. steel plates reinforced by 3½ x 2½ x 2½ in. angle irons extended across the truck and attached to the truck frame proper through the combined transom end and swing hanger pivot. This in turn is secured to the frame and arch bar by means of vertical bolts passing through it. The transom is further braced by gusset



"CRITERION No. 18" INTERURBAN TRUCK.

plates which are riveted to the frame and to the reinforcing angles of the transom. The lower swing hanger pivot rests under and is attached to the swing plank. Elliptic springs rest upon the bottom spring seat which is secured to the spring plank, and the top spring seat is attached to the iron truck bolster. The truck bolster supports the center plate and side bearings, the top spring seat forming a chafing plate to wear against the ½ x 8 in. plate which forms a part of the transom. The swing bolster and the brake rigging are secured by safety hangers to eliminate the possibility of accident.

The spring base of the truck is increased by hanging the equalizer bar underneath the box, thus enabling it to have double helical springs on each side, four more than are generally used. With a 6-ft. wheel base, brakes on the outside of the wheels and the swing hanger in front of the wheels, a large amount of space for the motors is secured. The brake head and shoe are attached by a key, making it a simple operation to remove the worn shoe. The brake leverage can be altered as desired, according to the power required. By removing the pedestal tie bar bolts the truck can be lifted away from the journal box, thus leaving the latter with the equalizer and equalizer springs in their normal position. The journal boxes are of large size, giving ample room for oil and packing, and will take a 4¾-in. journal. The axles are 5 in. in diameter. The total weight of the truck is 8,700 lb.

The company has lately made three large shipments of this type of truck and has several other orders under way at its works which have recently been built with special reference to this line of manufacture. Because of its substantial construction, its easy riding and the nominal cost of repairs required, this truck is particularly recommended by the makers for heavy interurban work.

Owing to the low water in the Mississippi River, the Twin City Rapid Transit Co. was unable during the first week in December to secure sufficient power from this source to operate its system between Minneapolis and St. Paul. The steam power houses were resorted to, and the interurban service between the cities was temporarily cut down.

GROUND BROKEN FOR FT. WAYNE-DAYTON INTERURBAN.

The Ft. Wayne, Dayton & Cincinnati Traction Co. whose plans were outlined in the December issue of the "Review," started on the construction of its lines December 15th when ground was formally broken at West Elkton. The ceremonies were witnessed by about 2,000 people on which occasion Dr. S. F. George, president of the company, delivered an address in which he outlined the work undertaken by the company.

As previously described, the company's system embraces 400 miles through a section not reached at present by railways. The entire private right of way has been secured by this road from Ft. Wayne to Brighton, near Cincinnati. The company has recently secured the right of way for a new branch from Greenville to Chattanooga, where it will connect with the main line.

OHIO TROLLEY STATISTICS.

The annual report of the commissioner of railroads and telegraphs, of Ohio, states that on May 1, 1901, there were 68 companies operating electric railroads in Ohio. The number of miles operated by these companies aggregated 1,818, which is about one-fifth of the main track mileage of all the steam roads in the state. Electric lines are being promoted with great rapidity in Ohio. As an evidence of this the commissioner shows that during the fiscal year ending Nov. 15, 1901, 96 electric railroad companies were incorporated in that state with a total capital stock of \$24,361,000. The gross earnings of the trolley lines of the state for 1901 were \$13,583,651, or more than 20 per cent greater than those of the year previous.

BANQUET OF THE OHMER CAR REGISTER CO.

An elaborate dinner was given by the Ohmer Car Register Co. on December 28th to the managers of the various departments of the works and the company's traveling representatives. The occasion was also marked by the awarding of prizes to the employes for meritorious suggestions in regard to improvements in the manufacture of registers, a custom which has been practiced annually by the Ohmer company. Ten prizes were awarded ranging from \$2 to \$25 in value and the prize committee had in all 61 suggestions from the men to consider. Speeches were made by the heads of a number of the departments and after drinking a toast to the absent officers and traveling representatives, Mr. Ohmer concluded the ceremony with a few well chosen remarks. Most of the speeches were in the line of criticisms and suggestions in regard to the work of the company, many of which will, when adopted, prove of much practical benefit.

The Everett-Moore syndicate it is said, will shortly acquire the St. Thomas (Ont.) Street Ry., and extend it to London, Aylmer and Port Stanley. A grant for the proposed extensions is now pending before the Ontario legislature.

NEW ST. LOUIS CAR.

The accompanying illustration gives a general view of one of the new cars which is being built for the Metropolitan Street Railway Co., of Kansas City, Mo., by the St. Louis Car Co.; the order was for 50 closed motor cars. The details of the car are as follows: The length over the corner posts is 21 ft., and the extreme length of the platform, 4 ft. 6 in. The width of car over



ST. LOUIS CAR FOR KANSAS CITY.

the posts is 7 ft. 10 in., while its width over the widest part is 8 ft. 3 in. The platforms are built with permanent vestibules having five drop sash. The doors are of quartered oak 1 3/4 in. thick with drop sash in two lights; the outside is paneled with No. 16 steel. Double strength A glass is used in the sash and is fastened with bead moulding screwed to place. There are seven ventilator sash on each side of the car, and four guide pipes which run on the outside of the car, outside of the sash, the full length of the body. These window guards are of 1/2-in. seamless brass tubing; the curtains are hung on spring rollers. Seats are of the Hale & Kilburn spring cushion type with canvas back rattan covered with the best quality of Wilton carpet. The interior finish is in even color of quartered oak. There are two bevel edge plate glass mirrors set in each end of the car, and it is also provided with a Hunter illuminated sign, and du Pont trucks and fenders. The material and workmanship throughout is of the finest.

A "UNIVERSAL" SAFETY TREAD.

The "Universal" safety tread, as its name implies, is a design to insure an absolutely safe foothold for pedestrians, on stairway, sidewalks, street car steps, and in other places where there is a tendency for the footway to become slippery and therefore dangerous.

The "Universal" tread is a combination of lead and steel, but there are no continuous ribs of steel to wear smooth and counteract in whole or in part the clinging effect of the lead. The lead is held in an ingenious steel matrix, which in itself would prevent



UNIVERSAL SAFETY TREAD.

slipping, and which, when filled with the lead, gives a surface that is as safe to walk upon lengthwise of the ridges as transversely—a characteristic that suggested the name "Universal."

In its application to street car steps, the surface of the tread is usually made up in three divisions as shown in the cut. The central portion having the ridges running parallel to the edge of the step, is both renewable and renewable. That is when the outer edge where most of the wear comes is worn down, the piece can be turned end for end, bringing the inner edge to the front, thereby doubling the life of the tread.

The device which is made by the Universal Safety Tread Co., of 45 Broadway, New York City, has been endorsed by a large

number of street railway companies, and the makers are able to guarantee that the tread will last practically as long as the car step.

VISITS FROM SANTA CLAUS.

The Syracuse Rapid Transit Railway Co. distributed among its employes, Christmas presents which amounted to \$1,750 in cash.

The following notice signed by Mr. E. G. Connette, vice-president and general manager, was posted at midnight in the waiting room of the employes: "In recognition of the valuable and efficient service during the past year the company will give each of its employes a cash present. The foreman of each department will distribute the gifts on Christmas morning."

No one of the force was lost sight of in the distribution of the presents and from the office boy to the oldest man in the service each received a present of from \$3 to \$5.

Employes of the Schuylkill Traction Co., who number about 100, were presented with cash presents, aggregating about \$400 on Christmas. Mr. Clark Merchant, president of the company, announced that 10 per cent of the gross earnings of the road for the week previous to Christmas would be presented to the men as a Christmas gift. The

pay roll for the week was made the basis for the distribution of the Christmas money, each man's share being based upon the amount he received at his last pay day.

EXTRA TROLLEY FARES LEGAL.

A decision was rendered last month in the case of a suit brought against the Brooklyn Heights Railroad Co. to restrict it from collecting more than one fare for a continuous ride over its road and the roads operated by it. The decision pointed out that a street surface railroad incorporated under the street surface railroad act of 1884 is prohibited by statute from charging a passenger more than 5 cents for one continuous ride from any point on its road, or any road under its control, to any other point on such roads within the limits of an incorporated village or city. It is pointed out that the fact that a railroad company extends its road by acquiring the tracks of another railroad company having the right to charge a fare of 10 cents, for example, would not give the latter company the right to charge to cents. In the case of the Brooklyn Heights Railroad Co., however, this law does not apply, as the Appellate Court has already decided, that the statute provision does not affect roads acquired from steam railroad companies.

TROY FRANCHISE IN DISPUTE.

The United Traction Co., of Albany, N. Y., recently filed with the secretary of state a certificate of extension of its tracks in what was formerly the village of Lansingburg which has since been consolidated with the city of Troy. The certificate filed shows that the consents of the village authorities and of property owners along the line was secured in December, 1900, but the city authorities deny that the franchise granted by the former village of Lansingburg is valid since its consolidation with Troy. Engineers of the United Traction Co. have already commenced making surveys of the proposed extension but they have been notified by the police of the city not to break ground or tear up the road in any way without a permit from the commissioner of public works. The engineers will be allowed to make the survey, but may not do construction work.

The Bay Cities Consolidated Railway Co., of Bay City, Mich., has accepted a contract for heating the municipal building during the winter.

The Pennsylvania State Building at the Pan-American Exposition has been purchased by a syndicate which owns Flagstaff mountain, the highest point reached by the Mauch Chunk, Lehigh & Slatington Street Ry. The building will be placed on top of the mountain and used as a restaurant and cafe.

THE FIRST CLEVELAND-DETROIT THROUGH CAR.

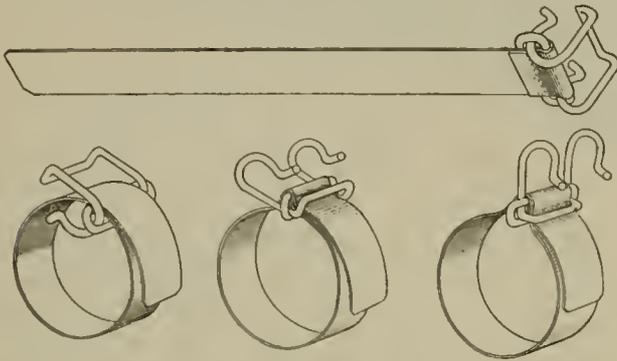
The first trolley car of the Everett-Moore syndicate to make a through trip between Cleveland and Detroit was run on December 23d and carried several officials of the Everett-Moore syndicate and the representatives of several eastern banking houses. The trip was made with the object of giving the eastern capitalists an opportunity of inspecting the system and also for getting data upon which to base a through running and traffic schedule.

It was expected that through cars between Cleveland and Toledo and probably Detroit would be in operation this month. The party made the trip from Cleveland to Toledo in less than six hours, which is excellent time considering the fact that the line is new and has not yet been properly ballasted at all points.

THE BOSTON CABLE CLIP.

The Chase-Shawmut Co., of 300 Atlantic Ave., Boston, is making a specialty of a novel clip for supporting aerial feeder and other cables, wherever the cable is suspended from a guy wire. The device consists of two pieces of steel wire and a strap of sheet metal. There are no rivets, pins, or buttons, and it can be adjusted entirely by hand.

The clip can be quickly and easily adjusted to any cable that the strap will go around, and can be placed over a splice as well as on the regular cable. The metal strap is simply pulled tight



"BOSTON" CABLE CLIP

around the cable before it is passed through the hanger piece. Upon turning over the hanger the metal strap is bent down and locked in place, the lever action taking up all slack and binding the strap tight. The steps in the process of fitting the clip to the cable are set forth in the illustrations. Special consideration is directed to the firm gripping power of the clip, which will cause it to stay where it is placed and will not permit the cable to slip or sag on long spans where the dip is great, or where one end of the stretch is lower than the other.

ELECTRICAL INDUSTRIAL RAILWAYS.

Electric railways have long been recognized as an important time and labor saving device in and about manufacturing plants, for use in mines and by contractors, and naturally the makers of railroad materials have given a great deal of attention to this field. Among those who have realized very good results in equipping roads of this type, as well as running them economically, is the well known firm of Arthur Koppel, of New York. This firm has built many electric roads for industrial purposes and has also developed portable electric railways, thus making electric railroads available for such as have to use them at different places, and at each place for a comparatively short time. All the parts composing these equipments are light and easily handled, and the roads can be rapidly laid down. Every detail is thoroughly worked out and even specially constructed and patented cars for stringing the trolley wire enter into the equipment.

Electric railways have been built by Arthur Koppel in many different countries, and for many different purposes, as for instance

factory roads bringing the raw material into the plant, carrying the different materials around, and finally taking the finished product to the station, for mines, for contractors, for plantations, and even for passenger traffic.

In order to give interested parties an opportunity to get acquainted with these industrial roads, their working and their equipment, the firm has erected in its New York office at 60 Broad St. an exact model of such an electric railroad in 1-10 actual size, equipped on the overhead system, with electric locomotive and coal flat, plantation, contractors, and passenger cars. The firm also publishes a special catalog on this subject.

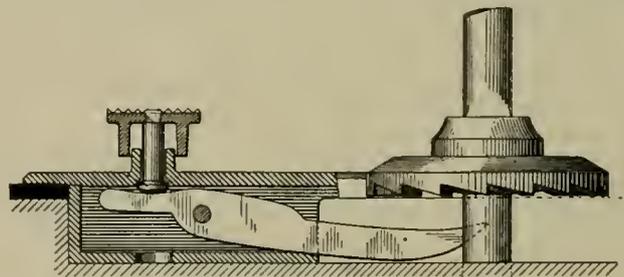
GROWTH OF TROLLEY LINES IN PENNSYLVANIA.

A striking feature of the annual report of the Pennsylvania State Bureau of Railways is the growth of the street railways in that state during the past 14 years. In 1887 the capital stock outstanding of the street railways of the state was \$17,211,680. The figure for 1901 is \$108,676,774. In 1887 the length of all roads was 519.3 miles, during the past year the total length of all tracks operated has reached 2,167.91 miles. The increase during the past year was somewhat over 100 miles. The total number of cars owned in 1900 was 6,395 and in 1901, 6,618. The number of passengers carried during the former year was 538,196,532, and during the past year it was 560,654,629.

NEW BRAKE RATCHET.

A new foot ratchet for holding the brake staff of an electric car in any desired position when the brakes are set has been invented by John C. Ernest, of 609 Peffer St., Harrisburg, Pa., and has been used with satisfaction for over a year by the Harrisburg Traction Co.

To the brake staff is secured in any desired manner, a crown-wheel, the face of which stands just above the surface of the platform, so that it may readily turn with the staff. In a mortised recess formed in the platform is a metal box, which contains a dog, mounted on a pivot, as shown in the cut, and having its front end curved and tapered to form a broad tooth adapted to engage the teeth on the under side of the crown-wheel. Bearing against the



ERNEST BRAKE RATCHET.

other end of the dog is a foot pin having an enlarged head at its lower extremity, and a foot piece or cap at its upper end.

The weight of the dog serves to raise the pin and its cap, and normally the engaging tooth is held away from the crown-wheel. When the brake is to be applied, the foot of the operator is pressed down on the cap, forcing down the pin, and raising the free end of the dog against the crown-wheel. To release the brake, the staff is given a slight turn letting the dog drop and permitting the staff to revolve and release the brake.

The top plate of the box at one end is elongated and a corner thereof is cut out on the arc of a circle, so that the periphery of the crown-wheel may be fitted nicely to it, thus excluding all dirt, snow, water and ice from the box.

The Union Traction Co. of Philadelphia has increased the wages of its 5,000 motormen and conductors from 18 to 19 cents an hour, the new scale becoming effective on January 1st. Eighteen months ago, the company voluntarily granted an increase in wages of 1½ cents an hour.

DISASTER AT ITHACA.

A hard rain which occurred December 14th and 15th in the neighborhood of Ithaca, N. Y., raised Six Mile Creek so rapidly that thousands of dollars worth of property along this stream were swept away in a few hours. One of the heaviest losers was the Ithaca Street Railway Co., a large part of whose plant was situated on the banks of this creek. All street car traffic was entirely suspended, as the railway power plant and lighting plant of the city were destroyed. The wreckage which blocked the channel of the



FIG. 1.

creek turned the stream from its course so that the whole lower part of the city was overflowed.

A sub-station which has recently been built by the street railway company is the only one of its buildings left intact. This station contains a storage battery plant which is capable of operating part of the lines, but nearly all the rest of the company's buildings as well as two cars, were entirely lost in the flood. One entire side of the car barn was torn out and the steel roof twisted and left hanging with but slight support. The dynamos, engines and boilers of the old power plant are in the bottom of the new channel formed by the creek. The blacksmith shop, paint shop, oil house, and the house in which the foreman of the machine shop lived were entirely washed away. There was no loss of life reported, although Mr. Graton, foreman of the paint shop, was supposed for some hours to have been drowned. He was seen at the shop a short time before it was washed away and had not been seen to come out, he escaped from the building, however, before the collapse occurred. It is estimated that the company's loss will reach nearly \$50,000, as in addition to the ruined buildings and machinery, long stretches of track on the Cuyahoga Lake division were undermined by the flood.

The part of the valley in which Ithaca is located is a mile and a half wide and although the city is about two miles from the lake, it is but a few feet above its level, so that Ithaca, which is sometimes called the "City of Seven Creeks," is subject to inundation. The hard rain which commenced on December 14th was sufficient to cause alarm and the climax was reached by the breaking away of the dam at the outlet of Dryden Lake about 10 miles away which lowered the lake six feet and precipitated this large body of water upon Ithaca, whose creeks were already full.

The accompanying illustrations, for which we are indebted to Mr. Louis Graton, give an excellent idea of the damage to the buildings of the Ithaca Street Railway Co. In one of these views, the gable of the wooden building which faces to the north indicates the points of the compass. The waters of the creek flow from east to west except at the point shown on the extreme lower right hand corner of the illustration, where they were deflected to the south for about 50 rods by wooden docking. An iron bridge spans the creek at a point directly opposite the car barn standing in front of the machine shop. Near this bridge was the 60-ft. paint shop and the oil house. The docking, bridge, paint shop, oil house and the dock at the end of the docking have all disappeared together with one or two acres of soil. At the point marked t there is a wall which once deflected the waters of the creek

west of the wooden docking. This has been brought to view for the first time since 1857, at which time another devastating flood occurred. At point 2 stood an almost new house that was occupied by the foreman of the machine shop and it was surrounded by a number of large trees, some of them being not less than 15 in. in diameter. As already stated, this house was entirely washed away, as well as all the trees surrounding it. The fallen roof near the derrick covered the building that contained the engine and dynamos. The engine is in sight, but the dynamos are under the roof. At point 3 is the north roof of the car barn. The long cupola of the sub-station receives the wires from the power house which is 2½ miles distant.

The other illustration gives a south view of the car barn with its south wall nearly all washed away. The ruined boiler and stack are also shown at the end of the frame building.

It is the intention of the company to refill and again occupy the place which was washed away by the flood. A contract has already been let for piling which will make a more effectual break-water than the former one. It is hoped that this prompt and courageous action by the management of the company in the face of such a disaster will be rewarded by the success it deserves.

It is estimated that the total loss to property holders in Ithaca reaches nearly \$500,000, and the loss to the city in ruined and damaged pavements alone will approach \$135,000. While the loss in Ithaca caused by the flood reached the largest figures, a number of other central New York cities received considerable damage at the same time. At Utica and throughout the Mohawk Valley the damage to railroads was serious. The Rome, Watertown & Ogdensburg and the Mohawk division of the New York Central were entirely tied up for several days. Near Rome, the latter road had three distinct washouts, all four tracks being swept away for a considerable distance. At Elmira about \$100,000 damage was done to houses and stores. A number of railroad bridges in this neighborhood were completely washed away and for 40 hours no mail from the east was able to reach the city.

Middletown, N. Y., was in a similar condition owing to land slides and washouts which occurred at a number of points. At



FIG. 2.

Wilkesbarre and Scranton, Pa., the washouts and land slides were so serious as to cut off the railroad connections entirely for some time. It was several days before the tracks were sufficiently repaired to permit trains from New York to reach the former place.

THE CHICAGO & INDIANA AIR LINE.

The Chicago & Indiana Air Line Co., which proposes to build an electric line from South Bend, Ind., to Chicago, is negotiating with the officials of the Indiana Railway Co. for rights to enter South Bend over the Indiana company's tracks as soon as the Interurban line is built. Agents of the new road have been actively engaged in purchasing rights of way for this line along the Chicago Michigan City wagon road. The company is paying at the rate of \$2,000 a mile for a 50 ft. right of way, and has secured a large number of options along the route.

ELECTRICAL EQUIPMENT OF THE LONDON UNDERGROUND.

The decision of the London Board of Trade in regard to the recent arbitration between the Metropolitan and the Metropolitan District railways was based on the arbitrators' report to that body, which was as follows:

ARBITRATORS' REPORT TO THE BOARD OF TRADE.

"The Metropolitan Railway Co. is owner of nine miles and the District Railway Co. is owner of four miles in length of that portion of the Underground Railway in London which is known as the Inner Circle, and are joint owners of the City Line and Extension Railways. Both companies have for some time concurred in the necessity of working these railways by electrical power, but have been unable to agree to adopt the same system, the Metropolitan company advocating what may be described as the "alternating" current system, the District company preferring the "continuous" current system of electrical traction. Under these circumstances in the summer of 1901 all necessary steps were taken by the companies to procure the appointment of a special tribunal under the Metropolitan District Railway Act, 1901, sec. 9, to hear evidence and to report to the Board of Trade with the object of deciding which of the two above-named systems should be adopted. A special tribunal was accordingly appointed, consisting of myself, as arbitrator, Mr. Thomas Park, engineer, of Wolverhampton, nominated by the Metropolitan Railway Co., and Mr. H. F. Parshall, engineer, of 8 Prince St., London, E. C., nominated by the District company, which heard the evidence of the two parties and the arguments and speeches of counsel on their behalf on the 7th October and eleven subsequent days.

"The position under consideration is novel, for Parliament has for the first time thrown on the Board of Trade the task of imposing on a railway company a system of working to which that company is opposed. The system to be adopted on the Inner Circle will have to operate on a circular railroad, in tunnel, through which a dense traffic is carried by trains frequently stopping, and rapidly succeeding each other, and where a large number of trains of foreign companies are at frequent intervals interjected. On such a road it is of vital moment that a service of precise and imperturbable regularity should be maintained. It is further requisite that the trains should be handy, i. e., should, without discomfort to passengers, quickly start, accelerate, retard and stop. It is above all essential that the system adopted should be safe to the public and the employes of the railway companies concerned. The "continuous" system, whereby an alternating current of high tension is first transformed, and then converted into a direct current of 500 volts, and collected from a third rail into the train motors, is very well known, and it was not seriously questioned by the Metropolitan company that it had been proved to satisfy the requisites above enumerated by long and well-tried experience on similar railroads, carrying similar traffic under similar conditions both in America and England.

The "alternating" system as carried out by Ganz & Co. of Buda Pesth, proposed by the Metropolitan company, abolishes the rotary converters employed in the "continuous" system and introduces into the tunnels where the trains run a current of 3,000 volts carried on overhead conductors and collected thence into the train motors by trolleys.

"It was admitted that no fully equipped railway in actual working used a current in the traffic exceeding a pressure of 750 volts, nor have any experiments been made of Messrs. Ganz's proposed system on railways presenting the peculiar features of the Inner Circle. It is true that certain experiments of this method of traction have been made in the yards of Messrs. Ganz & Co., and on the Sondrio & Lecco Ry. in Italy (not yet opened for traffic) of a very interesting and important character, but those experiments have not resulted in the proposal by the Metropolitan company for the Inner Circle system of the plant there tested. The motors, the trolleys, the controlling gear, the conductors, the safety devices described by Messrs. Ganz before us as those proposed to be used on the Inner Circle differ materially from those tested as before mentioned, and the maximum of acceleration for the motors was changed from 1-8 ft. to 2-6 ft. per sec. while the system originally a 15 cycle system was changed to a 25 cycle system.

"It is therefore accurate to say that the system tested at Sondrio

and at Messrs. Ganz's yards is still in the experimental stage, and that important departures from and amendments of that system were avowed as necessary before us for the Inner Circle.

"It will thus be seen that the Metropolitan company, who alleged in substance a superiority in economy only for the "alternating" system, seeks, against the will of its partner in ownership, to displace a well-tried and widely successful system, and to make an experiment under perhaps the most expensive and complicated conditions which could be found in Europe. Such an experiment may very possibly be made on a railway of a scale where considerations of safety are less vital—where if any loss ensues it will not be heavy, and will be borne by those only who are responsible for making it; but it is impossible to recommend its trial against the will of the District company on the Inner Circle.

"Many controversial matters of great interest from the point of view of electrical science were discussed before us. Upon these questions it is not necessary—and would probably be premature—to express an opinion.

"It is for the broad reasons already set forth in this report that I advise the "continuous" system should be adopted on the Inner Circle and on the City Lines and Extension Railways. In this advice Mr. Parshall concurs, Mr. Parker does not dissent, and does not desire to send in any separate report.

"I think it right to add that the manner in which the District company conducted the preliminary negotiations which took place between the two companies to determine the system of electrical traction was most embarrassing to the Metropolitan company, and fully justified that company in clearing the matter up by arbitration

(Signed) "Alfred Lyttleton."

Immediately following the decision of the Board of Trade, Mr. Yerkes awarded the contract for the electrical equipment of the Inner Circle to the British Westinghouse Electric & Manufacturing Co., whose new works at Manchester, Eng., will be in operation within a few weeks. A portion of the installation, however, will be built in the Westinghouse works, at Pittsburg, in order to hasten the construction of the road.

The generators will be of 6,660 h. p. each and will be driven by steam turbines which will be several times larger than any others heretofore built. The work will begin immediately and it is expected that within two years from January 1st, the Inner Circle will be operated with an up-to-date system of electric traction.

WORLD'S FAIR EMBLEM PRIZE.

A competition has been inaugurated by the Louisiana Purchase Exposition for the design of a symbol or emblem to be used for the seal, the stationery and for the publicity material of every description for the exposition. An appropriation of \$5,000 has been made to meet the competition charges, divided as follows:

For the prize design, \$2,500. Honorarium of \$250 to each of eight selected sculptors. For the expense of the jury of selection, \$500. The jury is to be composed of two artists, two architects, two sculptors, and one historian. This jury is to choose eight sculptors or medalists which will be commissioned for the honorarium to design an emblem. But in addition to these eight, the competition is open to the entire world and all designs submitted, whether from outsiders or from the eight selected, are to be considered on a par in awarding the prize of \$2,500. No restrictions are laid down as to lettering, sentiment or style of the design, the only stipulation being that it shall be symbolic of the historical event which the fair is to commemorate.

The men who serve on the jury of selection are to be of national reputation, and an invitation will be sent to representatives of foreign governments at Washington requesting that they submit the plan of competition to interested parties in their respective countries. A period of six months will be allowed for the competition.

FIRE AT LA SALLE, ILL.

The power house and car shed of the City Electric Ry., of La Salle, Ill., were destroyed by fire on January 15th. It is reported that only two cars of the entire equipment are still serviceable. The loss is estimated at \$60,000, insurance \$5,000. J. R. Burrows, of La Salle, is receiver and superintendent.

DIFFICULT ENGINEERING IN NEW YORK SUBWAY.

In the "Review" for last November, page 834, reference was made to a unique feat of engineering in connection with the New York rapid transit subway work.

At 135th St. and Broadway, where the viaduct, which is to carry the rapid transit road over the Manhattan Valley connects with the underground subway portion, it was found imperative to change the plans so as to give three tracks at this point instead of



CHANGE FROM 2-TRACK TO 3-TRACK CONSTRUCTION.
Photo by P. P. Pultis.

two as called for in the original design. These alterations involved the shifting of two heavy retaining walls and the widening of a long section of the completed subway, so as to give room for the additional track.

The first block of this length of the subway, which comprises the inclined approach to the tunnel, involved the moving of two walls composed of concrete, heavy blocks of stone and pressed brick, each weighing about 200 tons. In the work of moving, wooden wedges were first placed at frequent intervals under the walls. On the bottom of the wall, thin strips of metal were inserted, the lower strip being fastened to the wedge and the upper one on which it was intended to slide. Grease was poured on these strips, and by means of hand jack screws applied simultaneously at short intervals along the base of the wall, the entire wall was shifted to a new foundation, a distance of 5 1/2 ft.

The second block comprised a section of the completed subway structure itself, which was shifted intact with the exception of the westerly wall.

Before the actual work of moving could be undertaken the subway had to be thoroughly braced to avoid possible wrenching or twisting stresses in the wall or roof. On either side of each of the central upright girders supporting the roof, were bolted heavy cross timbers, a short distance above the tunnel floor, these timbers forming practically a false or secondary floor framing.

On these floor timbers were carried timbers supporting the roof along both the westerly and easterly wall, and on the easterly side additional bracing timbers were carried diagonally from the lower corner at one side to the center line of the roof. Virtually all the load was thus taken from the steel girder members and transferred to the false timber work. Heavy timbers were then inserted at short intervals under the entire section to act as slide ways.

When all was in readiness the holding down belts of the central line of steel girders were withdrawn from the cement piers on which the girders rested, the roof was cut away from the westerly wall; the foundations of the easterly wall were cut through; and the entire structure was then forced over to the new foundations.

To give the desired additional width the westerly wall was forced

back in the same manner as were the walls on the first block. The roof was next pieced out with a new set of girders riveted to the ends of the old roof girders, in the manner indicated in one of the illustrations. As far as can be determined the new three-track subway is in as good condition as was the old two-track tunnel.

The actual work of building the entire rapid transit subway has now been in progress about 16 months, just one-third of the time allowance of four years stipulated in the contract, but in that one-third of the time almost 58 per cent of the earth excavation and a little more than 35 per cent of the rock tunnelling have been completed.

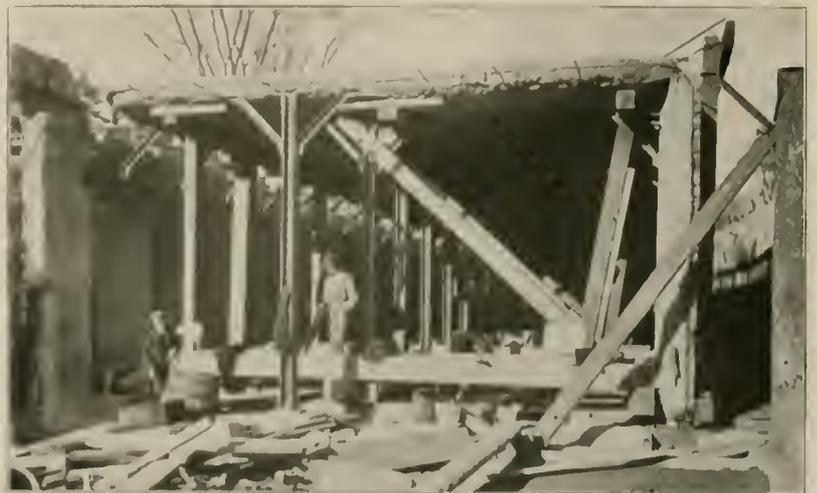
Including the estimate for December the contractor's requisition for pay for work done amounts to \$12,000,000, a little more than a third of the total contract price. If the present rate is kept up the subway will be practically completed by August, 1903, or about seven months ahead of time.

NEW ENGLAND STREET RAILWAY CLUB.

The second annual meeting and banquet of the New England Street Railway Club will be held at Hotel Brunswick, Boston, on Thursday, Jan. 23, 1902. An informal reception will be held from 5 to 6 p. m., followed by the banquet at 6 o'clock sharp. At the conclusion of the dinner the regular meeting will be called to order.

It is the aim of the entertainment committee to make this gathering of unusual interest and importance. The governors of the several New England States, the chairman of the railway commission and many of the prominent street railway men of New England have been invited as guests. Music will be furnished by the Hyde Park Glee Club of 23 male voices, accompanied by a full orchestra. The annual election of officers will take place at this meeting.

Tickets for the banquet will be \$2 each, and owing to the elaborate arrangements and expenses attending the gathering, it is requested that members apply at once for tickets, as the supply will be limited. Requests should be made to the secretary, Mr. J. H. Neal, 101 Milk St., Boston, Mass.



STEEL CONSTRUCTION AT 12TH ST. AND BROADWAY, SHOWING BRACING.
Photo by P. P. Pultis.

The entertainment committee having arrangements in charge is as follows: Edward C. Spring (chairman), superintendent Newton & Boston Street Railway Co., Newtonville, Mass.; J. H. Neal, F. G. L. Henderson, superintendent Newton Street Railway Co., West Newton, Mass.; H. E. Reynolds, division superintendent Old Colony Street Railway Co., Quincy, Mass.; F. J. Stone, manager Electric Storage Battery Co., 60 State St., Boston.

PERSONAL.

MR. T. C. RODERICK, formerly of Indianapolis, has been elected superintendent of the Owensboro (Ky.) City Railroad Co., to succeed Mr. E. C. Folsom who recently resigned.

MR. IRA A. McCORMACK and MR. C. W. WASON, of the Cleveland Electric Railway Co., returned to Cleveland December 17th after an extended tour of inspection of street railways in eastern states.

MR. WILLIAM PESTELL, superintendent of motive power and machinery of the Worcester (Mass.) Consolidated Street Railway Co., has had a long and valuable experience in electrical engineering work.



W. PESTELL.

Prior to 1890 he was engaged with a number of electrical enterprises, in which he was called upon to do considerable designing, building and repairing of motors and generators. In 1890 he went with the Sprague company in Boston. In 1893 he went to Salem to take charge of armature winding for the old Naumkeag Street Ry., and remained in this position until the Naumkeag road was absorbed by the Lynn & Boston. After the consolidation he was given charge of the electrical and mechanical departments of the new company. He subsequently moved to Lynn and after the Lynn & Boston road had been purchased by the Massachusetts Electric Companies he continued to serve as electrical engineer. He went to Worcester in the spring of 1901 and in the few months since assuming his new duties has made important suggestions regarding changes in the power house, track and repair departments, which have resulted in the introduction of a number of improvements and economies. Under Mr. Laffin, the general manager, he has general oversight of power houses, reform work, and all electrical matters.

MR. GODFREY MORGAN, formerly superintendent of the Niagara Gorge Railroad Co., Niagara Falls, N. Y., has been appointed general superintendent of the Youngstown (O.) & Sharon Railway & Light Co.

MR. C. F. MOORE, of Akron, secretary of the Northern Ohio Traction Co., has assumed the management of the Canton-Massillon lines of the Everett-Moore syndicate. Mr. Moore may determine to reside in Canton.

MR. EDWIN W. OLDS, superintendent of rolling stock of the Milwaukee Electric Railway & Light Co., was presented with a pair of otter driving gloves and a silk umbrella by the employes of his department, on Christmas eve.

MR. HAYES QUINCY TROWBRIDGE, on December 10th, was elected a director of the Fairhaven & Westville Railroad Co., of New Haven, Conn., to fill the vacancy in board occasioned by the death of his father, E. Hayes Trowbridge.

MR. GUY MORRISON WALKER has removed his office from the Electric Building, Cleveland, to No. 1017 Broad Exchange Building, New York, where he will represent the Everett-Moore interests as New York attorney and financial agent.

MR. F. F. BODLER who takes the place of master mechanic of the North Jersey Street Railway Co., vice Mr. H. H. Adams, resigned, was formerly with the Jersey City, Hoboken & Paterson Ry. He is a graduate of Lafayette University and has worked his way up through the various branches of electric railway service.

MR. CHARLES CURRIE, second vice-president and general manager of the Northern Ohio Traction Co., of Akron, O., on

December 14th assumed charge of the Canton-Massillon Electric Railway Co., of Canton, O., as general manager and treasurer, and henceforth will operate both systems which together comprise about 140 miles of road.

MR. H. H. ADAMS, master mechanic of the North Jersey Street Railway Co. has resigned to become superintendent of motive power for the United Railways & Electric Co., of Baltimore, Md. Mr. Adams is a graduate of Stevens Institute and has been with the North Jersey road for six or seven years. He is succeeded by Mr. F. F. Bodler.

MR. J. W. HANCOCK was elected vice-president and general manager of the Roanoke (Va.) Railway & Electric Co. at a meeting of the directors on December 20th. Mr. Hancock has been connected with the Roanoke company for several years, and for some time past has been acting general manager in which capacity his efficient service quickly won recognition from the company and its patrons.

MR. M. F. CONNETTE has been recently appointed roadmaster of the Syracuse Rapid Transit Railway Co. and has charge of the overhead construction. Mr. Connette formerly resided at Nashville, Tenn., where he had charge of the East Nashville division of the Nashville Street Ry. He removed to Syracuse in April, 1900, and prior to his present appointment has been superintendent of the Tallman St. car house of the Syracuse company.

MR. THOMAS C. BARR, of East Orange, N. J., has been elected president of the Elizabeth, Plainfield & Central Jersey Railway Co., to succeed Mr. David Young. Mr. Barr was formerly president of the Essex Passenger Ry. and had previously been identified with street railway interests in Philadelphia. Mr. John Ackerman was elected general manager, and Col. Edwin E. Hine, treasurer, of the Elizabeth, Plainfield & Central Jersey Company.

MR. BURT VAN HORN, who in December resigned as general manager of the International Traction Co.'s properties, will spend the winter on the Pacific Coast, taking a much needed rest. Mr. Van Horn became associated with Mr. W. Caryl Ely in the building of the Buffalo & Niagara Falls road, securing the franchise and serving as vice-president and general manager; after the organization of the International Traction Co. he became general manager of all the operating companies.

MR. THOMAS SMITH, who is about to leave his position with the Westinghouse company at Pittsburg to become assistant superintendent of the British Westinghouse Works near Manchester, England, was tendered a banquet on December 24th by all the subjects of King Edward employed in the Pittsburg manufactory. The banquet was a most enjoyable one and at the end of it the company presented Mr. Smith with a purse of money and a valuable watch was presented him by the British hosts of the evening.

MR. FRANK H. NEWCOMB has been appointed to succeed W. J. Taylor as assistant to George H. Roberts, jr., Postmaster, Brooklyn. Mr. Newcomb is well known to street railway men as the manufacturer of motormen's and conductors' caps. He was born at Easton, Mass., 43 years ago and came to Brooklyn in 1868. For 19 years he has been a latter in that city, his place of business adjoining the Flatbush Ave. postal sub-station of which latter he has had charge through three administrations, covering a period of 12 years. Mr. Newcomb is thoroughly familiar with the practical workings of the postal service, and his appointment as assistant postmaster is highly satisfactory to the officials at Washington. Mr. Newcomb assumed the responsibilities of his new position on January 1st.

MR. THOMAS E. MITTEN on Dec. 18, 1901, succeeded Mr. Burt Van Horn as general manager of the properties controlled by the International Traction Co., of Buffalo, and Niagara Falls. Mr. Mitten entered the electric railway field when in Denver in the early 90's, being then with the Denver & Rio Grande R. R. and equipping a steam line near Denver for electric traction. In

1895 he removed to Wisconsin and shortly afterwards became general superintendent of the Milwaukee Electric Railway & Light Co., which position he resigned in March, 1901, to become general superintendent of the Buffalo roads. Mr. Mitten went to Buffalo just as the company was making preparations for handling the Pan-American traffic, and during his superintendency made an enviable record, of which his promotion to general manager is an appropriate recognition. The office of general superintendent has been abolished.

MR. ROBERT ANDREWS, heretofore vice-president of the Safety Car Heating & Lighting Co., of New York, has been



ROBERT ANDREWS.

elected president of the company, vice Arthur W. Soper, deceased. Colonel Andrews is a native of Wilmington, Del., and is an expert on railroad operating and engineering matters. He graduated from the Polytechnic College in Philadelphia in 1854 and became assistant engineer of the State canals of Pennsylvania, in which capacity he served from 1854 to 1857, his next appointment being that of principal assistant engineer of the Sunbury & Erie R. R. He served that company from 1857 to 1860. From 1861 to 1864 he was staff officer in the army during the civil war. From 1864 to 1885 he was chief engineer of the Saratoga & Hudson River R. R., and for the 20 years from 1865 to 1885 he served the Wabash R. R. as division superintendent, chief engineer and general superintendent. From 1885 to 1888 he was general superintendent and engineer of the Virginia Midland R. R. In 1889 he went with the Safety Car Heating & Lighting Co. and has taken an active interest in this company's affairs ever since that date.

MR. C. E. FLYNN, general manager of the Wheeling (W. Va.) Traction Co., was a caller on the "Review" when in Chicago recently.

MR. ROYAL HOLBROOK, manager of the Otumwa (Ia.) Traction & Light Co., was presented with a Christmas gift of a valuable ring by the conductors and motormen in his employ.

MR. CHARLES FITZGERALD, formerly general superintendent of the Consolidated Traction Co. of Pittsburg, has decided not to accept the position of division superintendent offered him after the merger recently effected by the Philadelphia Co.

MR. W. H. BROWN, formerly of Philadelphia, has been appointed superintendent of the Rapid Transit Co. of Chattanooga, succeeding Mr. King. It is understood that Mr. Brown will have enlarged power and will be virtually general manager of the road.

MR. V. C. STANLEY, formerly general passenger and freight agent of the Grand Rapids, Holland & Lake Michigan Rapid Ry., has been appointed superintendent of that road, succeeding Mr. M. J. Kimb. It is officially announced that Mr. Kimb will accept a position with the Grand Rapids Railway Co.

MR. CHARLES A. JEFFS, formerly of Brookfield, Mass., has been appointed superintendent of the Gardner (Mass.) Westminster & Fitchburg Street Railway Co., to succeed Mr. Frederick La Noue, resigned. Mr. Jeffs for the past five years has been superintendent of the Warren, Brookfield & Spencer Street Ry., and was previously in charge of the Leominster & Clinton Street Ry., which is now a part of the Worcester Consolidated system. Mr. Jeffs will assume the duties of his new position at Gardner on February 1st.

MR. FRANK J. DUFFY, formerly paymaster for the St. Louis Transit Co., has been appointed assistant superintendent of the Richmond (Va.) Traction Co. Mr. Duffy is a brother of Mr. C. N. Duffy, auditor of the Chicago City Ry.

MR. W. A. HELLER has resigned as manager of the Muskegon (Mich.) Traction & Lighting Co., and has removed to Cumberland, Md. On the evening of his departure from Muskegon, December 10th, Mr. Heller was given a banquet at Lake Michigan Park pavilion by the employes of the traction company, and was presented by them with a diamond-studded watch charm.

MR. H. N. RANSOM, purchasing agent for the International Traction Co. of Buffalo, has associated himself with Mr. F. C. Randolph, of New York, Eastern manager of the Christensen Engineering Co., and will hereafter devote all his time to the interests of the Christensen air brake. Mr. Ransom was for many years with the Consolidated Car Heating Co., prior to his going to Buffalo.

MR. F. J. BOWDEN, of Hancock, Mich., president of the Houghton County Street Railway Co., will soon sail for Cuba, where he purposes to inspect the street railway systems under construction by Stone & Webster, of Boston. Mr. Bowden is understood to be indirectly interested in the project. The Cuban lines are being built under the supervision of Mr. George C. Towle, formerly superintendent of the Houghton County Street Railway Co.

MR. GEORGE S. DAVISON, secretary and general manager of the Pittsburg & Birmingham Traction Co., gave a banquet on December 30th, to the 25 members of the board of trustees of the Pittsburg & Birmingham and Monongahela Street Railway Relief Associations, representing the employes of the two companies. Menu and decorations were elaborate, a strikingly appropriate feature of the latter being a floral trolley car in the center of the board, illuminated by diminutive electric lights.

MR. D. A. BELDEN, who for ten years was general manager of the electric railway systems in and around Aurora, Ill., last month succeeded Mr. Ernest Woodruff as president and general manager of the Atlanta (Ga.) Railway & Power Co. Mr. Belden entered into street railway work in 1891; he secured the franchises and rights of way and built the Aurora & Geneva interurban and later the Aurora, Yorkville & Morris line, both of which were controlled by the Aurora Street Railway Co. In connection with the building of the Aurora & Geneva line there arose a controversy as to the right of an electric railway to condemn a right of way through private property for the purpose of avoiding grade crossings; the suit was very bitterly fought and carried to the Illinois Supreme Court, the final decision being in favor of the Aurora & Geneva Company. Mr. Belden resigned as general manager of the Aurora property in May, 1901, when those roads were acquired by Cleveland interests.

MR. LOUIS R. ALBERGER, who was formerly connected with Henry R. Worthington, New York, and for 13 years was in charge of the condenser department of the business carried on under that name, announces that he has organized a new company, known as the Alberger Condenser Co., to make and sell condensing apparatus, vacuum pumping machinery and cooling towers, embodying novel and important improvements. The new house is prepared to build both surface and jet condensers of all sizes and having air and circulating pumps, either steam or electrically driven, in connection with electric lighting and railway power stations. Special consideration will be given to the needs of large and extended plants. The associates of Mr. Alberger in the new business have also had years of experience and are thoroughly familiar with the line of work undertaken. The vice president, Mr. George Q. Palmer, is also manager of the Quantard Iron Works, which company will attend to the making of the Alberger special machinery. The headquarters of the Alberger Condenser Co. are at 95 Liberty St., New York City.

OBITUARY.

MR. J. A. BOWLES, roadmaster of the Seattle (Wash.) Electric Co., met with a fatal accident on December 4th in the company's Madison St. power house from which the cable line is operated. Mr. Bowles was in conversation with a friend when he attempted to step across the cable, and became caught in it. He was dragged against the flywheel and instantly crushed to death. The deceased leaves a widow and five children.

MR. BENJAMIN REECE, who for several years has been connected with the Diamond State Steel Co., died December 18th at Wilmington, Del. Mr. Reece was recognized as an expert on railway track maintenance in this country and has, at different times, published a number of articles on this subject.

MR. F. B. BROWNELL died on January 8th at the Battle Creek, Mich., sanitarium, where he went last September after a severe attack of grip which left him in a weakened condition. Mr. Brownell was born in Troy, N. Y., Dec. 20, 1851, his ancestors having been quakers descended from Thomas Brownell, of Darbyshire, England, who lived in Rhode Island in 1647. Mr. Brownell came to St. Louis in 1867 with his parents and soon after became associated with the Brownell Car Co., which was incorporated in 1875 with Mr. Brownell as president and Mr. M. B. Richardson, secretary. Besides being one of St. Louis' most prominent business men, Mr. Brownell was a member of the Merchants' League Club of that city and an active worker in the Republican party, having been vice-chairman and treasurer of the State Committee. His services to the party have



F. B. BROWNELL.

always been most valuable but he always steadfastly refused to be a candidate for any position, either elective or appointive, and never yielded but twice: once for school director and once for presidential elector. Mr. Brownell was highly respected both as a business man and a public worker, and his loss will also be mourned by a large circle of friends.

A. S. R. A. OFFICIAL REPORT.

Secretary Penington's official report of the 20th annual meeting of the American Street Railway Association, held in New York in October last, was received December 17th, just too late for acknowledgment in our December issue. The secretary has shown great energy in issuing his report so promptly in view of the fact that it contains 340 pages and numerous drawings, being nearly twice as voluminous as the report of any previous meeting of the association. The New York convention papers were of practical value and Mr. Penington's report is in a form most convenient for reference; besides, it is the only report published which contains all of the diagrams submitted to illustrate Mr. Harrington's report on storage batteries located in power stations. This is also the only complete report of the banquet proceedings published.

New York promoters project an electric street railway system in Grand Forks, N. D. The line as planned will connect the state university, the suburban east side and the business and residence districts of the city, aggregating about 15 miles in length.

Devitt, Tremble & Co., who were prominent in financing the Youngstown-Sharon Railway & Light Co., report that the earnings of this property for December were largely in excess of any estimates previously made. The traffic of the Sharon and Wheatland line has grown to such an extent as to require the immediate double tracking of the road for its entire length, and cars are now operated through between Youngstown and Sharon. Prior to January 8th, passengers were required to leave the cars at McGuffey St., nearly two miles from the business center of Youngstown, owing to the delay in completion of the viaduct over the railroad yard at that point.

ELECTRICITY ON NEW YORK ELEVATED.

The Manhattan Railway Co. of New York City formally started the electrical operation of its Second Ave. division on January 9th, at which time the first train ran from South Ferry to 129th St., carrying nearly a full load of the company's guests. The return trip was made as far as 80th St., at which point the guests were taken in automobiles to visit the new power house at 74th St. and East River. Among the officers and guests of the company to make the initial trip were Howard Gould, Edwin Gould, A. Skitt, John D. Rockefeller, jr., Joseph C. Hendrix, Samuel Sloan, G. P. Morosini, H. H. Vreeland and J. Arbuckle. A number of stops were made in the lower part of the city, after which the train made a quick run to Harlem. The whole run was made in less than half an hour, including stops, although no attempt at a record run was made. At one point the tram made a half mile in 45 seconds, which is equal to 40 miles an hour, the time which the electric trains are scheduled to make. At present both steam and electric trains are being operated on this division, but the latter will be constantly increased in number until the steam trains are entirely displaced. It is planned to run three-car trains of two motor cars and a trailer during the light hours of traffic and six-car trains with four motor cars and two trailers during the rush hours. The station platforms along the road are now being lengthened to enable the operation of six-car trains.

The party was shown one of the new summer cars which the company is going to put into commission next season. These are a little longer and wider than the old cars and each of the windows extends across two seats.

JURISDICTION OF RAILROAD COMMISSION OVER TROLLEY LINES.

The railroad and warehouse commission of Illinois in an opinion filed December 12th assumes control over the crossings of electric with steam roads, and it may later claim the power to fix electric railway rates. The act empowering the board to prescribe the manner of crossing of two roads was passed when the first electric railroads made their appearance in this state and the companies operating electric lines have contended that the law was not intended to apply to them. The present decision was rendered in the case of the Chicago, Milwaukee & St. Paul Railway Co. vs. the Freeport General Electric Co. The latter company obtained a franchise for the extension of its line which carried it across the main track of the steam road. The latter objected to a grade crossing and asked the railroad commission to prescribe the manner of crossing. The electric railway company moved to dismiss the case for want of jurisdiction, but the commission overruled this motion and ordered the construction of an overhead crossing. The decision states that a railroad company organized for the purpose of transporting both passenger and freight is most certainly in the same line of business (that of common carrier) as any railroad company operated by steam power, and such a road within the meaning of the statute is a railroad. This opinion is construed as a declaration by the commission that electric railways as now commonly operated are railroads within the meaning of the statute creating the commission. If this view is sustained in the courts the commission will exercise the same general control over them as it does over steam roads.

The Freeport General Electric Co. will appeal the case so that ultimately the exact scope of the jurisdiction of the commission over electric railways will be defined by the Supreme Court.

The Ballston Terminal R. R., of Ballston Spa, N. Y., is said to have under consideration the construction of an electric line from Gloversville to Little Falls, where connections will be made with the Utica & Mohawk Valley lines.

The Brooklyn Rapid Transit Co., after a two-months' trial has discontinued its theater car service. Three parlor cars had been in commission to handle the crowds bound to and from Brooklyn theaters, a charge of 25 cents for a seat in the cars being made. The cars could not well be operated on schedule time, and as they were of course out of commission while performances were going on, the plan was abandoned as impracticable.

OPENING OF THE AKRON-RAVENNA LINE.

An extension of the lines of the Northern Ohio Traction Co. of Akron, O., to Ravenna which was commenced early last spring was completed on November 15th on which date the opening of the new line took place. The extension is about eight miles in length and connects Ravenna, a town of some 5,000 people, with Akron, and on the occasion of the opening of the road much enthusiasm was displayed by the citizens of the smaller town. A long car filled with the officials of the Northern Ohio Traction Co., and guests from Akron, Cuyahoga Falls and Ravenna glided into the latter town on the afternoon of Nov. 15th, accompanied by the roar of cannon and waving of flags. The car proceeded to the court house followed by a large part of the population of Ravenna where the Mayor and other citizens of that town received the Northern Ohio Traction Co. representatives and expressed their appreciation of the new line in a number of speeches. The accompanying illustration is from a photograph taken of the car and visiting party in

HYDRAULIC PLANT NEAR YORK, PA.

An extensive hydraulic plant is now in course of construction at York Haven, on the Susquehanna River, about 11 miles from York and 16 miles from Harrisburg. The object of this enterprise is to supply current to operate the street railway systems of York, Lancaster, Steelton and Harrisburg, all of which places are within a radius of 16 miles from the new plant. A new line, it is said, will be constructed from Cumberland to York, which will probably be the first portion of the system to be supplied with current from the new plant.

The York Haven Power & Water Co., which is building the hydraulic plant, will also furnish power for operating various industrial plants in the nearby towns as well as supplying them with current for lighting purposes. Maj. George B. Burbank, consulting engineer of the company, estimates that the falls will generate 25,000 h. p. The power house for this plant will be 478x51 ft. and will contain 40 turbine wheels of 600 h. p. capacity, 20 750-kw. alternating



GUESTS AT THE OPENING OF THE AKRON-RAVENNA LINE.

front of the Ravenna court house. Mr. Christy, vice-president of the railway company, and Mr. Currie, general manager, were among those who made addresses at the reception. They explained that the company would give a first class service between Akron and Ravenna and that 15 new cars had been ordered for this road. The service will be half-hourly throughout the greater part of the day.

TUNNEL ACCIDENT IN LIVERPOOL.

An unusual accident occurred in Liverpool, December 23rd, in which seven lives were lost on the overhead electric railway near Dingle station. A fuse which burned out set fire to a car just before the train entered the tunnel in which were stored stacks of creosoted railroad ties. These ties caught fire from the train and the tunnel was soon enveloped in flames, which were extinguished with the greatest difficulty. The accident occurred at six o'clock in the evening and the train had been crowded, but the majority of the passengers had alighted at the previous station.

Owing to the volumes of dense smoke which issued from the tunnel it was several hours before an entrance could be effected. Many passengers jumped from the burning train and ran out of the tunnel, while a great many were nearly suffocated by the smoke and were dragged out by their fellow passengers.

Messrs. Schoepf, Foraker and McGowan, of the Cincinnati Traction Co., recently spent two days in Chicago looking at the plans for the new building which the company will erect at Fifth and Walnut Sts., in Cincinnati.

The Chicago Union Traction Co. has 165 new cars under construction at its shops. One hundred are for summer service, and will be put in commission on the north and west side lines. The remaining 65 are to replace those recently burned in the Lincoln Ave. car house.

current generators and 2 turbines of 250 h. p. each will operate the exciters.

From this building to the falls there will extend a granite wall 3,500 ft. long and from 28 to 38 ft. high. This will enclose a race of 375 ft. in width and 16 ft. in depth connecting with the dam at the head of the falls. The foundations of the power house have been excavated in solid rock and the masonry work is well under way. The entire electrical equipment of this plant will be furnished by the Stanley Electric Co. and the turbines by Robert Poole Sons, Baltimore, Md. Mr. H. B. Montgomery is the general manager of the new plant.

The company is capitalized at \$3,000,000 and has issued \$1,500,000 of bonds. The officers are: President, Henry L. Carter; vice-president, W. F. Bay Stewart; treasurer, Henry W. Stokes, New York; secretary, William Mason, Philadelphia.

W. B. AUSTIN & CO.

The firm of W. B. Austin & Co., one of the leading electrical supply houses of Chicago will enter the street railway field, making a specialty of electrical wires and cables. Austin & Co. are western agents for the Holmes, Booth & Haydens Co. and the Safety Insulated Wire & Cable Co. which are among the largest wire makers in the country. Safety underground cables exclusively have been used by the North and West Chicago systems and the Chicago City Ry. has also been an extensive purchaser.

W. B. Austin & Co. has been in the general electrical supply business for eight years and now that more particular attention will be given to the new line, the firm may be expected to become an important factor in the street railway field. Mr. Austin, the senior partner, has been identified with electrical interests for 16 years.

The Saginaw (Mich.) Suburban Railway Co. has received a new franchise from the Mt. Morris village council.

FINANCIAL.

NORTHWESTERN ELEVATED RAILWAY CO.

The Northwestern Elevated Railroad Co., Chicago, shows passenger receipts for December 17.8 per cent greater than for the corresponding month of 1900. The yearly average for 1901 was 55,000 passengers carried daily, as compared with 47,594 in the seven months during which the road was operated in 1900. The following table gives the monthly traffic for the year 1901:

	Whole No. Passengers.	Daily Average.
January	1,612,677	52,022
February	1,547,218	55,256
March	1,772,004	57,193
April	1,758,702	58,023
May	1,760,900	56,900
June	1,607,707	53,574
July	1,505,316	48,559
August	1,542,889	49,770
September	1,621,050	54,065
October	1,830,366	59,014
November	1,795,710	58,875
December	1,954,611	63,375

Year 20,326,600 55,600

The comparison for the seven months during which the road was in operation in 1900 shows the following figures:

	1901.		1900.		Increase.	
	Whole No.	Daily Av.	Whole No.	Daily Av.	Daily Av.	Per Ct.
June	1,607,707	53,574	1,259,100	41,972	11,602	27.7
July	1,505,316	48,559	1,265,206	40,816	7,743	18.9
August	1,542,889	49,770	1,303,752	43,002	5,778	13.1
September	1,621,050	54,065	1,412,760	47,002	6,973	14.8
October	1,830,366	59,014	1,575,017	50,807	8,237	16.2
November	1,795,710	58,875	1,602,330	53,345	6,512	12.2
December	1,964,611	63,375	1,667,742	53,798	9,577	17.8

Seven mos. 11,968,540 55,928 10,196,645 47,648 8,279 17.3

It is estimated that its traffic for the year will give about \$1,050,000 gross earnings. Operating expenses, rental and taxes amount probably to \$575,000, leaving \$475,000 for bonds and stock. Applications for the company's new \$4,000,000 4 per cent bonds offered pro rata to the stockholders at 96 flat closed December 28th. The 5 per cent bonds are being paid off as rapidly as possible but a good many holders of these are reinvesting in the 4 per cent bonds which has made the demand for the latter strong. The original subscribers to the 5 per cent bonds bought them in February, 1900, at 99. They are now redeemed at 105, giving 6 per cent profit in two years, in addition to the 5 per cent interest, and the original holders have been able to secure the ten-year 4 per cent bonds at 96.

SOUTH SIDE ELEVATED RAILROAD CO.

The South Side Elevated Railroad Co., of Chicago, shows a gain of 8.6 per cent for the month of December over the corresponding month of 1900. With the single exception of August, every month of 1901 showed an increase over the corresponding month in 1900. The following table shows the traffic by months with a comparison with that of the previous year:

	1901.		1900.		Increase.	
	Whole No.	Daily Av.	Whole No.	Daily Av.	Daily Av.	Per Ct.
January	2,205,247	71,137	2,154,625	69,504	1,633	2.3
February	2,086,700	74,525	1,961,400	70,050	4,475	6.4
March	2,364,339	76,269	2,240,184	72,264	4,005	5.5
April	2,333,160	77,772	2,140,950	71,658	6,114	8.5
May	2,300,355	74,205	2,117,176	68,266	5,900	8.6
June	2,080,350	69,645	2,036,760	67,892	1,753	2.6
July	1,976,653	63,763	1,800,132	60,978	2,785	4.5
August	1,895,433	61,143	1,908,267	61,557	*414	..
September	2,038,810	67,627	1,951,800	65,062	2,565	3.9
October	2,264,922	73,062	2,133,466	68,821	4,241	6.2
November	2,303,280	76,776	2,161,710	72,057	4,719	6.5
December	2,481,891	80,061	2,285,351	73,722	6,339	8.6

Year 26,330,189 72,137 24,000,089 68,468 3,669 5.4

*Decrease.

The gross passenger receipts for the five years are as follows: (11 Mos.)

1901.	1900.	1899.	1898.	1897.
\$1,316,510	\$1,249,544	\$1,131,404	\$944,926	\$611,875

This shows an increase of \$66,066 over the receipts for 1900.

METROPOLITAN WEST SIDE ELEVATED RAILWAY CO.

The Metropolitan Elevated of Chicago made the largest gain in passenger traffic in December of any month in 1901, and also showed the largest business of any month in the history of the road. The average number of passengers carried daily exceeded 100,000. The following table gives the traffic by months with a comparison of 1901 and 1900:

	1901.		1900.		Increase.	
	Whole No.	Daily Av.	Whole No.	Daily Av.	Daily Av.	Per Ct.
January	2,780,669	89,699	2,756,136	88,585	1,114	1.2
February	2,734,445	97,659	2,593,304	92,618	5,036	5.4
March	3,048,500	98,338	2,929,748	94,508	3,830	4.1
April	2,900,551	97,018	2,712,900	90,430	6,588	7.3
May	2,860,732	92,572	2,674,928	86,288	6,284	7.3
June	2,585,370	86,179	2,466,180	82,206	3,973	4.8
July	2,458,548	79,308	2,247,490	73,790	5,518	7.5
August	2,518,936	81,256	2,432,167	78,457	2,799	3.6
September	2,646,780	88,226	2,460,000	82,000	6,226	7.6
October	2,976,620	96,020	2,690,367	86,786	9,234	10.6
November	2,920,110	97,337	2,694,660	89,822	7,515	8.3
December	3,123,870	100,770	2,793,100	90,100	10,670	11.8

Year 33,574,131 91,984 31,400,976 86,277 5,707 6.6

1901. 1900. 1899. 1898. 1897.
\$1,678,706 \$1,572,548 \$1,427,512 \$1,194,383 \$804,277

EVERETT-MOORE RAILWAY HOLDINGS.

The following statements were recently issued by the Everett-Moore syndicate showing the results of the operation of the company's roads for 11 months of 1901.

The Cleveland Electric Railway Co. has \$13,000,000 capital stock, operates 136 miles of track and shows gross earnings of \$2,088,012, leaving a surplus for stock of \$716,501.

The Cleveland, Painesville & Eastern Railway Co. has a capital stock of \$1,500,000, operates 41 miles of track and shows gross earnings of \$153,051, and a surplus for stock of \$6,172.

The Cleveland & Eastern Railway Co. has a capital stock of \$1,200,000, operates 45 miles of track and shows gross earnings of \$82,916.

The Cleveland & Chagrin Falls Electric Railway Co. has a capital stock of \$300,000, operates 15 miles of track and shows gross earnings of \$43,670, with surplus for stock of \$1,445.

The Detroit United Ry. has a capital stock of \$12,500,000, and operates 356 miles of track. Its gross earnings were \$2,647,730 and its surplus for stock \$613,873.

The Detroit Port Huron Shore Line Ry. has a capital stock of \$2,000,000 and 89 miles of track. Its gross earnings were \$355,195 and surplus for stock, \$42,980.

The London (Ont.) Street Railway Co. has a capital stock of \$400,000, operates 28 miles of track and had gross earnings of \$128,808, and surplus for stock of \$28,645.

The Northern Ohio Traction Co. is a consolidation of the street railway lines in Akron with suburban lines to Ravenna, Kent, Barberton, Cuyahoga Falls, Bedford and Cleveland. It is capitalized at \$3,500,000, operates 89 miles of track and showed gross earnings of \$563,625, and surplus for stock of \$74,914.

The Toledo Railways & Light Co. has a capital stock of \$12,000,000, 110 miles of track and gross earnings of \$1,184,706 with a surplus for stock of \$294,575.

In the reports mentioned above the Cleveland & Eastern Railway Co. is the only one which showed no surplus for stock. The nine companies embrace a little over 900 miles of track with \$46,400,000 of capital stock.

MASSACHUSETTS ELECTRIC COMPANIES.

The second annual report of the Massachusetts Electric Companies covering the operations for the year ending Sept. 30, 1901, has been published. The organization of this corporation, which con-

trols ten companies operating street railways in the vicinity of Boston, was fully described in the "Review" for May, 1901, page 207. The corporation controls 819½ miles of track in 22 cities and 66 towns, having an aggregate population of 1,000,000 people outside of Boston. The total stock of the underlying companies amounts to 134,622 shares and of this number 134,077 are in the possession of the trustees. The gross earnings from operation for the year amounted to \$5,778,134 and the operating expenses were \$3,915,485, leaving net earnings of \$1,862,647. The fixed charges were \$937,206 and dividends \$779,462, leaving a surplus for the year of \$145,979. The companies' total surplus is \$466,286. The organization has \$15,857,400 preferred and \$12,293,100 common stock.

During the year the trustees were authorized to issue 4½ per cent notes for five years, amounting to \$3,500,000, the proceeds of which were used for the acquisition of more stock; \$2,700,000 of this amount was issued. The sum of \$1,339,436 has been expended for improvements and reconstruction during the last year. A large amount of construction work has been in progress during the last two years, but this is now practically completed and its cost has been charged against the surplus account. The incomes of the operating companies show an increase of nearly 5 per cent in the gross earnings and nearly 7 per cent in the net divisible income for the year.

SYRACUSE RAPID TRANSIT RAILWAY CO.

The increase in the amount of business done by the Syracuse Rapid Transit Railway Co. in 1901 over that of the previous year has been creditable. The gross earnings for the year 1901 were \$662,868, and for the year 1900 they were \$590,032, making an increase of \$72,836. The following table shows comparative figures of the number of people carried for the last four fiscal years.

	1898.	1899.	1900.	1901.
Revenue passengers carried	9,220,110	10,226,125	11,253,876	12,608,372
Transfer passengers carried		1,076,386	2,448,297	2,735,278
Car miles run	2,942,242	2,756,023	3,303,126	3,409,411

MARKET STREET RAILWAY CO

The purchase of the Market Street Railway Co. by an eastern syndicate concludes negotiations which have been in progress for about a year. The first road to be absorbed by this syndicate was the San Francisco & San Mateo line, which was purchased early in the year for approximately \$1,300,000. The Sutter Street and the Sutro lines were next purchased for about \$2,000,000. The most important step in the negotiations, however, was the purchase of the Market Street system with its branches running all through the heart of San Francisco and reaching the outskirts in all directions. This road is capitalized at \$18,617,000 and the syndicate has purchased three quarters of the stock for which it paid \$14,000,000 at par.

Improvements are to be made which will cost in the neighborhood of \$4,000,000, so that the syndicate's entire investment in California will reach the sum of \$21,000,000. The total mileage of the railroads acquired is 238.

Among the improvements contemplated by the company is the extension of the San Mateo line as far as San Jose. Electricity is to be substituted for the Market St. cable if the necessary consent can be secured from the city authorities. On the lines where steep grades occur the cars will be equipped for both electrical and cable propulsion.

NEW ORLEANS STREET RAILROAD CO

The statement was given out by Mr. H. H. Pearson, of the Pearson syndicate of Philadelphia, that 50,000 out of the 75,000 shares of common stock of the New Orleans Street Railroad Co. had been secured by the syndicate and that a lease of the road would be taken by January 15th. A pool of common stock was formed in the latter part of 1899 and a committee appointed by the stockholders with full authority to conclude negotiations with the Pearson syndicate. The stockholders forming the pool authorized the committee to sell the stock in the pool for \$35 per share cash or to agree to a lease or other plan by which the stock should be guaranteed as follows: \$2 per share until July 1, 1905, the first

semi-annual payment to be July 1st, 1902, for the period beginning Apr. 1, 1902, and thereafter semi-annually on January 1st and July 1st; \$2.50 per share from July 1, 1905, to July 1, 1907; \$3.00 per share from July 1, 1907, until the expiration of the existing charter of the company; the person or persons so guaranteeing, to have the right of purchase of the stock at any time at \$35 per share.

While no details of the lease have been made public, it was probably based upon the lines laid down by the committee of stockholders.

CONSOLIDATED TRACTION CO.

The following comparative statement for the months ending Nov. 30, 1900-01, has been issued by the Consolidated Traction Co. of Pittsburg, Pa.:

	1901.	1900.
Gross earnings from operations	\$266,839.09	\$235,545.40
Operating expenses	126,214.87	106,588.47
Net earnings from operations	140,624.22	128,956.93
Total net earnings and other income	170,372.40	156,951.81
Total deductions	62,648.79	63,049.55
Total income	107,723.70	93,902.26
Fixed charges	86,143.33	86,475.82
Net income	21,580.37	7,426.44

MILWAUKEE ELECTRIC RAILWAY & LIGHT CO.

The statement of the business done by the Milwaukee Electric Railway & Light Co. and the Milwaukee Light, Heat & Traction Co., which is controlled by the former for the year ending December 6th shows the gross cash receipts of the Milwaukee Electric Railway & Light Co. to be \$2,388,524 and the gross cash receipts of the Milwaukee Light, Heat & Traction Co. to be \$321,335. The increase in the earnings of the two companies over the previous year amounts to \$226,681.

FOND DU LAC ELECTRIC LIGHT & RAILWAY CO.

The report of the Fond du Lac Electric Light & Railway Co. for the year 1901 shows gross earnings of \$69,285, of which \$34,627 are for the street railway. The company operates about five miles of railroad in the city of Fond du Lac and the license fee paid to the city is 2 per cent or \$602.

WINNEBAGO TRACTION CO.

The Winnebago Traction Co., of Oshkosh, Wis., has filed its annual report of gross receipts for the year ending Dec. 5, 1901. The total receipts for that year are \$93,357, and show a marked gain over those of the year previous, the amount for the year 1900 being \$88,859. These figures include the receipts on both the urban and interurban lines. The license fee to be paid by the company this year in lieu of the taxes is \$1,876 as against \$1,777 paid for 1900.

ST. LOUIS TRANSIT CO.

The gross earnings of the St. Louis Transit Co. for month of November, 1901, and for the 11 months of the year, taken in comparison with the corresponding periods of last year, show a steady increase and an estimated total of over \$1,500,000 for the past year is indicated. The first 11 months of last year show earnings of \$5,322,793 against \$4,001,928 in 1900. The earnings for November, 1901, were \$479,399 as against \$436,762 last year. Comparisons of the different months of 1900 and 1901 show a steady increase of earnings throughout the year.

The United Traction Co., of Albany, N. Y., for the four weeks ending December 28th reports the following: Receipts from operation, \$100,089; for the corresponding period in 1900, \$104,351. This shows a gain of \$4,737 for that period. It made a gain of \$3,321 on the Albany division, and \$1,413 on the Troy division.

The Schuylkill Traction Co. reports gross earnings for November of \$11,382, an increase of \$3,666 over November, 1900. For the 12 months, from November 30, 1900, to Nov. 30, 1901, the gross receipts reached \$141,677. From May to November, 1901, the

gross receipts showed an increase of \$16,351 over the corresponding period of 1900.

The Madison Electric Railway Co., of Madison, Wis., reports gross receipts for the year ending Dec. 1, 1901, to be \$68,593. The receipts for the previous year were \$60,780 and for 1899 \$52,657. These figures show an annual increase in receipts of about \$8,000 per year for the last three years.

The Newport News & Old Point Railway & Electric Co. reports for the eight months from March 1st to Oct. 31, 1901, as follows: Gross earnings, \$470,034; operating expenses, \$308,131; net earnings, \$161,903; fixed charges, \$108,228; surplus, \$52,674.

The Boston Elevated Railway Co., according to its last annual report, carried during the year 1901, 213,703,983 passengers, which was an increase over the year 1900 of 12,579,273.

TROLLEY SPRINKLER AT COLORADO SPRINGS.

The Colorado Springs & Suburban Railway Co. on December 1st began using a new sprinkling car in Colorado Springs. In general appearance it is similar to the usual street car, the exterior being finished in the company's standard colors, and when not sprinkling it is not particularly noticeable except that shutter windows are used instead of glass. There is a full glass vestibule at each end of the car in which the motorman operates. The car body is mounted on a single truck which is equipped with two G. E. motors of 60 h. p. capacity each. A steel tank of 2,600 gallons capacity is enclosed in the car, leaving a passageway on each side between the tank and the car side. The spray is delivered from two sprinkling heads located on either side of the car in the center of its length. The water is forced from these heads by two force pumps run by a 30 h. p. motor located at one end of the car. The amount of water thrown as well as the width of the spray is regulated by levers at either end of the car. An emergency brake is also supplied for quick work in passing a moving vehicle or running at high speed. The sprinkling apparatus as well as the car can be operated from either end. A third sprinkling head is located in front of the truck beneath the car for flushing the space between the tracks.

PRESIDENT WINTER AS A PHILANTHROPIST.

The Grand Rapids, Holland & Lake Michigan Rapid Railway has for some time had considerable trouble in the city of Holland owing to having a hostile council to deal with. The council has been threatening the life of the company with unnecessary restrictions and refusing grants which were essential to the company's continuing in business. Recently Mr. Winter, president of the company, appeared before the council and offered to give the city of Holland the street railway line provided the city would operate it for two years. Just as the aldermen were about to accept the gift, Mr. Winter stated that the company had lost \$40,000 in operating expenses in the past two years. The gift was immediately declined and the franchises for which the company asked were at once granted. The company is now only required to pave between its rails and has the privilege of hauling freight over the city almost as it pleases. President Winter is now considered a philanthropist in Holland.

Owing to the scarcity of coal, the Dayton (O.), Springfield & Urbana Electric Railway Co. was put to the necessity of burning wood in its Glen Echoe power house; and on the night of December 20th the interurban service was temporarily suspended.

The parties interested in the building of the Columbus, Delaware & Northern Ry. and the Columbus, Delaware & Marion Ry. recently held a meeting at which the two projects were consolidated, thus avoiding the building of two rival lines between Columbus and Delaware. The new company which is to be formed to operate this road will have the same members as the two old companies and their holdings in the new company will be proportional to the investment made by them in the two old roads.

PERMANENT ARBITRATION BOARD FOR LABOR DISPUTES.

A number of conferences have been recently held between representatives of capital and labor under the auspices of the National Civic Federation in New York City, and as a result of these deliberations a permanent committee has been appointed consisting of representatives of organized labor, of the general public and of organized capital. The motion for the appointment of this committee was made by Mr. F. P. Sargent, grand master of the Brotherhood of Locomotive Firemen and was seconded by Senator Marcus A. Hanna. A committee of 37 men was subsequently appointed which contains the following names:

ON BEHALF OF THE PUBLIC

Grover Cleveland.
Cornelius N. Bliss.
Charles Francis Adams.
Archbishop John Ireland.
Bishop Henry C. Potter.
Charles W. Eliot, President Harvard University.
Franklin MacVeagh, Chicago.
James H. Eckels.
John J. McCook.
John G. Milburn, Buffalo.
Charles J. Bonaparte, Baltimore.
Oscar S. Straus.
Ralph M. Easley.

REPRESENTATIVES OF ORGANIZED LABOR.

Samuel Gompers, president of the American Federation of Labor.
John Mitchell, president of the United Mine Workers.
F. P. Sargent, grand master of the Brotherhood of Locomotive Firemen.
T. J. Shaffer, president of the Amalgamated Association of Iron, Steel and Tin Workers.
James Duncan, secretary of the Granite Cutters' Association.
Daniel J. Keefe, president of the International Association of Longshoremen.
Martin Fox, president of the National Iron Moulders' Union.
James E. Lynch, president of the International Typographical Union.
Edward E. Clarke, grand conductor, Brotherhood of Railway Conductors.
Henry White, secretary of the Garment Workers of America.
Walter MacArthur, editor of The Coast Seaman's Journal, San Francisco.
James O'Connell, president of the International Association of Machinists.

REPRESENTATIVE EMPLOYERS.

Senator Marcus A. Hanna, Cleveland.
Charles M. Schwab, president United States Steel Corporation.
S. R. Callaway, American Locomotive Works.
Charles Moore, president National Tool Company.
J. D. Rockefeller, jr.
H. H. Vreeland, Metropolitan Street Railway Co.
Lewis Nixon, Crescent Shipyard, Elizabethport, N. J.
James A. Chambers, president American Glass Co., Pittsburg, Pa.
William H. Pfahler, president National Association Stove Manufacturers, Philadelphia, Pa.
E. P. Ripley, president Atchison, Topeka & Santa Fe Ry.
Marcus M. Marks, president National Association Clothing Manufacturers.
J. Kruttschnitt, president of Southern Pacific Railway Co.

The general sentiment was that a way out of the labor difficulties could be found by amicable discussions of the questions at issue between employers and employes. It was also thought that these ends could best be served by a standing committee on which both sides should be represented. A number of speeches by representatives of labor and others were made and the hope was unanimously expressed that hereafter labor troubles might be settled by peaceable means and without resort to strikes and their attending violence.

HALF FARES.

The Pottsville (Pa.) Union Traction Co. has notified its employes that hereafter none of them will be allowed to hold municipal offices.

The Indiana Railway Co. has financed its project and will soon begin the construction of the proposed electric railway from South Bend to St. Joseph, Mich.

W. R. Todd & Co., of Cincinnati, are organizing a company of local capitalists for the purpose of buying the Everett-Moore holdings in the Detroit United Ry.

It was announced December 21st that the Berlin Electric Elevated Ry., the first of its kind on the continent of Europe, would soon be opened for general traffic.

Rapid progress is being made in the construction of the electric line between Augusta, Ga., and Aiken. An extensive power plant is in course of erection at Clearwater.

An attempt to boycott the interurban line between St. Joseph, Mich., and Benton Harbor was recently made by employes of St. Joseph factories who reside in Benton Harbor.

The Union Traction Co. of Indiana is about to extend its freight and express service on interurban lines. A number of cars for this service are being built and will soon be put in commission.

The Toledo, Fostoria & Findlay Electric Railway Co. has leased its right of way for a quarter of a mile through the richest oil territory in Ohio to J. W. Kirkbride, a prominent oil producer.

New Year's day established a record in the history of the Montreal Street Railway Co., the number of fares collected being more than 125,000. Seventy-one special cars were put in service.

The Northern Texas Traction Co., which has nearly completed an electric line between Fort Worth and Dallas, received 15 new cars, on December 14th, for use on the urban lines in Fort Worth.

A third-rail electric line has been put in operation in Paris. The road connects the new station of the Invalides and the Normandy and Brittany lines of the Chemin de Fer de l'Ouest. The power is generated at Issy.

The Compressed Air Co., of New York, has closed a contract to equip the Minneapolis & Amoka Ry. with compressed air cars. The equipment includes a compressing plant and eight motor cars similar to those used by the Rome (N. Y.) Street Railway Co.

The Cleveland Electric Railway Co. has requested a number of leading factories and stores to dismiss their employes in blocks of from 50 to 100 every evening, instead of letting them all out at once, in order to obviate the over-crowding of cars during rush hours.

The Boston Christian Endeavor Society has decided to use street advertising space for putting cheering words from the Scriptures before the eyes of the public. It is proposed to make a trial of a few street cars for displaying texts at first and later to extend the system.

An electric railway in Plattsmouth, Neb., is proposed by a company of which J. F. Riley is at the head. The plans include interurban lines to Weeping Water, Louisville and Nebraska City, and are reported to be contingent upon the success of the Platte River canal project.

The promoters of the proposed electric line from Gorham, N. H., to Berlin, have awarded the contract for construction to H. I. Coe of Berlin. Mr. Coe has placed orders for a 200-kw. generator, 20,000 lbs. and eight miles of rails. The car house will be located at Gorham.

Cars are now running over the greater part of the new road between Toledo, O., and Adrian, Mich., and it is expected to have the entire line in operation in the spring. The traffic, both passenger and freight, is large. Mr. A. P. Southworth is superintendent of the company.

The striking employes of the Sattley Manufacturing Co., Springfield, Ill., on the evening of January 3d attempted to wreck a street car which contained 35 substitutes from the Sattley works. Dynamite was used and the car was badly damaged, the passengers, however, fortunately escaping injury.

The Lake Shore Electric Railway Co. ran the first car over the newly completed line between Lorain, O., and Vermilion, on December 9th. The party making the initial trip included F. W. Coen, R. E. Danforth, G. A. Resek, W. H. Stout, E. S. Smith, Thomas Mackall and Thomas Wood.

The new extension of the Metropolitan underground road at Paris will be retarded owing to a difficulty encountered in tunneling under the catacombs from the Etoile to the Place du Rhone. The tunnel will necessarily be built much lower than at first projected, in order to secure a firm roofing.

The Hartford (Conn.) & Springfield Street Railway Co. celebrated the official opening of its road for through service between Hartford and Springfield with appropriate exercises on January 13th. Cards of invitation were issued, and special cars were provided for the accommodation of the company's guests.

The construction of a third track for the Lake Street Elevated, Chicago, was begun December 2d. The third track construction is for an express service from 52d Ave. station to the heart of the city. There will be scarcely any modification of the structure necessary as the third track was arranged for from the beginning.

The Citizens' Land Co., of Pine Bluff, Ark., has been incorporated by members of the local street railway company, and proposes to improve a tract of 60 acres near the city as a suburban park, containing race track and summer theater. An extension of the street car line to the park site will be opened for traffic before February.

A Baltimore syndicate which has recently purchased the Market Street Ry., of San Francisco, proposes to construct a large gymnasium fully equipped with every form of modern apparatus for the use of its employes. A library, billiard hall and a large reading and lounging room are included in the employes' headquarters.

Lima Center, a hamlet in Michigan on the route of the Hawks-Angus electric line from Jackson to Ann Arbor, enjoys the distinction of having been moved, church, school house and all, to make way for the interurban. The buildings were safely deposited a few yards distant from their former sites in order that the road might be constructed without making a curve.

The Pittsburg, McKeesport & Connellsville Railway Co. expects to have its entire system of 130 miles in operation by April 1st. Twenty-five new cars will soon be put in commission on the lines between Fairchance, Masontown and Duquesne. It is proposed to locate a number of pleasure resorts along the route, and the principal of these will be Olympia Park, near Versailles borough.

The Utica (N. Y.) & Mohawk Valley Railroad Co., which has been organized with a capital of \$3,500,000 to control a 37-mile system of electric railways extending from Rome to Little Falls, has under consideration the election of the following officers: Horace E. Andrews, president; John J. Stanley, vice president and general manager, and George H. Radcliffe, general superintendent.

The London press has lately given much space to the alleged superiority of the Briton over men of other nations in point of chivalry toward women, as evidenced especially in their deportment on street cars. In this connection the recent appeal to the

county council to establish a street car service for women only. In London, is funny, as the applicants claim that, during rush hours, a woman has little chance of getting a seat on London cars.

SIGNALING CAR WITH LIGHTED MATCH.

The Kansas City-Leavenworth Railroad Co., operating an inter-urban electric road between Kansas City and Leavenworth, Kan., at one time received numerous complaints from its patrons that cars did not stop when signalled, especially at night. The road passes through many lonely and sparsely settled districts and the cars frequently run at speeds approaching 50 miles an hour. Upon investigation it was determined that the complaints were well founded, but the trouble was discovered to be not due to the negligence of the motormen, but to the difficulty of seeing intending passengers in time to stop the car when running at these high speeds.

As a solution the manager hit upon the scheme of instructing the public to use a lighted match or piece of paper as a signal at night. At first thought this idea would seem to be impracticable owing to



the winds and the smallness of the light, but the manager, Mr. Herbert W. Wolcott, advises us that the scheme is working to the entire satisfaction of the public and the company. He states that while riding on the front platform at night he has seen a lighted match held at a distance of 1,500 ft. in front of the car, and the light from a match or small piece of paper is frequently visible at a distance of half a mile.

On all its folders and time tables the company now shows the cut that is reproduced herewith, with the following inscription underneath: "Parties desiring to take a car are requested to signal the motorman when he is at a distance of 5 or 10 pole lengths so that the car can be easily stopped. At night a lighted match should be used. When the signal is seen the motorman will indicate the fact by two short blasts of the whistle."

THOMSON ELECTRICAL COMPANY.

Mr. D. Thomson, who for the past 16 years has been identified with the management of street railways in the western states and in Canada, has organized the Thomson Electrical Co. to handle electrical supplies and to finance and build complete railway, light and power plants. General offices have been opened in suite 631-632 Manhattan Building, Chicago, and the business experience of the new company thus far indicates a pronounced success.

In addition to the business of promoting street railways, the

Thomson company will make a specialty of handling the Thomson incandescent lamp and the Thomson friction tape. It is also agent for the Piqua trolley car, the Gore track drilling machine, the Burnham track drill, and the Lincoln Electric Co. and the Tripartite Steel Pole Co.

Mr. Thomson, president and manager of the company, is a native of Philadelphia, and began his career in the electrical field in 1886 as manager of one of the departments of the Royal Electric Co., of Montreal, Que. After remaining with the Royal company for nearly seven years, Mr. Thomson severed his connection to become manager of the Hamilton Light & Power Co., of Hamilton, Ont. Later, he was assistant manager of the Ithaca (N. Y.) Street Railway & Light Co., a position which he resigned after three years to become president and manager of the Hannibal (Mo.) Railway Co. Before removing to Chicago, Mr. Thomson was for one year manager of the Dubuque (Ia.) Street Railway Co. He is a brother of Prof. Elihu Thomson of the old Thomson-Houston Company, and is well known to street railway men throughout the United States and Canada.

NEW TRUCK COMPANY FOR TROY.

It has just been announced that the Powell & Turner Truck Co. is to establish a factory at Troy, N. Y., for the production of trucks for the use of electric street railways. The truck which is to be made by this company has been tested on the street railways of Troy and was pronounced highly satisfactory by a number of railroad men and capitalists who watched the results of the tests. The company has recently placed a sufficient amount of its stock to warrant the immediate commencement of manufacturing operations, and a meeting of the stockholders is to be called in a few days at which officers will be elected and the committee on site and manufacture will make its report.

TANGENTIAL TRACTION.

A translation of an article from the Madrid Mining Review on a so-called new and ingenious system of electric traction has been transmitted by Consul Ridgely of Malaga. The translation of the description of this system credits this invention to Messrs. Dulant, Rosenfeld and Zelenay and also states that it is a clear and precise resumé of the system. As far as we have been able to understand the subject, however, the scheme seems to be one of the wildest ones which has ever been foisted upon the public. Quoting from the circular we find that "tangential traction is based upon the application of polyphasic alternating currents and the most characteristic feature lies in the complete absence of a rotating motor in the carriage and in the absence of obstacles to currents between the vehicle and the source of electric energy."

The circular then goes on to explain that in a polyphase motor there is no electrical connection between the rotor and stator. "If we develop upon a plane the inductor of such a motor and suspend above the apparatus inducted by it, and similarly developed, the rotary movement is transformed into rectilinear motion." The invention consists therefore in fixing between the developed stator and suspending beneath the vehicle the developed rotor. And having thus expounded the principle of the new system the article proceeds to meet the objections which it is admitted immediately present themselves to the mind. The distance between the rotor and stator, which must evidently be very largely increased in this system above that usually allowed in practice, has been overcome by a new arrangement which is not described but which it is stated makes a considerable reduction in the copper to be employed. The expense of laying down a stator over the whole length of the road is also considered and has been overcome by another invention not described. It is called, however, a discontinuous stator and is said to render the application of the system economical. The description states that it will be sufficient to furnish the line with stators "at about every fifth of its length." It is not stated whether or not the car is supposed to coast over the other four-fifths of the road.

The remainder of the circular is devoted to a number of other equally lucid explanations, but we think this description of tangential traction will be sufficient to give a fair estimate of the value of this invention.

ECHOES FROM THE TRADE

THE HAZARD MANUFACTURING CO., of New York City, received an order last month for all of the galvanized steel rigging to be used on the German Emperor William's yacht, which is being rigged by Flynn & White, of New York City.

THE WHEEL TRUING BRAKE SHOE CO., of Detroit, Mich., is mailing a postal advertisement which is to be commended for a number of novel and striking features. The whole story of flat wheels and their remedy is told in an ingenious illustration.

THE OHMER CAR REGISTER CO., of Dayton, O., is now installing its equipment upon 135 cars of the Union Traction Co. of Indiana, a fact which will undoubtedly be of interest to many companies, which might have had the idea that Ohmer registers are not adaptable for large systems.

THE HEIL RAIL JOINT WELDING CO., of Milwaukee, has recently completed an addition to its plant which more than doubles the capacity of the works. The company has the welding of a large mileage under contract and designed a new joint particularly adapted for interurban roads.

THE BURT MANUFACTURING CO., of Akron, Ohio, announces recent orders for very large "Cross" oil filters from the Government Printing Office at Washington, from McIntosh, Seymour & Co., Auburn, N. Y., and from the De Beere Consolidated Mining Co., Ltd., Kimberley, South Africa.

THE JOHN STEPHENSON CO., Elizabeth, N. J., has received a new order for 100 additional cars from the Brooklyn Rapid Transit Co. The Stephenson company is making several changes at its works and is putting in a new building to be used as a restaurant for the employes and officers of the company.

THE ARNOLD POWER STATION CO., of Chicago, last month elected the following officers: President, B. J. Arnold; vice-president, W. L. Arnold; secretary and treasurer, R. G. Arnold. The board of directors have appointed W. L. Arnold general manager and George A. Damon managing engineer.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has recently issued its Circular Index No. 4 giving a list of the circulars now in force, Circular No. 1028 on "Rotary Converters" a revision superseding the edition of July, 1901, and Circular No. 1058 on "Westinghouse No. 76 Railway Motor."

THE IRONSIDES CO., of Columbus, O., purveyors of wire rope fillers and shields, boiler scale solvents and cylinder and engine oils, is presenting its patrons and friends with a souvenir matchbox of appropriate and striking design. One side bears a colored reproduction of an iron clad bark on the port tack.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has issued its bulletin No. 68, describing the application of storage batteries to railway plants and the operation of the "Chloride" accumulator by the Hamilton (Ont.) Electric Light & Cataract Power Co. The bulletin is well illustrated with half tones and diagrams.

THE FRANK RIDLON CO., of Boston, is enjoying a very heavy business for this time of the year. The demand for the Ridlon specialties continues to increase, as the facilities of this company for filling orders, coupled with the good serviceable qualities of the products which it handles, makes this a very satisfactory route to do business with. The new bearing babbiting device brought out by the Ridlon company and described in the "Review" for last November, page 857 is evidently something for which managers have been looking as inquiries and orders have

come in from parts of the country as far away as Texas and California, and although the machine has been on the market but a few months several companies have already filed duplicate orders.

THE B. F. STURTEVANT CO., of Boston, Mass., has issued a small catalogue describing the Sturtevant forges which are the natural outgrowth of the manufacture of the well known Sturtevant blowers. The company is prepared to take contracts for the complete equipments of blacksmith shops and will forward its large catalog on forges upon application.

"GRAPHITE," the monthly publication of the Joseph Dixon Crucible Co., Jersey City, N. J., in the interest of Dixon's graphite productions, contains for January four pages of wit, wisdom and pictures. The company announces through this medium that it has begun the erection of extensions of its factories. The new buildings will cover an area of 100 x 200 ft.

THE CENTRAL ELECTRIC CO., of Chicago, is distributing a new bulletin on D. & W. telephone protectors. This protector which embodies all the necessary elements of such a device combines a high tension fuse, a zinc cell, and a lightning arrester, all arranged on one block, making an instrument of neat and compact design. A descriptive bulletin of the material will be sent free to anyone upon application.

THE G. C. KUHLMAN CAR CO. is dismantling its old plant and is rapidly completing the equipment of the new works. By finishing the cars now in hand at the old shops and commencing all new work at the new plant the company will be able to make the change with practically no interruption. The company is to be congratulated on the rapid progress made with its new shops, which were only commenced in September last.

THE GENERAL ELECTRIC CO. has issued: Bulletin No. 4207, "Low Energy Arc Lamps." Bulletin No. 4268, "Brush Arc Generator." Bulletin No. 4269, "Direct Driven Revolving Field Alternators for Electric Lighting." Bulletin No. 4270, "Type C R Feeder regulators." Flyer No. 2087, "Double Push Button Flush Pocket Switch." Flyer No. 2088, "Enclosing Globe Breakage." Flyer No. 2089, "Flexible Insulating Couplings."

THE KNELL AIR BRAKE CO., of Battle Creek, Mich., is out with its 1901-2 catalog describing its latest models of axle driven compressors and air brake parts. Considerable space is devoted to "Style B" axle driven compressor, which is a new form recently placed upon the market in response to the demand for a light, simple and efficient air brake for use on cars mounted on maximum traction trucks. This compressor was described in the "Review Daily," for Oct. 10, 1901, page 686.

THE STERLING-MEAKER CO. reports a number of good orders for the Sterling double register, which is a neat looking piece of mechanism and is earning an excellent reputation in service. The Meaker "94" which has long been used by some of the largest roads, also has an active sale. It is but 9 in. square and the figures, both trip register and totalizer are an inch high; a new "back" has been lately designed, fitting it for either rod or cord ringing, and the "in" and "out" signs have been put into the face, both changes being considered marked improvements. The Sterling-Meaker Co. also makes three other types of registers, the Sterling safety brake, the Sterling sand box, and the Sterling fender.

THE CREAGHEAD ENGINEERING CO., of Cincinnati, O., advises us that it has recently been awarded the contract for reconstructing and extending the Camden Interstate Railway Co. of Ironton, O. The extension will give this road a total length of

nine miles. The Creaghead company is also at present constructing an interurban road between Parkersburg, W. Va., and Marietta, O., a distance of 13 miles. The overhead construction of this line includes No. 0000 round trolley wire and 10 ft. flexible Creaghead brackets.

B. F. STURTEVANT CO., Boston, Mass., has issued its catalog No. 114, describing Sturtevant dry kilns and steam hot blast apparatus with various attachments. The progress made by the Sturtevant company since 1860 in adapting hot blast drying to practically all classes of material and the perfection and enlargement of its apparatus are described. The catalog contains 86 pages and is well illustrated.

THE BULLOCK ELECTRIC MANUFACTURING CO., of Cincinnati, and the Wagner Electric Manufacturing Co., of St. Louis, on January 1st established a foreign sales department with headquarters at Cincinnati. Hereafter all foreign business, except in Mexico and Canada, for the two companies will be handled by this new department which will be under the management of Frank G. Bolles. The work of the advance department will continue under the direction of Mr. Bolles, under whose charge it has been for the past three years.

THE AMERICAN BRAKE SHOE CO. has issued a bronze medal recording the fact that the company has received the highest awards for brake shoes made under its patents at Chicago in 1884, at Chicago in 1893 and at Paris in 1900. On the obverse are reproductions of the three medals received at the expositions, and on the reverse are the names of the licensees of the American Brake Shoe Co., the Sargent Co., the Ramapo Foundry Co., the American Steel Casting Co., Ross, Meehan Foundry Co., Parker & Topping, Eureka Foundry Co.

THE C. W. HUNT CO., of West New Brighton, New York City, is sending out a series of special catalogs covering the distinctive features of its coal and ash handling machinery and industrial railways. The subjects treated recently include steam hoisting engines, electric hoists, electric locomotives and coal conveyors. Pamphlet No. 111 is of special interest to street railway engineers, as it describes in detail the apparatus employed at the Lincoln power station of the Boston Elevated Ry., for handling coal from the ship to the furnace.

THE W. T. VAN DORN CO. reports 1901 as its banner year. During the year the company received an order for equipping 1,450 cars of the Manhattan Ry., New York, with the Van Dorn automatic draw bar with complete draft rigging and the delivery of this order is almost completed. Other orders are on hand which will keep the company's plant running at its full capacity for the next three months. This work includes several orders from foreign countries. The Van Dorn couplers are now in use on all of the elevated roads in this country.

SHERBURNE & CO., of 53 Oliver St., Boston, Mass., report an excellent business record for 1901. This company handles construction tools, rail benders, hand cars, track drills and a full line of supplies needed in the building of steam and electric railroads. Mr. Frank O. Nourse, the energetic selling representative of Sherburne & Co., states that Sherburne tools have been used in constructing many of the prominent roads of New England. The company's voluminous catalog lists over 800 separate items which can be supplied at short notice.

THE CROCKER-WHEELER CO., of Ampere, N. J., reports that the past year has been a most prosperous one; the company reports a record-breaking midwinter business, and finds it difficult to keep the production up to the demand. Among recent shipments are: Two 400-kw. generators to the Vandergrift Construction Co.; one 300-kw. generator to Stetson & Co., Philadelphia; one 150-kw. generator to the D'Olier Engineering Co., West Camp, N. Y., and one 40-kw. generator and 28 motors to the Smith-Brooks Publishing Co., Denver. The United States Tube Co., of Buffalo, has been supplied with a motor equipment, and the electrical equipment of the Con. P. Curran Printing establishment

in St. Louis, Mo., which takes the place of line shafting, has been completed. Orders for a large number of motors have been received from Armour & Co., the American Bridge Co. and the Marion Steam Shovel Co. An order for a 30 kw. special generator has been received from the Sultan of Linga. The machine is to be installed in the royal palace, which is on an island near Singapore.

THE LUDLOW SUPPLY CO., of Cleveland, advises that Mr. W. E. Ludlow, who has been manager of the railroad department of The Chisholm & Moore Mfg. Co., of Cleveland, severed his connection with that company on January 1st, and will be actively connected with The Ludlow Supply Co. as president and treasurer. The later company, however, will act as general sales agents for The Chisholm & Moore Mfg. Co. for its railroad specialties, which consist of rail joints, rail braces, rail chairs, chain hoists, cranes, etc. Col. Ludlow will be able to assist materially in making The Ludlow Supply Co. the success that its position as the only street railway supply house in Cleveland would warrant. This company has secured the agency for the "Wilson" trolley catcher from the Frank Ridlon Co., Boston, which is one of the best known devices of its kind on the market, and it has also secured the agency for the Gore track drill, which is one of the fastest drills known, having, in actual construction work, been known to drill 24 holes an hour, through a 5/8-in. web in steel rails, including the moving and placing of the drill.

RAILROAD COMMISSIONERS' CONVENTION.

At the San Francisco convention of the National Association of Railroad Commissioners, held in June, 1901, the Street Railway Accountants' Association was elected to honorary membership to be represented at the meeting by a committee of the members. The next meeting of the Railroad Commissioners' Association will be held at Charleston, S. C., Feb. 11, 1902, and the Street Railway Accountants' Association will be represented at this meeting by Messrs. H. C. Mackay, W. F. Ham and C. N. Duffy.

The Railroad Commissioners have appointed Judge Lavant M. Reed, of Bellows Falls, Vt., Ashley W. Cole, of Albany, N. Y., and George W. Bishop, of Newtonville, Mass., to co-operate with H. L. Wilson, Boston, Elmer M. White, Hartford, and W. F. Ham, Washington, of the Accountants' Association, in the preparation of a standard form of report for electric railways.

A meeting of this joint committee was held in New York on January 10th and it will report at the convention.

The Erie R. R. projects equipping its line between Dunkirk and Salamanca, N. Y., at present operated by steam, for electric traction.

The striking employes of the Scranton (Pa.) Railway Co. on December 18th attempted to demolish four of the company's cars with dynamite, and another car was stoned. The passengers escaped without serious injury.

The Tokyo Tetsudo Kubushiki Kwaisha, projecting an extensive system of electric railways in Tokyo, has arranged through Mitsui & Co., of New York, to purchase American equipment to the amount of \$800,000. The General Electric Co. will furnish three 1,200-kw. generators; Babcock & Wilcox, eight water tube boilers aggregating 4,400 h. p.; the Peckham company, 250 car trucks, and the Morgan Engineering Co., of Alliance, O., will build a 20-ton electric traveling crane.

PITTSBURG SPECIAL FOR PITTSBURG TRAVELERS.

Leaves Chicago 7:30 p. m. every day, arrives Pittsburg 7:45 next morning. In addition to vestibule coaches this train carries sleeping cars from Chicago to Pittsburg. One car has buffet serving breakfast, and passengers can get off train at Pittsburg refreshed and ready for business. Its counterpart, the Chicago Special, leaves Pittsburg 6:30 p. m., and brings passengers to Chicago next morning. Arrange with H. R. Dering, A. G. P. Agt., 248 South Clark St., Chicago, for your next Pittsburg trip on this train.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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The street railway manager is constantly striving to increase the efficiency of his employes, fully realizing that as the discipline approaches nearer the ideal, the company will directly benefit in many particulars. Two of the things sure to follow a betterment of the personnel are reduced expenditures for accidents and damage claims which is a direct money gain that can be readily appreciated and more cordial relations between the company and the public, this latter being even more important, though not so easily shown on the balance sheet.

In the past we have described various plans which companies have adopted with the idea of making conductors and motormen more careful in the discharge of their duties, by encouraging the well-doin' ones and marking the bad ones, and the subject has been before recent street railway conventions. In this issue will be found details concerning two systems recently adopted by the street railways of Detroit and Buffalo, respectively.

The Detroit United Ry. has adopted the Brown system of discipline, well known among the steam railroads, according to which trainmen are given marks of merit or demerit, as their conduct in the service deserves. On the record thus made depends each man's standing with the management, and the injustice often resulting from suspensions for misconduct is avoided. Bulletins issued at frequent intervals keep the entire personnel advised as to the acts that the management considers praiseworthy or reprehensible and thus serve as a stimulus.

At Buffalo the International Traction Co. has in effect a premium system, whereby trainmen who avoid accidents receive compensation in addition to the scheduled rate. This plan, during the short time it has been in service has resulted not only in a decreased number of "accidents," but in far better accident reports. The men feel that they have a direct personal and financial interest in protecting the company from accident claims and damage suits, and use every effort to secure the names of proper witnesses, and in cases where no damage or only trivial injury results, usually return with the report of the occurrence a duly executed release

or a signed statement that the company was not negligent. This result is due in a large measure to the fact that when patrons understand that the loss because of "fake" accident claims will fall, in part at least, upon the employe, instead of wholly upon the company, their attitude is greatly changed, and they willingly give their names as witnesses, or, if the victims of a harmless fall, will sign a release, when otherwise evil-minded attorneys might persuade them to sue for damages.

Managers will differ as to the efficacy and desirability of various plans such as these, but, entirely aside from their relative merits, it is gratifying to know that so many different ones are being given practical trial, and we may be certain that good to the whole industry will result.

Apropos of accidents and accident reports, it has at times been suggested that the practice of requiring trainmen to make reports on all accidents out of the ordinary occurring on their cars might have its disadvantages. It is argued that if at the slightest mishap, such as a passenger falling in the car, the conductor draws out a formidable-looking note book, asks everybody for their names and addresses and anxiously inquires if the passenger has been hurt, it is probable that by the time he is through the unlucky person has received the impression that the company considers the matter a very serious one. He may thus be led to believe that he must have good grounds for a claim, whereas, if nothing had been said the passenger would probably forget all about the incident.

A case in point occurred in New York. Two women boarded a car and before one of them could get to a seat the car started and she fell to the floor, sinking backward as easily as if she were lying down on a couch. She rose and took her seat, chatting with her companion and laughing heartily at her predicament. It was not until the conductor came and asked her name and the name and addresses of all the witnesses that the expression on her face changed from a smile to one of intense pain.

"I'm terribly hurt—on the side," she said in answer to his inquiry, "and it was all the motorman's fault. I'll see my doctor and then I'll go to a lawyer." When the conductor had gone she could not repress a smile and, turning to her companion remarked, "I can't feel it, but I guess the company will have to pay me a couple of hundred dollars, as long as they think it is so serious." If the conductor had taken no notice of the incident after assuring himself by the actions of the parties concerned that no actual damage had been done, the case would never have been heard of again.

The manager who has had to defend a suit for damages where the plaintiff really stumbled against the street curb after leaving the car—and there have been such cases—will undoubtedly urge that no incident that may possibly be made the basis of a damage suit is too trivial for a report.

To give the conductor entire discretion as to what incidents to report would be dangerous, but there may be room for improvement in the manner of collecting data. Let the men be instructed to avoid all excitement and display of anxiety in trivial cases.

There are spots in the United States and Canada where the way of progress has been made unusually difficult for the electric railway by the opposition to operating cars on Sunday. Those well-meaning but over-zealous advocates of strict Sunday observance will probably feel that their cause has received a serious setback when they learn the news from Edinburgh, where for centuries the inhabitants have done their daily toil on six days of the week and walked to church on the seventh.

The Edinburgh city corporation owns the cable tramways, but leases them for operation to a private company. Cable trams are expensive to run, and the company sent a delegation to America for a few pointers on tramway matters. Among other things the delegates reported that in several cities in the United States cars are run on Sundays, and they were told the companies derive considerable revenue from that source. Application to the city council was made by the tramway company for permission to run the trams on Sunday. This application was refused, but the company needed the money, and in the absence of specific agreement insisted on its right to handle the property in its own way. In consequence a few weeks ago the people found the cars running on Sunday morning, and they were well partitioned.

The city council has commenced proceedings against the company to stop further operation on Sundays, but the public at large

has presented a very emphatic endorsement of the innovation, and it is probable that old fogysm will have to give way to conceptions and ideas better suited to the twentieth century times.

The tramway company compels none of its employes to work on Sundays, but leaves the matter to their own choice. So far it has had more applications for Sunday runs than it can fill.

The question of equipping long roads for electrical propulsion has been before electrical engineers for several years, and while considerable progress in this direction has been made, such as equipping branch lines, elevated roads and a few experimental lines with electricity, the management of our leading railroads as well as those in foreign countries are entirely too conservative to undertake the expense of electrically equipping main lines with heavy freight and passenger service as long as any doubt whatever exists as to its being profitable. This subject, however, is one which is forcing itself more and more strongly upon the attention of electrical engineers and railroad men, and we believe that the time is not far distant when electric traction for long railroads will be an accomplished fact.

The greater portion of the inaugural address of Mr. William Langdon, president of the Institution of Electrical Engineers, deals with this subject, and it is a significant fact that Mr. Langdon, who is himself a steam railroad man, believes that the steam locomotive has seen its best days and that it will be replaced in the comparatively near future by the electric motor.

It can readily be seen that the building and consolidation of short electric lines in different parts of the country have inaugurated a competition which will prove more and more disastrous to steam roads as the growth of the electric systems continues. The building of high speed electric railways between important commercial centers is bound to take place, and unless these lines are undertaken by the steam roads themselves they must prove a source of considerable loss to older roads by diverting a very profitable part of their business. An example of this is pointed out by Mr. Langdon in the case of the Manchester and Liverpool mono-rail line, which has recently been sanctioned by Parliament. Connection between these two cities is already made by three lines of railroads, all of which provide good and apparently ample service. At least a part of whatever success may be attained by competitive electric roads must be drawn from the traffic of the steam systems; although to some extent the electric lines have created a traffic which did not exist previous to their operation. The conclusion may be reached that if the existing systems of railroads do not avail themselves of electrical propulsion, that electrical railways of considerable magnitude will be built independently and in competition with the existing roads. Mr. Langdon makes the suggestion that it would be worth the while of the companies threatened with competitive electric roads to combine to carry out experiments in this direction at their joint expense. If electrical operation over a considerable distance did not offer the advantages claimed for it the companies could then tell where they stood. There is very little question in the minds of electrical engineers that electricity is particularly well qualified for this work, but there is undoubtedly much experimental work to be done before the most desirable system of long distance working can be determined upon. Theoretically, at least, the alternating current seems best adapted to this work, and while no scheme of alternating current propulsion for railways has thus far been perfected to an extent which would warrant its adoption on a line of any considerable size, we believe that this is simply because there has been no demand heretofore for such a system. When the demand arises no one who is familiar with the subject of electric traction doubts but that the system will be forthcoming. Mr. Langdon believes that for the electric service the difference in speed between passenger and freight trains which now exists is entirely too great; he advocates breaking up freight trains into smaller units which can be operated at higher speeds and which can alternate between short, high speed passenger trains. At any rate short high speed passenger trains at frequent intervals would render slow freight trains an impossibility, and on a road having only two tracks it is impossible for the full benefits of electric operation to be secured unless the speed of the freight traffic is correspondingly increased. The capacity of a road working under such conditions would unquestionably be very largely increased, as there would be less switch-

ing of trains and the number of them could be doubled if the time were halved without increasing the labor charges.

The lamentable accident which occurred last month in the New York Central tunnel, and which resulted in the death of 17 persons and the serious injury of 34 others, forcibly emphasizes the fact that steam locomotives cannot be used with safety where the ventilation is inadequate to prevent clouds of smoke from obscuring visual signals. In the tunnel in question the signal system installed is probably as perfect as any which can be devised for use with steam locomotive systems, as in addition to the visual signals both a system of gongs is rung and torpedoes are automatically placed on the track in case a train runs past a signal, but in spite of all these precautions this accident, as well as the one of last year, proves that the use of steam locomotives is undesirable, at least in situations of this kind.

The public, as well as the majority of railway engineers, now recognize the superiority of electric propulsion for tunnel work, and ever since the adoption of electric locomotives by the Baltimore & Ohio in 1895, there has been no question of the ability of an electric system to handle the heaviest train without difficulty. Apropos of this subject, a letter from Mr. George Westinghouse which was recently published in the daily press has elicited considerable comment, as at first glance the reader might easily assume it to contain an argument against the safety of electric traction. Mr. Westinghouse states that as a matter of fact, with an electrically operated train the risk of accident will, judging by experience, be increased rather than diminished, because of the presence of the heavy electrical machinery which it is proposed to attach to every car of each train. He cites several accidents where cars have been destroyed by fire resulting from some derangement of the electrical apparatus, and argues that the electrical energy required to operate a heavy train is sufficient to melt a considerable bar of iron if anything goes wrong upon a car of ordinary combustible construction. The remedy suggested in his letter for this trouble is the use of cars built of metallic or other incombustible material. At the time of its publication Mr. Westinghouse's letter was understood generally as an argument against electric traction, and the surprise at this was the more marked as the Westinghouse company has been one of the most prominent in introducing and equipping electrical systems. His criticisms called forth a number of comments from prominent engineers which were so antagonistic as to elicit a second letter from Mr. Westinghouse describing his stand on this question more explicitly and emphasizing the importance of the non-combustible construction of cars. While Mr. Westinghouse, as was to be expected, explicitly denies any antagonism to the system of electric propulsion, it would appear that in his desire to be cautious he considerably overestimated the danger of electricity, which certainly in the case of most accidents which can be mentioned has been due to faulty construction rather than to any inherent shortcomings in the system. While no one can doubt the wisdom of taking every possible precaution to avert railway accidents, the use of a car made entirely non-combustible is an extreme which will appear over-cautious to most railway men. While the use of electricity can be made dangerous through ill-advised or faulty construction, there is no agency which can be made safer by adopting sound engineering principles.

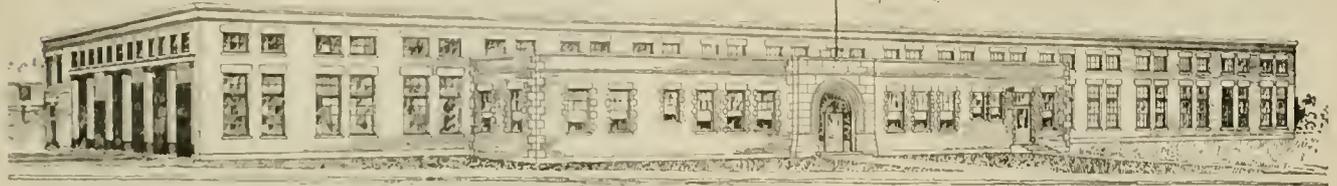
While heavy currents such as are required to handle heavy trains are sufficient to melt bars of iron and set fire to woodwork, these currents are so easily controlled, and may be automatically limited to the working capacity of the conductors, that the chance of such a fire occurring is practically nil. Electricity also lends itself with the utmost facility to automatic regulation, and if a section of electric road be divided into blocks, arrangement can easily be made so that if one train is upon the block, the second train attempting to enter the same block will be totally cut off from a supply of current, making collisions practically impossible. The discussion on this subject in the daily press may have proved useful as a warning against the use of carelessly constructed or equipped electric systems, although it is perhaps unfortunate that the public should have its confidence shaken in its belief in the safety of electricity through its misinterpretation of Mr. Westinghouse's letter or his over-cautionsness.

New High Alternating Current Installation of the Berkshire Street Railway Co., at Pittsfield, Mass.

"Through the heart of the Berkshires," aptly describes the route over which the Berkshire Street Railway Co. is now building an electric railway, that according to the prophesies of those interested, is to become one of the finest interurban properties in New England. As far as location is concerned these assurances would scarcely seem to be exaggerated.

Starting in the town of Cheshire, Mass., where connection is

where connection will be had with the line of the Albany & Hudson Railway & Power Co., running from Albany to Hudson, N. Y. A connection will be made with the Western Massachusetts Street Railway Co., which is to build a line from Lee to Westfield, connecting with a line running to Springfield, Mass. Franchises have also been asked and partially secured for locations on several streets in the city of Pittsfield, these grants forming a valuable



EXTERIOR OF POWER STATION, PITTSFIELD, MASS.

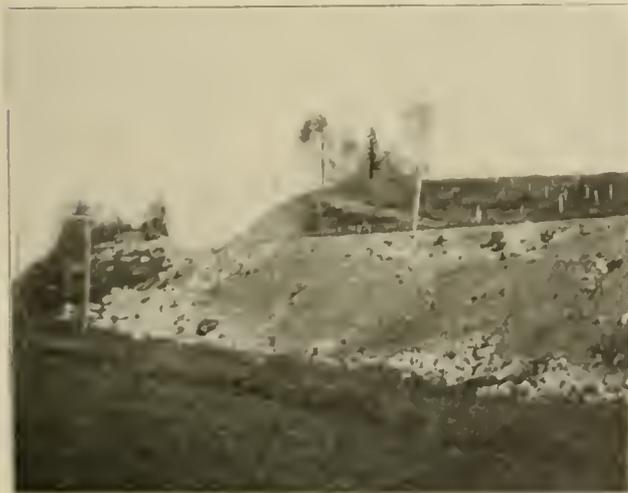
made with the Hoosac Valley Street Ry., of North Adams, the Berkshire Street Ry. runs south through the towns of Cheshire and Berkshire to Pittsfield, a city rejoicing in the euphonious title of the "Haven Amid the Hills." From Pittsfield the line strikes south again, touching the towns of Lenox, Lee, Stockbridge, Great Barrington and Sheffield to the Connecticut state line, forming in its entirety practically a continuous electric railway from the state line of Vermont to the state line of Connecticut traversing the extreme western end of Massachusetts. It is estimated that in this strip of territory there are more magnificent hotels and fine

asset as they will enable the company to give its passengers transfers to points in and near Pittsfield.

In arranging the power scheme consideration was given to the general territorial layout as well as to the present and probable future demands of the service. Decision was finally made in favor of a central generating station containing generators of the revolving field type, giving 3-phase current at 13,300 volts. This current is transmitted directly to the transmission line without the use of step-up transformers. From this line, step-down transformers are used, transforming the voltage from 13,300 to 380 volts for use at the rotaries, of which there are two 300-kw. machines in the main station and two 250-kw. machines in each of the two sub-stations. The rotary converters change the alternating current of 380 volts to direct current at 600 volts. By using generators of 13,300 volts step-up transformers are avoided, thus, it is claimed, increasing the efficiency. By the use of revolving fields there are no high potential revolving parts; the revolving fields are excited by 110 volt, steam-driven exciters.

Power House.

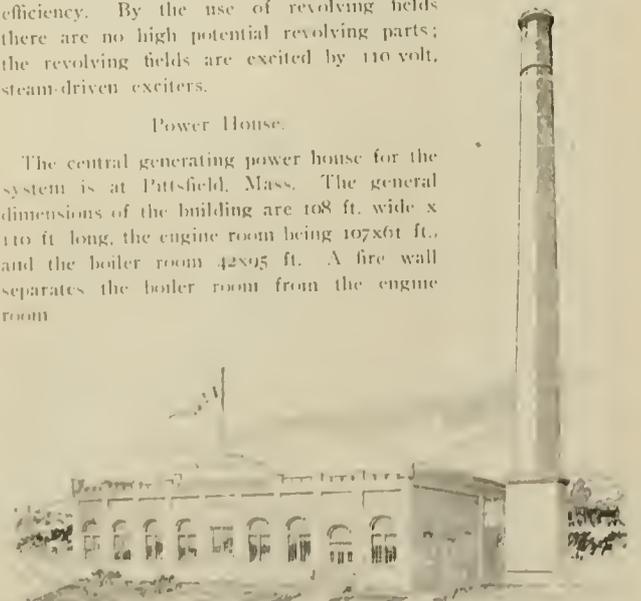
The central generating power house for the system is at Pittsfield, Mass. The general dimensions of the building are 108 ft. wide x 110 ft. long, the engine room being 107x61 ft., and the boiler room 42x95 ft. A fire wall separates the boiler room from the engine room.



LONG CUT AND FILL AT LANESBORO.

cottage that in any section of equal extent in New England. It forms the summer outing place for New York's and Boston's most exclusive society, and Lenox and Lee are said to be fast outrivaling Newport and Saratoga in favor with the wealthy classes of New York and Massachusetts, especially those desirous of finding rest and quiet during the summer months. In addition to the large and more fashionable hotels a multitude of cottages and boarding houses for six months in the year shelter a host of tourists and eating parties who are drawn by the clear invigorating air, the fresh spring water and the far reaching and inspiring scenery of the Berkshire Hill.

The road at present determined upon is 20 miles long, of which distance 15 miles are practically completed and will be running in the spring. Franchises have been asked and partially granted for extensions from Pittsfield to the New York state line



EXTERIOR OF CAR HOUSE AND OFFICE BUILDING, PITTSFIELD, MASS.

The building is of brick with granite trimmings. The roof framing consists of steel trusses, there being eight of these trusses in the engine room and seven in the boiler room. Each of the two main rooms has a monitor roof with steel framing. The roofing is of 1 in. plank covered with a 5 ply asphalt roof covering. The roof is drained by four inside conductors. The stack is 175 ft. high with 7 ft. 6 in. core.

In the engine room will be two 1200-h. p. cross compound engines with cylinders 22 and 44x48 in. These are each direct connected to a 750-kw. triphase revolving field Westinghouse generator with independent 110 volt steam driven exciter. As before stated current will be generated at 13,300 volts and passes direct to the transmission line at that pressure.

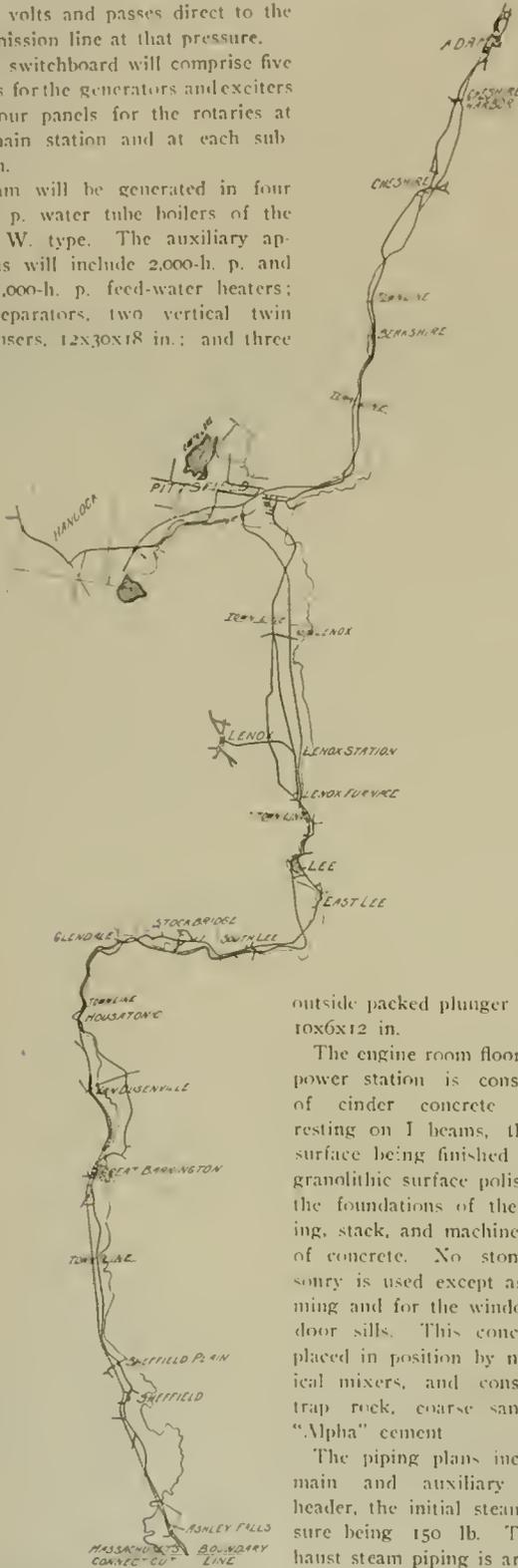
The switchboard will comprise five panels for the generators and exciters and four panels for the rotaries at the main station and at each sub station.

Steam will be generated in four 380-h p. water tube boilers of the B. & W. type. The auxiliary apparatus will include 2,000-h. p. and two 1,000-h. p. feed-water heaters; two separators, two vertical twin condensers, 12x30x18 in.; and three

All live piping is extra strong with extra heavy wrought iron bends. The Holly system of drips is used, as is also a complete system of oiling under air pressure, and a system of compressed air is in use for blowing off the electrical machinery and furnishing air for the oiling system.

Sub Stations and Overhead Construction.

There are two sub-stations, one at Lee and one at Housatonic, and in addition there are two 300 kw. rotary converters at the main power house at Pittsfield for feeding direct current to the terri-



MAP OF BERKSHIRE STREET RAILWAY SYSTEM.

outside packed plunger pumps, 10x6x12 in.

The engine room floor in the power station is constructed of cinder concrete arches, resting on I beams, the top surface being finished with a granolithic surface polish. All the foundations of the building, stack, and machinery, are of concrete. No stone masonry is used except as trimming and for the window and door sills. This concrete is placed in position by mechanical mixers, and consists of trap rock, coarse sand, and "Alpha" cement

The piping plans include a main and auxiliary steam header, the initial steam pressure being 150 lb. The exhaust steam piping is arranged in duplicate, the two exciter engines, the two condensers, and two pumps exhausting into the

open heater. The exhaust steam from the main engines can be condensed in either condenser, first passing through closed heaters. The water supply is taken from the Housatonic River or city service as desired.



LOOKING SOUTH AT LANESHORO.

tory immediately adjoining the station and to the northern end of the line.

The sub-station at Lee is ten miles from the Pittsfield plant and is housed in a frame building, which is virtually a two-story cottage, having rooms and chambers for the sub-station attendant and his family. The converters and transformers are in a one-story addition adjoining the cottage at the rear. The equipment consists of two 250-kw. rotary converters with static transformers of 600 kw. capacity.

The sub-station at Housatonic which is 20 miles from the Pittsfield plant is located in the rear of the car house and contains identically the same electrical equipment as the sub-station at Lee.

The alternating current circuits from the main station in Pittsfield are in duplicate, that is, there is one circuit from Pittsfield to the Lee sub-station, and one circuit from Pittsfield to Housatonic sub-station. In case of accident to either circuit the other can be



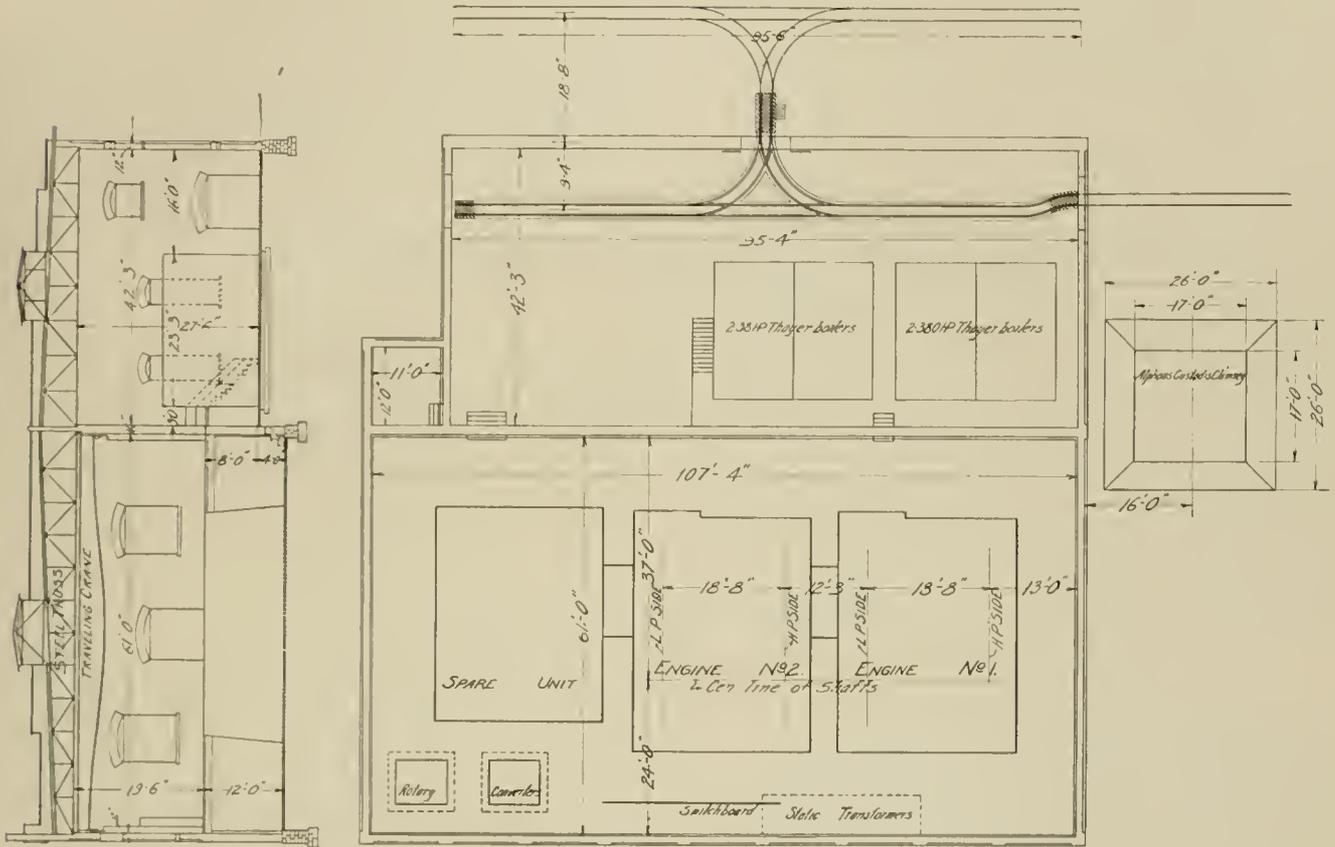
TRESTLE AT CHESHIRE.

cut in. By this method the liability from accident is reduced to a minimum. The transmission line does not follow the line of the street railway for the entire distance, the town of Pittsfield being cut out by a high tension line around the city, and the town of Lee is also avoided by a similar line running over the turnpike. This avoids running the high tension currents into the towns and also shortens the transmission distance considerably.

The over-head construction consists of two No. 0000 grooved trolley wires for the entire length of the road. The wire is carried on 35-ft. poles with Creaghead flexible brackets.

One of the accompanying diagrams gives the distribution of feeders and transmission lines. The transmission lines which are bare

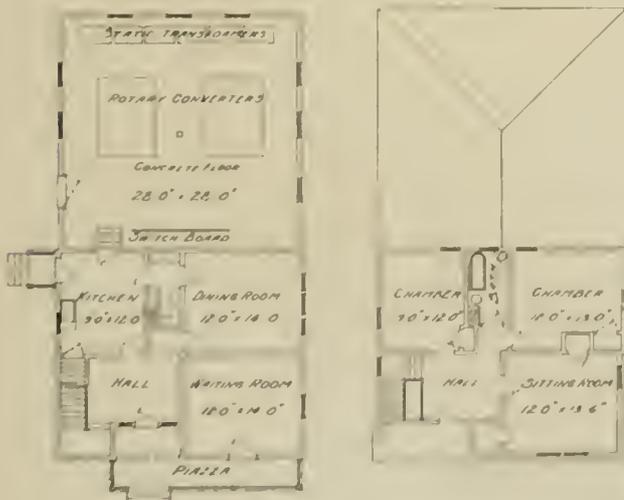
The insulators for the high tension line are of glass purchased from the C. S. Knowles Co., of Boston. They have 7½-in. petticoats and are supported on steel pins with glass sleeves. Lightning protection is afforded by a regular 4-joint barb wire strung along the tops of the poles and grounded every fifth pole. On the



PLAN AND CROSS SECTION OF POWER HOUSE, PITTSFIELD, MASS.

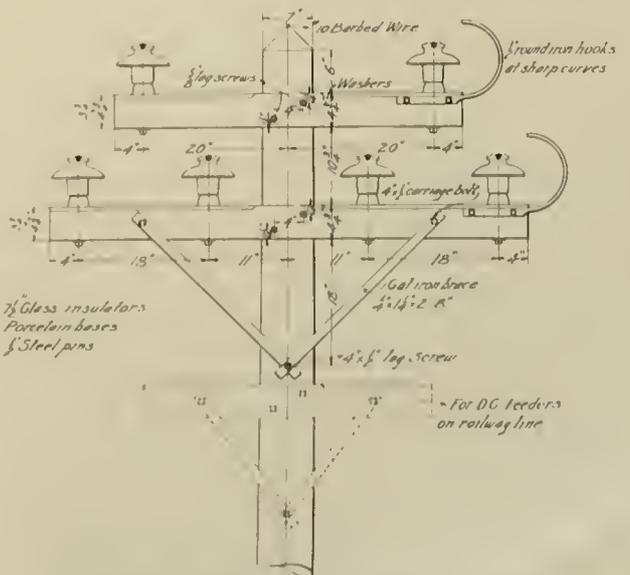
copper wire are carried on two cross arms, one circuit to Lee on one side of the pole; the other to Housatonic on the other side. Each circuit is arranged in the form of an equilateral triangle with

transmission line no poles are guyed. The sharp turns at poles are braced by stubs set on the inside of the curve. The direct current feeders are carried on a cross arm which is below the



PLANS OF COTTAGE AND SUBSTATION.

sides 18 in long. The pole top as presented herewith is the form used, both where the transmission pole line follows the track, and also where it cuts across country.



ARRANGEMENT OF OVERHEAD LINES.

transmission arms, the direct current feeders being tapped to the trolley wires every mile.

Organization.

The Berkshire Street Railway Co. was incorporated in June, 1901, with capital stock authorized and issued of \$550,000. The officers of the company are: President, R. D. Gillett, of Westfield, Mass.; vice-president, B. D. Rising, of Springfield, Mass.; treasurer, A. W. Eaton, of Pittsfield, Mass.; electrical and mechanical engineer, Charles K. Stearns, No. 93 Federal Street, Boston, Mass.; general contractors, Fred T. Ley & Co., of Springfield, Mass.; attorney, Charles E. Hibbard, of Pittsfield, Mass.; consulting engineer, Gilbert Hodges, of Boston.

The specifications for the engines, boilers, electrical machinery and auxiliary apparatus, the plans and specifications for the power house and sub-stations, specifications for the transmission lines and feeders and also for the piping were drawn up in the office of Charles K. Stearns, of Boston, and all the work with the exception of the track, bridges, and main car house is being carried out under his direction.

CHICAGO SITUATION.

The street railway franchise situation in Chicago appears to be slightly improving. The mayor has abandoned his plan of passing mandatory ordinances, having reached the conclusion that the only immediate effect would be litigation. He is now suggesting that the overhead trolley be temporarily admitted to the down-town district and urges that the City Railway and the Union Traction companies rearrange the down-town loops and use them jointly.

THE EVERETT-MOORE SYNDICATE.

During the past month there have been a great many rumors in circulation to the effect that the Everett-Moore syndicate was in negotiation with various parties, among them the Widener-Elkins syndicate, for the sale of the whole or portions of the Everett-Moore properties. It can be stated, however, that as yet nothing definite has been determined upon. The two traction companies most embarrassed are the Lake Shore Electric R. R. and the Detroit & Toledo Shore Line R. R., both of which are in process of construction.

Albion E. Lang is receiver for the Lake Shore property. Allan F. Edwards, general manager of the Detroit & Toledo Shore Line, is now receiver for that company, the suit of W. B. Strang, at whose instance D. B. Cunningham and the Ohio Savings had been named as receivers by the state court, having been settled. Mr. Strang will complete the road.

There is considerable competition for both of these lines and though the syndicate is very desirous of keeping the system together, favorable offers for the Lake Shore and Shore Line roads may lead to their sale so that the proceeds may be devoted to protecting the other properties.

Some changes have been made in the officers of the Detroit United Ry; J. C. Hutchins, succeeds H. A. Everett as president; George H. Russell succeeds Mr. Hutchins as treasurer, and Mr. Everett succeeds Mr. Hutchins as vice-president. With the acquiescence of the bankers' committee the execution of a \$25,000,000 mortgage was authorized. The proceeds of this bond issue are to be used to take up underlying securities of the Detroit United Ry and the suburban companies whose lines are now a part of the Detroit system, and there will then remain some \$6,500,000 of bond to be used to acquire new properties or build extensions.

The suburban companies incorporated with the United railway include the Detroit & Northwestern; Detroit & Pontiac; Detroit, Rochester, Romeo & Lake Orion and Wyandotte & Detroit River.

The Twin City Rapid Transit Co. will expend larger sums for paving in St. Paul, this year than it has spent in any one year of its history. City Engineer Claussen is quoted as stating that the paving laid by the Twin City Company costs a third more than that laid by the city. St. Paul pays \$2.25 and \$2.50 for sand and stone, while the company uses granite for which it pays \$3 per sq. yd.

BRIBERY CHARGES AT ST. LOUIS.

January 27th warrants were issued for the arrest of two ex-members of the St. Louis city council and one ex-member of the house of delegates, who were charged with being implicated in an illegal scheme of bribery in connection with a franchise ordinance granting the St. Louis & Suburban Ry. an extension through Forest Park. The allegations are that the company placed \$135,000 in two safety deposit vaults, \$75,000 for members of the house of delegates and \$60,000 for members of the council.

The house of delegates was enjoined from passing the ordinance, which had passed the council; the case being appealed, the Supreme Court held that the municipal assembly could not be enjoined, but by that time the term of the assembly has expired, and the ordinance was never passed.

The grand jury has since examined witnesses and returned indictments against several other members or ex-members of the municipal assembly and directors of the Suburban company.

January 30th, ex-Governor Johnson, attorney for Pres. Charles H. Turner of the Suburban company, was quoted in an interview as follows: "Mr. Turner told me that it was almost impossible to secure the passage of any kind of measure in the municipal assembly without putting up large sums of money. Mr. Turner said that he was asked for a certain sum of money and he put it up. He does not deny that he put the money in the safe deposit boxes for the purpose of securing the passage of the bill. He thought that the passage of the bill would not only be a benefit to the suburban company, but to the people of St. Louis as well. It was necessary, Mr. Turner told me, to pay money to secure the passage of the bill. There was no other way to deal in the matter except to pay the money. I believe every large corporation in the city has been compelled to act in a similar manner whenever it has wanted legislation. The St. Louis corporations, I have been given to understand, have become accustomed to being held up by the municipal assembly."

BIRMINGHAM, ALA., NOTES.

The relaying of the East Lake line of the Birmingham Electric Railway, Light and Power Co. with 70-lb. rails is well under way and is progressing as rapidly as practicable, notwithstanding the inclement weather. The East Lake road is one of the few double-track electric lines of its length in the south. It is seven miles in length and much frequented in the summer time by pleasure riders.

The reconstruction of the Bessemer and Birmingham line is also being pushed and the new track, laid with 70-lb. rails, has been carried as far as the Fair Grounds, almost half way. Each day that passes draws nearer to a close the era of the steam dummy, which has been operating on this line for many years. With the conversion of this line into an electric road the dummy becomes a thing of the past in Birmingham.

A contract is being closed with the Ohmer Car Register Co. of Dayton, O., for the equipment of nine cars on the Bessemer and Birmingham line with its new style of registers. Six classes of fares are used on this road, and the register not only shows the number of each class, but prints the day card for the conductor. This is the only style register that can properly take care of as many different kinds of fares. These registers are rented at so much per day and are not sold.

Several minor changes in the cross-town routes are contemplated, and to this end a petition is pending before the mayor and aldermen for franchises. Should the board report favorably on this petition the changes that follow will greatly facilitate the downtown lines in handling the crowds.

The shops are all very busy at present overhauling, repainting and canvassing the roofs of the summer cars so that when the warm weather arrives the summer equipment will present a very neat and jaunty appearance.

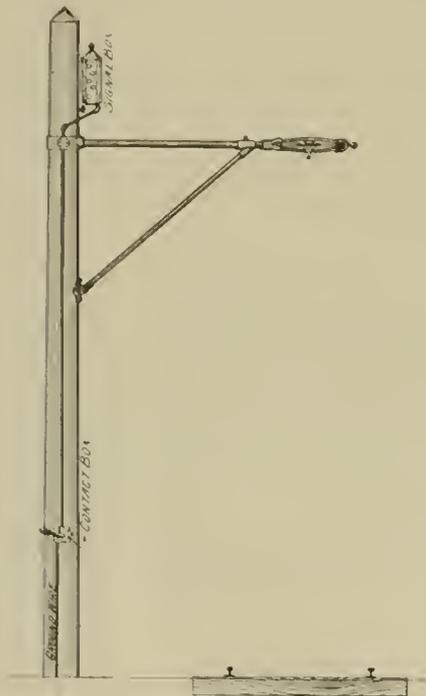
The Colorado Springs Rapid Transit Railway Co. is installing machinery in its newly completed power house on Las Animas St., adjoining the tracks of the Denver & Rio Grande. The company is grading and relaying with heavy rails a large part of its system.

CORRESPONDENCE

SIGNALLING INTERURBAN CARS AT NIGHT.

Editor "Review": I suppose that the question of the relative merits of a lighted match and a regular signal box for the purpose of signalling interurban cars at night comes under the head of new business, and as the "Review" is always first in describing these little schemes that follow in the wake of the interurban railway, I wish to explain how we have overcome the difficulty prospective passengers formerly had in stopping cars at cross-roads out in the country after dark.

Our friend the Kansas City-Leavenworth Railroad Co. advises its patrons to strike a match to signal the car, as illustrated in the "Review" for January, page 60. This is all very well if the intended passenger is of the masculine persuasion, but in a case of a woman, how! Oh! how can she strike the match? The writer saw this difficulty when our interurban line from Mansfield to



SIGNAL FOR INTERURBAN LINES.

Shelby was put in operation last summer, and your readers will doubtless be interested in a description of our mode of signalling.

We put five lamps in series. These are enclosed in a neat iron box, and are fed from the trolley. The ground wire is brought down the pole in a gas pipe into another small contact box which is supplied with a neat lever. The lamp box and all connected with it are waterproof and so arranged that no part can be tampered with or get out of order. All that the passenger has to do is to hold down the lever, and this throws on the light that can be seen any distance and the motorman has lots of time to stop without skidding wheels or straining the posts of his car, which always happens with very quick stops. When the signal is seen the lever is released and the lights are out.

The box and combination therewith will last for years and the amount of current consumed is one-half ampere for, say, one-fourth minute, and this is so trifling as not to be taken into account. These boxes are made by the Century Machine & Manufacturing Co., Mansfield, O. Patents on the combination described are pending. Yours truly,

ARTHUR J. HAYCOX, RY. SUPT.,

Mansfield, O

Citizens Elec. Ry., Lt. & Power Co.

PENSION FOR EMPLOYEES.

Editor "Review": It was with pleasure I read your article in the January "Review" on our pension system. Our employes are all well pleased with the association, and we now have over 1,000 members. During the short time it has been organized, about two months, some of the members have drawn as much as \$75, and it will take several years, at 20 cents per week, to pay this amount. We have four members on the pension list and they seem to be well pleased with their situation. Yours truly,

A. T. POTTER, Gen. Mgr.,

Providence, R. I.

Union Railroad Co.

Editor "Review": Replying to your inquiry as to the most satisfactory scheme for caring for superannuated employes, I believe that the moral obligation of the company to care for such employes depends largely upon the conditions in each individual case. As a broad principle, it seems to me that any effort to better the condition of employes will result in better service from them. If the company has a sufficient number of employes, I believe that a mutual benefit society, with pension provisions, to which both employer and the employes contribute, would be a strong factor in keeping the employes devoted to the best interests of their employer and themselves.

At the present time we are about to erect a building for our motormen and conductors, wherein the men will have many conveniences, such as a reading-room, dining-room, baths and a large assembly hall, with stage. When this is completed we hope to organize a benefit association for the employes, but have not decided yet the details of operation. Yours truly,

J. K. NEWMAN, Pres.,

New Orleans & Carrollton Ry., Lt. and Power Co.

New Orleans, La.

Editor "Review": Replying to your recent letter asking my views on pensions for street railway employes, I will say that it seems to me there is a moral obligation resting on employers to care for superannuated employes who have given faithful service for 25 years or more, although I do not think the advantage of making the personnel more permanent is sufficient to justify the cost of a pension system.

In my opinion the most practical, all things considered, for a street railway company would be a pension paid wholly by the employer. One reason for this would be that an employe having been in the company's service for a number of years may be able to better himself considerably, in which case it seems arrangements would have to be made for the withdrawal of any contributions he had made to a pension fund, as in justice he would be entitled to them. In case an employe should remain the allotted time with the company, I feel that he deserves a pension without expense on his part.

I have always favored a mutual benefit or insurance organization among the employes of a street railway company, and we are now endeavoring to form such an organization, so that in case of illness, accident or death to an employe a fund will be available to be used something in the manner set forth in the plan adopted in Providence; that is, we have offered to make a donation to our employes with the understanding that they contribute, say 25 cents a month each, and in case of illness or injury they would receive \$4.00 per week from this fund, and in case of death about \$100 from this fund. Yours truly,

C. E. FLYNN, Gen. Mgr.,

Wheeling, W. Va.

Wheeling Traction Co.

GREETINGS FROM NEW SOUTH WALES.

We received too late to acknowledge last month a card artistically printed in colors from the New South Wales Government Tramways, bearing the New Year's compliments of the officers of the tramway department. The New South Wales tramways now comprise 145 miles of track, and for the year 1901 carried 93,703,685 passengers and ran 6,835,926 tram miles.

The new electric railway system in El Paso, Tex., has been put in operation, and is reported to be one of the finest in the state.

top, permitting the tower to be swung back so as to lie flat upon the roof platform mentioned. When the tower is in its upright position it is held securely by two chains attached to upper opposite corners and extending diagonally down and hooking into eye bolts in the platform as indicated. An iron ladder at one end gives access to the roof.

This car is used to advantage for a variety of purposes. It par-



SNOW PLOW AT TAUNTON, MASS.

tially fills the place of a tower wagon, and with it the company does all kinds of overhead repair work. Salt and sand bins are carried inside the car, the sand being fed directly to the rail through spouts. The car is also provided with jacks and sundry tools likely to be required in breakdowns and other emergency cases.

In winter a portable sheet metal nose is fastened to one end and the car does duty as a snow plow in light snows. The weight of the nose in this case is supported on stanchions from the platform. The car is equipped with two G. E. 800 motors.

WRECKING CAR AND PIT HOIST IN PASADENA.

The accompanying illustration, for which we are indebted to Mr. W. H. Smith, general manager of the Los Angeles & Pasadena Electric Ry., shows two auxiliaries of the mechanical department, each of which has been found highly useful in its special field. Fig.

1 represents a wrecking car which is used both for repair work on the tracks and in case of accident to any of the rolling stock when in service.

The car is arranged for only one man in the cab and has but one controller. It is equipped with both hand brakes and independent motor compressor air brakes, Anderson-Smith arc head lights and an arrangement for carrying wrecking materials of every description in a small space. The general dimensions of the car are as follows: Length, 19 ft.; width, 7 ft. 6 in.; height of body, 9 ft. 3 in. It is mounted on a McGuire truck having a 7-ft. wheel base and 30-in. wheels. The brake equipment was made by the Christensen Engineering Co. Hunter fenders are used, one under each end of the car, and the power is supplied by two Westinghouse No. 49 motors. This gives the car a working capacity of about 80 h. p., and it has handled a 15-ton car heavily loaded with passengers up a $7\frac{1}{2}$ per cent grade.

A number of doors will be noticed in the side of the cab shown in the illustration, and there is a corresponding number on the opposite side. These are for different compartments which are used to store away wrecking materials such as frogs, wedges, jacks, crow bars, chains, block and tackle, blocking, etc. There is a large door at each end of the cab which closes two large compartments. Just beneath the floor of the cab a four-wheel dolly is carried to be used in case of broken axles occurring on the road. It is arranged that this dolly can be taken out from either end of the cab and run down on skids immediately under the disabled car.

Fig. 2 shows a general view of a new hydraulic and compressed

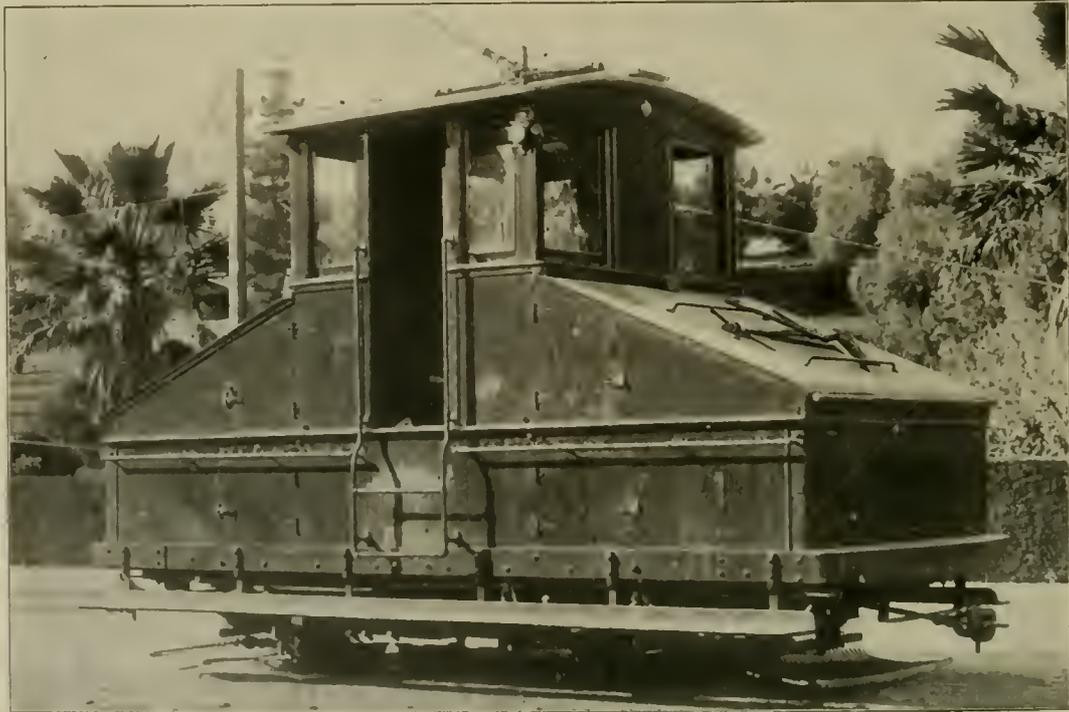


FIG. 1. WRECKING CAR—LOS ANGELES.

For work in heavy snow this division owns several old Rounds plows that have been remodeled and strengthened. New sills have been put in, extension pieces added to the noses, and truss rods extending from the ends of sills up over the side door posts have been provided to aid in carrying the weight of the noses. The plows are provided with two G. E. 1,000 motors

air pit jack which is used in the car house pits for numerous purposes. The general dimensions of the pit jack are: gage, 2 ft. $2\frac{1}{2}$ in.; wheel base, 3 ft.; length of car, 4 ft. 6 in.; diameter of cylinder, $7\frac{1}{8}$ in.; length of lift, 40 in.; diameter of piston rod, 3 in.; width of table, 2 ft. 9 in.; length of table, 4 ft. 6 in. This is operated from an 8 x 8 in. double stroke air compressor together with a storage

water tank. This apparatus has been found almost invaluable in making car house repairs such as changing wheels under the cars, changing motors and handling any heavy pieces. The illustration here shows the table raised to its full height. By means of this device a pair of wheels have been changed under a car, taking one

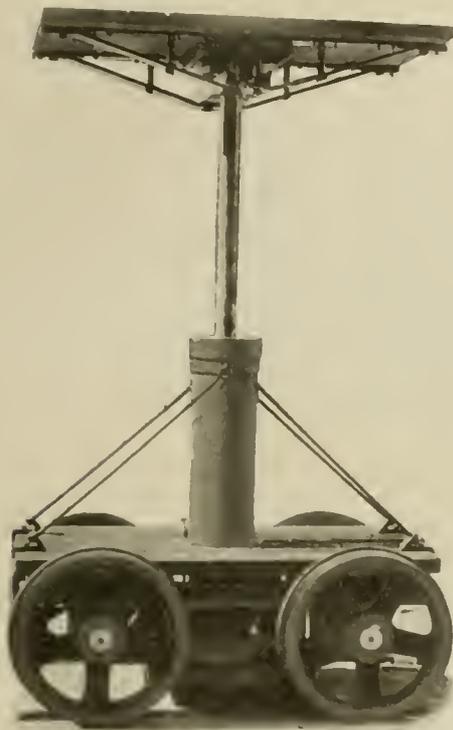


FIG. 2. PIT HOIST—LOS ANGELES.

pair out and putting another pair in, in 14 minutes. This, however, was done merely as an experiment and was on a car equipped with trucks of the company's own pattern, which are especially adapted to easy handling of such work.

VARNISH.

BY LOUIS GRATON.

Varnish, as far as its quality is concerned, may be considered an unknown quantity until submitted to test at the hands of an experienced manipulator. The varnisher is by no means a cleanly looking person as might be judged from the neatness of the work he produces. If we observe him in a carriage or sleigh factory he is generally smirched from head to foot and the floor of his work room needs to be occasionally scraped with a shovel, but it is often by such a dirty man under such dirty conditions that the best results with varnish are obtained. It sometimes seems that in the varnish room the longer the experience the more there is to learn.

Varnish comes under three heads, viz., good, bad and indifferent, the former being the rare sort. If you listen attentively, as you should, to the friendly chat of the varnish agent you will easily conclude that there is but one make of reputable varnish. It is only when you try to apply the stuff that your conclusion is apt to be modified. Generally, however, these varnish agents are good, gentlemanly fellows, possessed of a rich store of intelligent information which they seem glad to impart, and I doubt not all varnishers are glad of their periodical calls. It seems to me that we of the brush should not be too chary of any valuable experience we may possess. Recently one of the representatives of one of our best varnish houses told me the following incident to prove the superiority of his goods over others. He had called at a certain carriage shop during the last working hour of the day and found that the painter, who had been induced to buy some of his goods on a previous call, was not very enthusiastic over them. The agent asked him then and there to varnish a body that was just ready for this operation, under his instructions. The painter consented, but

through force of habit failed to put on as much varnish as the agent desired. So he told the painter to immediately give the surface another application. The painter did so with somewhat of trepidation, and the agent confessed to me that he had some anxiety in regard to the result. On the following morning he hastened to the shop, where it was found that the varnish had leveled itself into a perfect mirror-like surface, the only evil result of such an application being a row of beads on the lower edge that was easily removed with a putty knife.

I put this lesson in practice on the very next day not, however, with his varnish, but with our usual goods that are good enough for our purpose. Neither did I apply one coat after another but I did put on more varnish at one operation than I ever had before, and to my delight it proved a success. I give this instance to emphasize the fact that a progressive man, though his hair be turning gray, is always willing to learn. I know that the successful varnisher will smile at this story, but I also know that to many faithful fellow craftsmen this is not a matter for laughter.

Different varnishes require different manipulation, and a change of varnish necessitates getting acquainted with the new article. I once rejected a very heavy rubbing varnish that required a great deal of brushing to keep it in place. On complaining of this to the agent he suggested the addition of turpentine to it. This should never be done if durability is desired. If the varnish maker is up to the demands of his business he will make known in one way or another the requirements of his goods, such as length of time required to dry, etc. But the one thing he will not advise is the tinkering of his varnish especially by the addition of turpentine.

The chief virtue of a good varnish, aside from brilliancy, is elasticity. It is this that gives it tenacity and durability, and as durability and luster are paramount requirements it is apparent without long argument that the addition of the turpentine, which renders the varnish more siccative, hence more brittle, will defeat the two-fold object of longevity and brilliancy. The force of this argument will not be so apparent, if it applies to rubbing varnish, which is supposed to be covered soon by an elastic and slow drying varnish. Yet it is well known by men of the craft that a brittle varnish in conjunction with a kind that is elastic is likely to produce disastrous results, such as checking and cracking. Hence two varnishes used on a surface should be of one make (from one maker) and should approximate each other in point of tenacity and elasticity.

The elasticity of the varnish can be said to be its life, and the process of drying, or indurating, may take months and even years. Whenever it is absolutely dry then disintegration and decay begin. This drying process is long or short in proportion to the ingredients that have been employed to dissolve the gums that enter into the composition of varnish. It is true that a comparatively quick drying varnish may be preferable for architectural work or for a certain class of furniture but this article is concerned only with carriage or car varnish, or work that is subjected to the changes of the weather. It is also true that with street cars which are exposed to extremely hard conditions, a middle ground might be advocated, that is, the employment of a varnish that is medium in its drying. In the first place the cars to be repainted or revarnished cannot for reasons that are self-evident be held indefinitely in the paint shop, and in the second place, as the management usually desires its cars to look tidy, it becomes necessary to varnish them at least once a year; so that for reasons of economy (as the slow-drying varnishes are usually the most expensive) we are justified in employing a medium grade of varnish.

As I have stated in a former article, varnish should be kept in a warm dry place, as equable as possible in temperature, which should be about 70° F. Though it has been my privilege to apply varnish in a railroad round-house, with locomotives going in and out, big doors opening and shutting on all sides, and the temperature at zero, yet the result was first rate. But such result could have been obtained only with the very best varnish, and should not be expected even then.

And I will again emphasize what I said in the former article in regard to ordering during the warm weather the varnish necessary to use in the cold months. The chilling which it would doubtless receive in transit during winter would cause the gum to separate in fine granules that are not pleasant to the eye and that also interfere with the durability of the varnish.

Untold gallons of poor stuff that is labelled "varnish" is on the

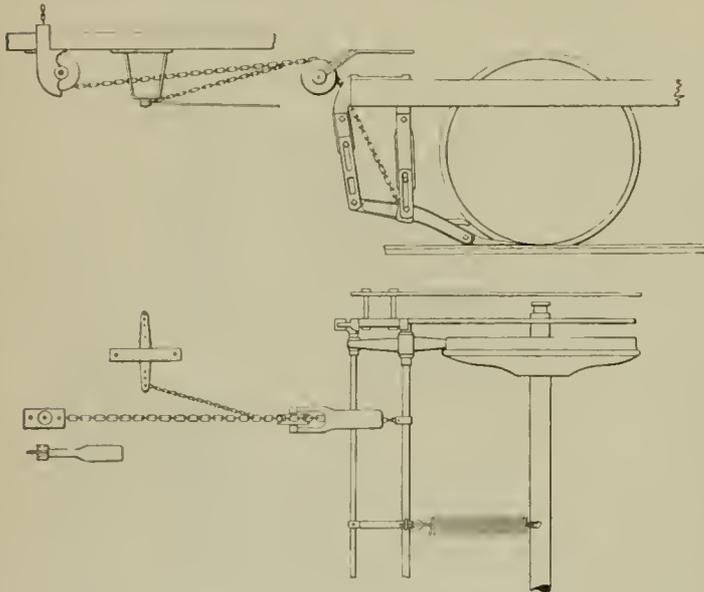
market today, yet I believe that as good varnish can now be bought as ever was made. Not long ago I chanced to talk on this subject with a very intelligent man, though he was a little pessimistic in regard to varnish. He wondered why it is so difficult, if not altogether impossible, to buy good varnish these days. He told of a wonderful buggy that his grandfather once had. This buggy was retouched and revarnished at intervals of five or six years only, and yet it always looked well and bright.

I asked him if he did not think that the carriages and cars of today, would give similar results if treated similarly. Our grand fathers considered it a sin to take out the carriage in bad weather or on muddy roads, and often the carriage was only out a dozen times a year. These ancient vehicles were carefully cleaned, properly sheltered and nearly always covered with a generous cloth. But now our vehicles are in almost constant use in all kinds of weather, on all kinds of roads and often with no care worth mentioning. Street cars, for instance, are in use 16 or 20 hours a day or even longer for seven days of each week. Is it any wonder that they need frequent attention from the painter?

While it must be confessed, that it is a difficult problem to select a good one from the innumerable mixtures that have the dignified name of varnish, nevertheless such can be had. And my parting advice to the user is patronize a reputable maker and, when you do strike the right stuff, stick to it.

THE FLOOD EMERGENCY BRAKE.

Patrick Flood, of Albany, N. Y., is the inventor of an emergency track brake that has been in service since 1895 on cars of the United Traction Co. running over heavy grades in Albany, Troy and Cohoes, N. Y. As an emergency brake it can be applied either from the front or rear platform for bringing the car to a stop, and it also acts as a holding brake when necessary to stop for passengers while going up grade. In the latter case the motorman releases the brake, turns off the power, and when the car loses its momentum it slides back on to the track shoes and makes a very easy stop without the application of the wheel brake. The ad-



FLOOD EMERGENCY BRAKE.

vantage of not having to start up hill with the wheel brakes on will be readily seen.

The details of the mechanism will be understood from the drawings. Normally the track shoes are carried away from the wheel and track. When the motorman or conductor releases a lever on the dash the shoes are forced under the wheels by a spring attached to a cross bar. It is claimed that wheels can not be flatted for the reason that the shoe goes under the wheel and prevents the wheel from sliding on the rail.

The brake is in use on the lines of the United Traction Co., of Albany; the Lowell, Lawrence & Haverhill Street Ry., Haverhill,

Mass.; Amsterdam (N. Y.) Street Ry., Schenectady (N. Y.) Street Ry.; Ithaca (N. Y.) Street Ry., and the Troy & New England R. R.

CONSOLIDATION IN NEW HAMPSHIRE.

An important merger of street railway interests in southern New Hampshire and northern Massachusetts will soon be perfected.

A new company incorporated as the New Hampshire Traction Co. is to absorb and operate as one system the following street railway properties: The Dover, Somersworth & Rochester Street Ry.; the Exeter, Hampton & Amesbury Street Ry.; the Amesbury & Hampton Street Ry.; the Seabrook & Hampton Beach Street Ry.; the Haverhill, Plaistow & Newbury Street Ry.; the Haverhill & Plaistow Street Ry., and the Portsmouth & Exeter Street Ry.

The new company will control in all about 86 miles of track. This will all be operated eventually from one alternating current station now being built by the Rockingham County Light & Power Co. Power for the street railway lines will be transmitted at high voltage to converter and transforming stations located at various points. The firm of Thompson, Tenney & Crawford, of New York, bankers, is managing the deal, and inform us that all details will be arranged before the coming summer.

THE AMERICAN EXHIBITION IN LONDON.

The American exhibition at the Crystal Palace, London, in 1902, is expected to be the largest and most important exhibition of exclusively American products ever seen in the United Kingdom. Most of the preliminary work in regard to the exhibition has now been completed and the allotment of space for the various classes of exhibits in the Crystal Palace has been determined.

The exhibits have been divided into eleven classes, including machinery and mechanical industry; natural and agricultural products; prepared fruit products; pharmaceutical and kindred preparations; carriages, vehicles, harness, etc.; hygiene; lighting, heating and ventilating textiles; fabrics, clothing; musical; photographic and optical instruments; education and science; naval and military; arts, painting, sculpture, etc.

Mr. Ernest Schenk, chairman of the Crystal Palace Co., recently visited this country where he spent five weeks in connection with the business of the exposition. His visit was with a view of obtaining the co-operation of the United States government in the way of making government exhibits and he states that his mission here was most satisfactory in its results. A number of representative American firms have already applied for space.

Perhaps the most important feature in connection with the exhibition will be the establishment of a commercial bureau under the direction of a committee of representative American and British firms. This committee will undertake to furnish exhibitors with all necessary information in regard to the channels of trade and the placing of goods on the British and continental markets.

The commissioner for the United States is Mr. Alfred H. Post, Produce Exchange, New York City, and the assistant commissioner for the commercial section is Mr. W. B. Baneroff, 20 Victoria St., London, S. W. Applications for plans and particulars of space, etc., should be forwarded to either of these gentlemen or to the general manager, Crystal Palace, London, S. E.

IMPROVEMENTS ON PEORIA & PEKIN TERMINAL RY.

The Peoria (Ill.) & Pekin Terminal Ry., operating 10 miles of electric railways and a 21-mile steam line, held its annual meeting January 21st, at which its board of officers and directors was re-elected, and a number of important improvements of the properties were discussed. It was decided to add to the passenger equipment, and to purchase two locomotives for handling freight traffic. Yards with a capacity for storing 500 and 150 cars per day respectively, will be opened in Peoria and Pekin, and a part of the electric railway system, it is expected, will be double tracked this year. The company's passengers receipts up to the date of the meeting were reported as 38 per cent in excess of the receipts for the corresponding period last year.

HANDING EXPRESS MATTER IN ELECTRIC CARS IN NEW YORK.

In the "Review" for July 15, 1901, page 407, extended notice was given of the inauguration of an express, freight and baggage service in special express cars to be operated over the lines of the Metropolitan Street Ry. system, of New York, including the Union Ry. lines in the Bronx. The idea was put in effect last June and in these six months the business has developed to a degree almost beyond the expectations of the promoters.

Through the courtesy of Mr. George W. Slingerland, general manager of the Metropolitan Express Co., we are able to publish herewith considerable information concerning the methods adopted for carrying on the details of the business. In view of the heavy traffic conditions in New York these methods for giving a frequent and satisfactory express and freight transportation service without interfering with the passenger traffic should be suggestive to other managers having or contemplating express or freight carrying facilities. In particular attention is directed to the company's new receipt form which embodies in one blank, (or rather an original and duplicate copy of one blank) consignor's receipt, way-bill, bill of lading, tracer, consignee's receipt, auditor's check, and in truth is the only blank used in the entire transaction of receiving, forwarding, transferring, recording and delivering express packages.

The express business is handled by a separate company known as the Metropolitan Express Co., which uses special express cars running on regular schedules and at frequent intervals over the various owned and controlled lines of the Metropolitan Street Ry from the Battery on the lower end of Manhattan Island, through the wholesale and shopping district, to the east and west uptown resident districts to the north, including the entire Bronx district, and the towns of Yonkers, Mount Vernon, New Rochelle, etc.

To expedite the express matter the territory covered is divided into about 43 districts with numerous main central distributing depots from which deliveries are made and where transfers are attended to. Deliveries and collections are made by messenger boys, by horse and wagon and by electric automobiles, this branch of the business being transferred in accordance with the demands of the service. For instance where long heavy hauls away from the street railway lines are necessary wagons are used. In the retail dry goods district boys collect the packages from the stores and markets. For covering a thickly settled section close to a distributing depot or for running from the town depots to the ferries, automobiles have proved very advantageous.

In many instances also the street railway express is being used as a sort of intermediary in the handling of large quantities of heavy goods. For instance many wholesale groceries and breweries in the downtown districts bring their daily consignments to the car depots in their own wagons. The goods are loaded into

ling of their city and northern suburban deliveries. For this work the express company maintains a large force of collection messengers who call at the retail stores from 7 to 10 times a day and make collections. These boys take the packages to certain specified points on the car routes where the packages are put in baskets and transferred to the first express car that passes. The messengers on the cars sort the bundles en route and deliver them in baskets at the distributing depot nearest the destination to which the packages are addressed. From the depots the bundles are immediately despatched by wagon, automobile, or foot messenger depending upon which way will secure the quickest delivery. The stores by this means secure nearly a dozen deliveries a day and if



MAIN EXPRESS DEPOT AT BAYARD ST. AND BOWERY.

necessary can guarantee the delivery of packages within an hour or two, and this without the risk and expense of maintaining a large force of teams, wagons and employes.

At the present time the express company has 20 cars in daily operation. These run on regular schedule starting from the battery at intervals of about an hour during the day on two of the main north and south lines, namely 3rd Avenue on the East Side and 7th Avenue on the West Side. In dispatching it is always arranged to have an express car follow a regular passenger car and the express motorman is instructed to make the same time as the regular. There is no delay therefore to passenger traffic. The collection points along the route in the department store district are located at points where all cars are required to come to a full stop. While the regular car is stopping at the far corner for passengers the express car stops at the near corner and receives whatever bundles and packages may be waiting. When necessary to transfer goods from car to car or do considerable loading the express is run from the main line into one of the depots. There is no hindrance to the regular passenger traffic or sidewalk travel in any way. The depots are arranged to permit the express cars to run along side of the platform while the wagons and electric vehicles drive up to the other side, thus reducing to a minimum the time necessary to transfer goods.

When this express service was first proposed the company announced it had no intention of antagonizing the old wagon express companies and the belief was expressed that the old companies and the new could work together in harmony to a great extent. This has proven to be true and in fact the United States Express Co. has appointed the Metropolitan Express Co. its sole carrying agent in the city of New York above 50th Street.

The service was started with 10 cars made over from old mail cars, but the company has recently found it necessary to purchase 20 new 8 wheel 37 ft. express cars from the J. C. Bull Co. An unusual feature about these is the fact that they are provided with overhead trolley, with electrical plow for conduit contact, and with storage batteries, permitting them to be used on the conduit lines, the overhead trolley lines in the Bronx, and the horse car lines on the cross town street. The change from underground to overhead traction is made by drawing up the plow and forcing it under the car.

The storage battery on each car is composed of 100 cells of the Electric Storage Battery Co.'s E. F. type and having a rating of 24 amperes for three hours and a momentary output capacity of



BAGGAGE CAR, METROPOLITAN EXPRESS CO.

cars and taken to the upper portions of the city and suburban towns where they are turned over to the shippers' own delivery wagons. This leaves the delivery of their goods principally in the hands of the merchant themselves, but saves them the long wagon haul through the city. Thus a large grocery house or brewery in Manhattan can mount one delivery wagon in Mount Vernon for instance to make frequent trips around that city where previously the wagon would have to drive 12 to 15 miles into New York for one load. A number of special express cars are assigned to this class of business. The facilities work both ways for a number of breweries and factories in the northern section of the city are utilizing the cars for sending goods to their city customers.

The delivery of packages for the large retail department stores has grown to enormous proportions and a number of prominent houses have turned over to the express company the entire hand-

Form 56

METROPOLITAN EXPRESS COMPANY

Received From **1901.**

101

No. 101

From District No. _____

To District No. _____

Weight _____ lbs.

C. O. D. _____

Return charges, if any, \$ _____

Advanced Charges, _____

Our charges, _____

Total, _____

Prepaid _____

Value asked and given _____

Value OR C. O. D. \$ _____

MARKED

MESSSENGER

At _____ M.

DO NOT WRITE on this Coupon before it is separated from Form 51.

ARTICLE

Form 51

METROPOLITAN EXPRESS COMPANY

Received From **1901.**

101

No. 101

From District No. _____

To District No. _____

Weight _____ lbs.

C. O. D. _____

Return charges, if any, \$ _____

Advanced Charges, _____

Our charges, _____

Total, _____

Prepaid _____

Value asked and given _____

Value OR C. O. D. \$ _____

MARKED

MESSSENGER

At _____ M.

DO NOT WRITE on this Coupon before it is separated from Form 51.

ARTICLE

Form 54

METROPOLITAN EXPRESS COMPANY.

Shipment No. **101**

Express charges, \$ _____

C. O. D., \$ _____

Return charges, \$ _____

Deliverables. _____

To Consignee: The **METROPOLITAN EXPRESS COMPANY'S** office at _____

can give you information concerning this shipment, or any express business you wish promptly transacted

USE THIS FOR REFERENCE. Duplicating Shipping Blanks Pat. Feb. 27, 1900

Form 53

METROPOLITAN EXPRESS COMPANY

Received From **1901.**

101

No. 101

From District No. _____

To District No. _____

Weight _____ lbs.

C. O. D. _____

Return charges, if any, _____

Advanced Charges, _____

Our charges, _____

Total, _____

Prepaid _____

Value asked and given _____

Value OR C. O. D. \$ _____

MARKED

MESSSENGER

At _____ M.

DO NOT WRITE on this Coupon before it is separated from Form 51.

ARTICLE

ORIGINAL RECEIPT.

DUPLICATE RECEIPT.

200 amperes. On a recent test run an express car made 16½ miles with one charging of the batteries at an average speed of 7½ miles per hour, including stops. The batteries may be charged either at regular stations or from the underground trolley circuit while the car is moving. As the line current frequently changes its polarity along the way the cells are charged through an auto-

matic pole changing switch, controlled by solenoids, and there is also an underload switch to protect the fuses and resistances in case an unforeseen emergency should suddenly lift the load from the battery.

The automobiles are run by batteries of one of the Electric Storage Battery Co's. older types. The short distance vehicles

have batteries rated at 36 amperes for three hours and the long distance wagons have batteries capable of giving 37 amperes for four hours.

To facilitate the handling of all classes of business with economy the company has adopted entirely new clerical methods eliminating a considerable amount of the clerical work incident to way-billing, tracing, etc.

This end is gained by a new form of receipt which the company has termed a "Transit Record" in place of the term way-bill or receipt.

The transit record is made out in duplicate by means of carbon paper. To the original copy, which is left with the shipper, are attached two coupons which are detached by the employe signing them. One of these coupons is called the auditor's check and is sent at once to the auditor's office. The other is the forwarding office coupon showing destination and other important information and is kept on file at the forwarding office.

The duplicate of the original receipt is also taken by the collecting employe and this form must accompany each individual shipment through to destination, no matter how many hands the shipment passes through, but each employe who handles the goods en route must endorse his name and check number on the back of this duplicate. This enables forwarding to proceed without interruption and the shipment is not stopped at any point to be way-billed, or for the receipt to be re-written. The man who makes the actual delivery of the goods secures the consignee's signature on the duplicate receipt and this form is then returned to the auditor's office and with the original auditor's check already on file constitutes a complete record of the shipment with information as to all charges collected or prepaid.

The original, the duplicate, the auditor's check and the forwarding office coupon are all stamped in one corner with the same number and much of the recording is done by the use of this num-

ber. The auditor's check enables the auditor to vise the entire business of the company including revenues and disbursements and by this means again much bookkeeping and clerical work is eliminated. To regular shippers books containing



AUTOMOBILE DELIVERY WAGON.

original and duplicate receipts or transit records are furnished already stamped with consecutive numbers, the series for each customer of course being regulated to avoid conflict.

TRANSIT RECORD.

Every Messenger and Transferman through whose hands this Transit Record passes must stamp his Name and Check-mark in regular rotation, hereon.

Messenger or Transferman.	Check-mark.
1	
2	
3	
4	
5	
6	

FORM ON BACK OF DUPLICATE RECEIPT

ber. For instance the agent in charge of a distributing depot does not have to enter on his daily distribution sheet a long description of the goods, but merely enters the number of the transit records turned over to each man for delivery. Tracing is accomplished by simply asking the responsible employe where is No. so and so. In this way a vast amount of entry and clerical work is avoided.

The auditor's office also has charge of the tracing department and by means of the original auditor's check which it receives is enabled to keep tab on every shipment until the duplicate transit record comes in, thereby showing that the entire transaction has

MEETING OF SOUTHWESTERN ASSOCIATION.

The fourth annual meeting of the Southwestern Gas, Electric & Street Railway Association will be held in San Antonio, Tex., April 18-21, 1902. The programme in detail will be announced later. The following papers will be prepared and read before the meeting:

- "Progress Clubs in Texas," E. H. Jenkins, San Antonio, Tex.
 - "Fuel Oil," H. F. MacGregor, Houston, Tex.
 - "Flat Rate Evil," Thos. D. Miller, Dallas, Tex.
 - "Office Management of Street Railways," T. H. Stuart, Waco, Tex.
 - "Inspection of Inside Wiring," Warren B. Reed, New Orleans, La.
 - "How to Increase Your Business," A. E. Judge, Tyler, Tex.
 - "Injury and Damage Cases," Frank E. Scovill, Austin, Tex.
 - "The Past and Future of Electric Lighting," by J. F. Strickland, Waxahachie, Tex.
- A very successful meeting is anticipated. Hotel accommodations had best be secured in advance, and the secretary will take great pleasure in answering communications upon this or any other subject.
- T. H. STUART, Secy.

ELEVATED LINES ARE RAILROADS.

The elevated railways of Chicago, having been assessed for taxation by local boards as street railways, and by the state board of equalization as railroads, suit was brought by the South Side Elevated R. R., as told on page 81 of this issue of the Review, to determine whether the elevated lines were railroads or street railways under the law. An opinion has since been rendered in which the circuit court ruled, February 8th, that the elevated lines are railroads within the meaning of the revenue act and are subject only to the jurisdiction of the state board of equalization. The case will probably be carried to the supreme court.

The City & Suburban Railway Co., of Portland, Ore., has completed an addition to its car house. The new structure is 100x200 ft. in dimensions, of corrugated iron, and has a capacity for housing 25 cars.

PREMIUMS FOR TRAINMEN AT BUFFALO, N. Y.

By courtesy of Mr. F. E. Mitten, general manager of the Buffalo Railway Co. and the allied companies controlled by the International Traction Co., we have been advised as to the details of a premium system recently made applicable to the trainmen on these lines, and which, so far as we know, has never before been tried in just the same manner.

Briefly stated, the plan is to fix the wages of all trainmen at a fair and reasonable rate and then, at the end of every six months, to pay to each conductor and motorman who has not had an accident for which the company has been required to pay during the intervening period a premium of one cent per hour for actual platform time during the whole six months.

Prior to the opening of the Pan American Exposition the trainmen of the International Traction Co. received 16, 17 and 18 cents per hour, depending upon the term of service, but at the opening of the exposition the street railway company, realizing that the work and strain upon the men during the period of the Pan-American travel would be unusually heavy, voluntarily increased the scale of wages two cents an hour, making the maximum rate 20 cents an hour.

In November last, after the fair was over, the rate was reduced one cent an hour, fixing the scale at 18 cents per hour, platform time, for the first year's service, and 19 cents per hour, platform time, thereafter, this rate applying only to city lines. On international lines a flat rate of 20 cents per hour was put in force. However, with the bulletin announcing the reduction, notice was given that on Jan. 1, 1902, and on the first day of each succeeding July and January, a premium of one cent per hour for all time actually worked would be paid to all motormen and conductors who had not cost the company anything in accident claims. Stipulation was made that if the total amount paid for any one man's accidents should be less than the amount of his possible premium, he should receive the difference.

On Jan. 1, 1902, the company paid \$3,500 in these premiums. As the plan was made effective on Nov. 23, 1901, the month of December, 1901, as against December, 1900, presents the first comparative test, but for that month the results show a decrease of 42 per cent in the number of accidents occurring. Mr. Mitten informs us that the improvement in the work of the men is not confined alone to the decreased number of accidents. The manner in which reports are made out and witnesses secured is far better than ever before, conductors taking particular pains to give the location of witnesses and expressions used by them at time of accident, from which the company is able to judge of their value as witnesses. Many of the reports of minor injuries are accompanied by slips signed by the injured person to the effect that neither the conductor nor the company was to blame. As the men almost invariably explain at the time of the mishap that they are personally interested in clearing the matter up, the passenger is usually much more inclined to be reasonable and absolve the employe from responsibility for the accident. The employes are instructed to make every effort when an unavoidable accident does occur to secure witnesses to prove the trainmen were not to blame.

On each premium day the general manager issues to each man in the employ of the company a personal letter. To those who have gained the premium through freedom of accident he encloses pay check for the amounts of extra remuneration and thanks the men cordially for their careful service.

To those that have failed to keep a clean record he sends the following letter:

"Dear Sir—I sincerely regret that it has been found necessary to deny you your premium on account of the accident, concerning which an account will be found on the enclosed card. I trust that you will not lose heart, but, on the contrary, will endeavor during the coming six months to use such care in the performance of your duties as to insure your receiving the premium check in July. I take this opportunity of saying that the management will continually strive to better the condition of its men, making both its rules and remuneration with a view of bringing out your best efforts and most careful work; the undersigned being willing to remove any just cause of complaint, expects to both merit and receive your loyal support."

With the letter is enclosed a card giving the nature of the accident for which the man is held responsible, the date it oc-

curred, and a statement of the expenses incurred by the company in defending the claim. For convenience in keeping records and making out these cards, the following classification has been adopted:

ACCIDENTS		
A—Collision with vehicles		P—Ejection from car
B—Collision with persons		Q—Frightened horses
C—Collision with animals		R—Electric shock to persons
D—Collision with bicycles		S—Electric shock to animals
E—Collision with cars		T—Electric Heaters
F—Cars leaving track		U—Miscellaneous
G—Employes injured when on duty.		
H—Center pole accidents.		EXPENSE.
I—Alighting or boarding moving car.		1. Witness fees and expenses
J—Alighting or boarding stationary car.		2. Expert testimony
K—Fell in, on or off car.		3. Medical expense
L—Fell off car on curve.		4. Special service
M—Trouble on account of fare		5. Incidentals, office expenses, etc.
N—Disturbance on car.		6. Salaries
		7. Salaries of Attorneys.
		8. Court fees and legal expenses.

LEGISLATIVE ACTIVITY IN NEW YORK.

Among the bills that have been introduced in the New York Legislature are the following:

A no-seat-no-fare bill, by Senator Sullivan of New York City. Concerning this bill the leading New York papers take a reasonable view, the Sun saying:

"On the Broadway line at night the crowds are crushing; but the railroad company would be deserving of indictment if it put on any more cars. It has already twice as many cars as ought to be on the tracks, when the rights of general traffic are considered. If the Sullivan bill ever went into effect and the public found themselves prevented from boarding the cars to the limit of their capacity, the result would be a revolution."

A bill with several good features permits one domestic corporation to guarantee the bonds of another domestic corporation in the same general line of business. This bill was passed and will make possible a closer affiliation of street railway properties controlled by the same interests.

J. H. Fitzpatrick has a bill in the assembly requiring a third employe on all cars in New York City, to aid the conductor in the performance of his duties.

A bill introduced by Senator Wagoner makes the head of a street railroad corporation directly responsible for the violation of the law prohibiting street railway employes to be compelled to work more than 10 consecutive hours in one day.

Assemblyman Kelsey has prepared an act amending the New York rapid transit law. This is designed to remove any legal hindrance to the subway contractor, Mr. McDonald, turning over the rapid transit road when completed to another corporation already formed or to be organized to operate the road. Under the present law the contractor is not only to build the subway, but to operate the road. The statement is made on authority that a new company, with capital stock of \$25,000,000, has already been organized by Mr. August Belmont to take over the underground road as soon as it is completed.

Another bill just introduced is in the interests of the Pennsylvania in its plan to tunnel under the Hudson and East Rivers, in order to secure terminals on Manhattan and Long Island. The bill amends section 73 of the New York city charter, which limits the terms of franchises to 25 years, and authorizes the Board of Aldermen of New York to grant in perpetuity a tunnel franchise of the desired under certain restrictions as to conditions and compensation.

Senator Bedell will endeavor to pass a measure compelling all street surface railway cars outside of the boroughs of Manhattan and Brooklyn to be vestibuled in the winter months.

The Richmond (Va.) & Petersburg Electric Railway Co. has been obliged to delay the construction of its line between Richmond and Petersburg on account of a pit of quicksand directly in its right of way.

MOUNTAIN PARK CASINO AT HOLYOKE, MASS.

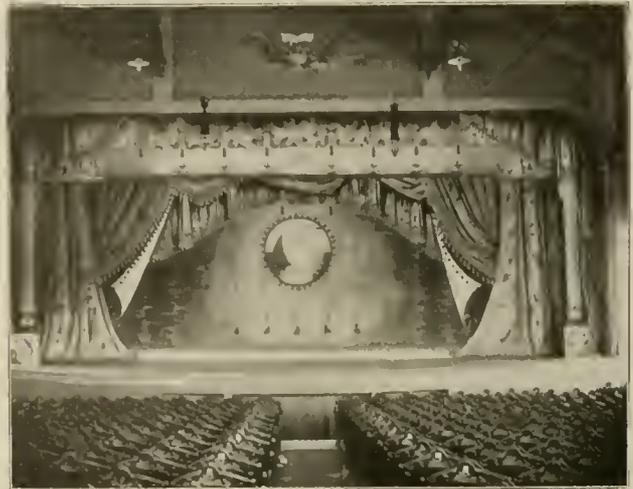
Through the efforts and activity of the Holyoke Street Railway Co., Mt. Tom in Central Massachusetts has come to be widely known as one of the most delightful mountain resorts in America, and as a center for tourists and visitors it is as popular as Mt. Lome in California or Pike's Peak in Colorado.

As described in previous issues of the "Review," the summit of Mt. Tom is reached by an incline railway operated on the balance system with two cars connected by a cable passing over an 8-ft. sheave at the top. On the summit, over 1,200 ft. above sea level, is a costly pavilion and hotel overlooking a wide sweep of country for 50 miles in all directions. This Summit House was illustrated in the "Review" for October 15th last.

The Holyoke Street Railway Co. also owns 400 acres of property located at the foot of Mt. Tom, about four miles from the center of Holyoke and six and a half miles from Northampton, Mass. This tract is known as Mountain Park, and here the company has established a spacious and finely arranged park and pleasure ground, with deer and other wild animals, a covered merry-go-round, scenic railway, and casino as side attractions. The park is reached by cars of the Holyoke Street Ry. in twenty-five minutes from Holyoke and thirty minutes from Northampton.

Entertainments were first given in Mountain Park in 1897, when an open air stage, 25x30 ft., was utilized for the performances, the spectators occupying about 400 seats in the open air arranged around the stage. This open auditorium, with additions and increase in seating capacity up to 1,000, remained until the past sum-

fore embodies the latest ideas in buildings for street railway park entertainments, and although it is somewhat more elaborate than



DROP CURTAIN IN THEATER.

many roads of the same size could afford, the plans are well worthy of study on the part of other managers.

Until the summer of 1901 vaudeville alone had been given, but



MOUNTAIN PARK.

Casino in foreground. Merry-go-round and Scenic Railway in center. Summit House and Pavilion on Mt. Tom in distance.

mer when the new casino herewith described was erected at a total cost of \$10,000. The building has been designed by experts in this line, and before the final details were decided upon an examination was made of the summer theaters at Fitchburg, Mass.

this last summer an opera company of twenty-five people was engaged for twelve weeks and presented a different opera each week. Vaudeville, minstrels and troubadours were given four weeks, making sixteen weeks of entertainment in all. The street railway management states that the season as a whole was quite satisfactory and justified the investment of \$10,000 expended in building the casino. The price of admission for evenings and holidays is placed at 15 cents for reserved chairs, and 10 and 5 cents for other chairs at the side and back. Matinee prices are 10 and 5 cents for single seats. Opera will be given again this coming summer for twelve weeks.

An examination of the engravings will make clear the arrangement of auditorium and stage. The dimensions of the casino on the ground line are: Length from front to back, 152 ft.; width of building, 110 ft.; length from front doors to curtain line, 115 ft. At both sides of the building are platforms 10 ft. in width, on which during holidays or when necessary additional seats can be placed.

The auditorium proper contains 2,400 seats, 1,200 of which are iron frame opera chairs numbered at the back for reserving, and 1,200 are folding wooden chairs. The platform just outside the building gives facilities for about 500 additional sittings, making a grand total of 2,900 seats. The roof is supported from the side and end framing with only four posts in the auditorium to obstruct the view of the stage. The auditorium floor beginning at the stage line rises at a pitch of 1 ft. in 100 ft., so that there is a clear un-



CASINO—SIDEN OPEN.

(Illustrated in the "Review" for Oct. 15, 1901, page 740; a Street Railway Illustrated in the "Review" for Aug. 15, 1900, page 478 and March 15, 1901, page 129, and in other issues. The casino there

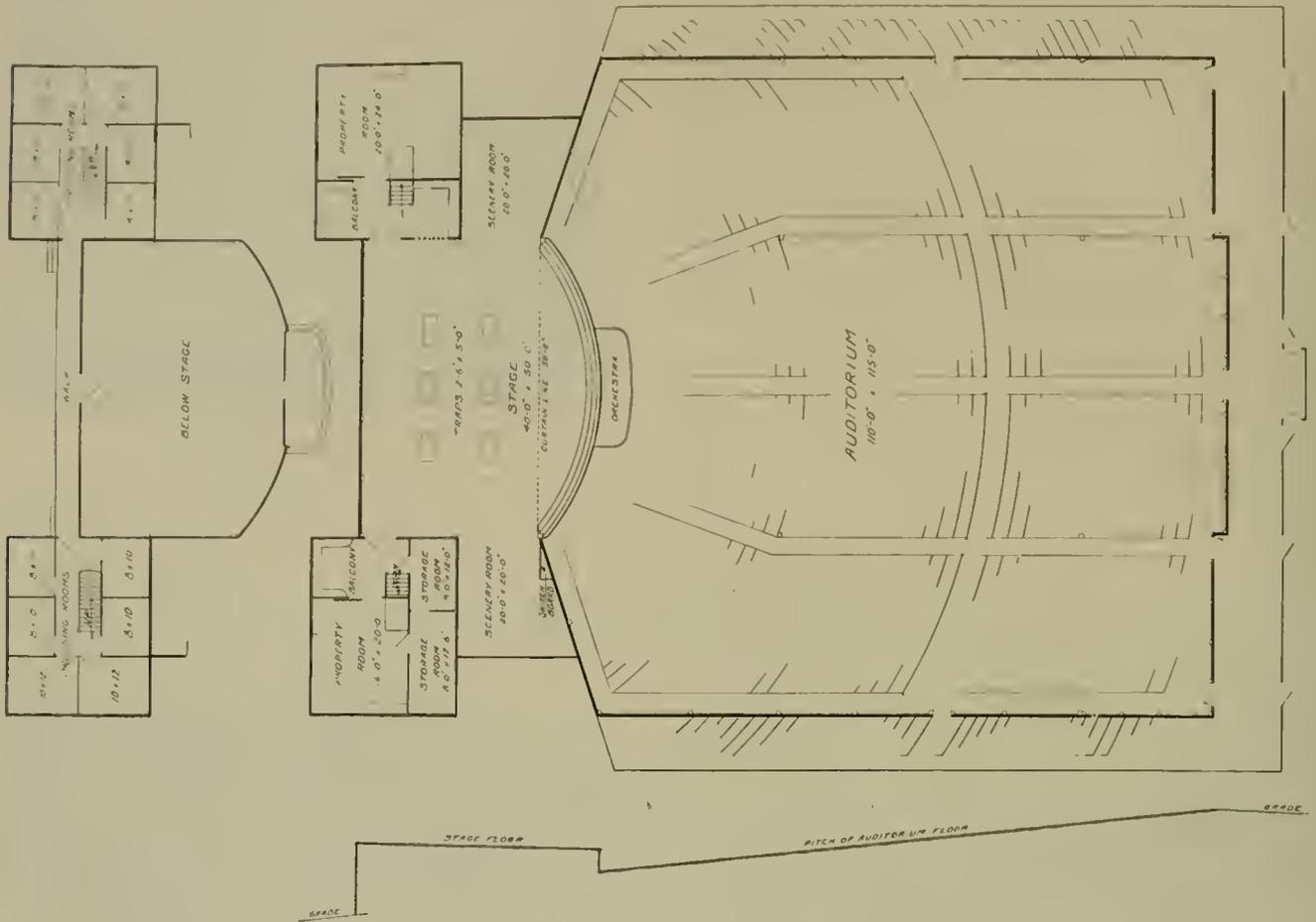
obstructed view from practically every seat in the house. Considerable grading was avoided by locating the casino on a natural slope

The stage is 50 ft wide by 40 ft. deep from the foot lights to back wall. The height from stage floor to the stage roof is 36 ft., giving ample clearance for scenery, curtain, etc. The scenery rooms

can close all the shutters in fifteen minutes in case a storm arises

The switchboard for controlling lights is located in the usual place on the stage floor at the left of the curtain. It is fully equipped with switches, dimmers, etc., to regulate all house, stage and foot lights as in all first-class theaters.

The lighting of Mountain Park and the casino, and also of the



FLOOR PLAN OF CASINO—MOUNTAIN PARK.

at either side of the stage are 20 ft. square and 25 ft. high. In these rooms are placed the scenery wings and paraphernalia to be used in the different acts during each performance. The property rooms on the stage level are 24x30 ft. There are six trap doors in the stage floor, each opening being 2 ft. 6 in. x 5 ft.

Below the stage is a room 8 ft. high, and having the same length and breadth as the stage floor above. At either side of this lower

pavilion and hotel at the top of Mt. Tom, is accomplished in a somewhat unusual way. Current for this purpose is furnished by an alternating generator set located at the street railway power house in Holyoke, five miles distant from the foot of the mountain. This set consists of one 110-h. p. direct current motor, one 100-h. p. alternating current generator of 1,000 light capacity, and a small exciter motor, all mounted on a single shaft, and running at 600 r. p. m. The 110-h. p. motor takes current direct from the main station bus bar at 550 volts. From the generator alternating current is taken at 3,450 volts, and at this pressure is transmitted over a pair of No. 0 aerial insulated wires to Mountain Park at the base of Mt. Tom. Here the current passes through two 300-light transformers, one for the casino and one for the park, and is changed to 104-volt alternating current for the incandescent and enclosed arc lamps. A third transformer is placed at the summit of the mountain for lighting the buildings at the top.

To avoid fluctuations in the lighting current, due to fluctuations in the load at the main station, a potential regulator, furnished by the Tirrell Regulator Co., of Concord, N. H., is connected with the generating set. This instrument by regulating the fields of the lighting machine compensates for variations in the main station voltage, and insures steady lights at the park and casino. The lighting set, which rests on one foundation bed, covering floor space less than 6 ft. wide by 6 ft. long, was furnished by the General Electric Co., and is said to be the first set ever furnished for service of this nature.

The building of the casino, the installation of the lighting set, and the management of the opera company has been under the direction of William R Hill, secretary and treasurer of the Holyoke Street Railway Co.



CASINO—OPENINGS CLOSED BY SHUTTERS.

room, and beneath the property rooms, are the dressing rooms, twelve in all, ranging in size from 4 ft. 10 in. x 12 ft., to 8 ft. 8 in. x 10 ft., those on the right being for women and those on the left for men.

As shown in the reproductions from the photographs, the sides of the auditorium are open, but these openings can be closed in case of storm or wind by wooden swinging shutters. Two men

IMPROVEMENTS IN KANSAS CITY.

About two years ago the stockholders and directors of the Metropolitan Street Railway Co., of Kansas City, Mo., undertook to reconstruct a large part of its system and to apply electric traction to a number of the roads which were operated by cables. The year 1901 was a busy one for the company, as in the neighborhood of a million and a half dollars has been spent for improvements which had been planned. The decision to change the motive power on its lines to electricity meant the tearing up of construction which originally cost \$11,000,000 and was yet good for several years of service. About nine miles of new track has been laid and a new power plant at 18th and Olive Sts., has been completed and put in operation. The machinery has also been purchased for the new plant which is to relieve the present Riverview plant which is inadequate to meet the present requirements. The new plant is to be situated as near the load center as possible, which will be in the heart of the business center of the city, and its cost when completed will be about a million and a half dollars. Work on this is to be commenced in the early part of this year. The building is to be 200x300 feet in area and will contain machinery capable of generating 35,000 h. p. The company is also building extensive car shops at 19th St. and Lister Ave., which cover 13 acres of ground and when finished will give employment to 350 men. The paint shop is already finished and the blacksmith shop, electric shop and a small steam plant are nearly finished. The company expects to build all its own cars, and repaint and repair them at its own shops. The construction both of the new shops and power house as well as the reconstruction of the company's lines will be continued throughout this year and will be pushed with the utmost rapidity.

A company has been organized in connection with the street railway company to charter special cars and run them past the principal hotels and over different lines through the interesting parts of the city. A party can charter a car and go everywhere its members may desire, switching from one line to another, as all of the lines in town will be electrically equipped. These excursions are expected to become very popular as it is a pleasing and inexpensive way of giving visitors a good idea of the city.

The street railway company for the past year has employed an average of 3,000 men, the construction force ranging from 800 to 1,000 men and the operating force exceeding 2,000 men. The company ordinarily operates from 275 to 300 cars which make the equivalent of about 4,500 round trips a day.

TAXATION OF CHICAGO "L" ROADS.

The question whether the elevated lines of Chicago are street railways or steam railroads came up for legal adjudication last month in connection with assessment of these roads for the purpose of taxation. Two assessments were made, one by the Cook County Board of Review and the other by the State Board of Equalization. The Board of Review claimed the right to assess on the ground that the elevated roads are in the same category with the surface lines of the city, and the State Board of Equalization took jurisdiction on the theory that the elevated roads are similar to steam railroads which under the statutes are assessed by the State Board. The roads elected to stand by the figures of the State Board and a suit to test the matter was brought by the South Side Elevated in which the other roads subsequently joined.

OHIO CENTRAL TRACTION CO.

The extension of the Ohio Central Traction Co.'s line from Bayview to Crestline was opened to the public on Christmas day and since that time has enjoyed a most satisfactory patronage. The cars are operated on a regular hourly schedule between Crestline, Bayview and Galion starting at 6:30 a. m. and running to 12:30 p. m. The line is well and substantially built and as soon as the winter has thoroughly settled it is expected to make high speed over this portion of the road. The road is to be extended to Mansfield, O., and when the question of the manner of transferring the traffic of the Pennsylvania Railroad can be settled.

The road is in charge of Mr. Wm. E. Haycox, general manager, who has been identified with the street railway business for many years. An Englishman by birth, he came to this country in 1874 and began his street railway work with the Euclid Ave. line in Cleveland as a conductor. In 1881 he was made assistant superintendent of the East Cleveland line where he remained until 1888, when he was made general manager of the Utica Belt Line of Utica, N. Y. After converting that road to electricity the company changed hands and Mr. Haycox returned Cleveland where he engaged in manufacturing business. Seeing the possibilities of an electric line between Galion and Bucyrus he secured a franchise for this road and interested the eastern capital to build it. This was subsequently bought by the Pomeroy-Mandlebaum syndicate, who at once secured Mr. Haycox as its general manager, and it has been under his supervision that the extensions of the line have been carried out.

TWIN CITY COMPANY REFUNDS DEPOSITS.

The Twin City Rapid Transit Co. has decided to abolish the custom of requiring a \$25 security deposit from conductors and motormen in its employ, and during the month of January each man who had made this deposit had it refunded. Since the days of horse cars in Minneapolis and St. Paul when devices for registering fares were unknown a rule has been in force requiring conductors and drivers to deposit \$25 as a guarantee against loss to the company through carelessness or negligence. Some of the employes who received this money back had had it tied up in this way for the last fifteen years.

With the growth of the railway system it has been found that the detail of bookkeeping and other work necessitated by the deposit plan was more trouble than the system warranted. With modern cars and appliances and the excellent class of employes now on the company's pay roll the officers believe that there is little reason to require a deposit and with this understanding, as well as through a desire to avoid much troublesome detail, it was decided to return the deposits and abolish the system. The men are much pleased at the decision as they feel that they are practically \$25 ahead. While the deposit always represented something coming, none of the men expected to realize except through leaving the service of the company.

TROLLEY CARS TO MOUNT SINAI.

It is stated that Cleveland and Chicago capitalists have been successful in securing concessions for electric railway lines from Cairo, Egypt, to Mount Sinai and thence through Syria and Arabia to Mecca. A branch is to connect Damascus with the system at Mount Sinai. The company securing these privileges has been incorporated under the name of the Cleveland Construction Co. and it is estimated that the business during a single year of the annual Mohammedan pilgrimages to Mecca, to which place it is the duty of every Mohammedan to go, would pay a handsome profit on the cost of construction of the road, as the number of pilgrims is enormous. Trolley cars are already running from Jerusalem to Galilee. It is stated that the Sultan of Turkey has granted the greater part of the concessions for the proposed system.

NORTH AUGUSTA ELECTRIC & IMPROVEMENT CO.

One of the first interurban roads in the South of any considerable length is now being built by the North Augusta Electric & Improvement Co. of which Mr. Walter M. Jackson is general manager. The line is being constructed from Augusta, Ga., to Aikin, S. C., and connects several thriving towns. Its total length between Augusta and Aikin will be about 22 miles. About 8 miles of this has already been built and the company is pushing the construction of its power house as fast as possible. The road runs through Clearwater, Bath Longley, Warrentonville and Graniteville, all of which are manufacturing towns with large cotton mills already established.

TRAMWAYS IN NANTES.

A brief account of the tramways in Nantes was recently forwarded by United States Consul Brittain. The street railway company is called Compagnie des Tramways de Nantes and has its main offices in Paris. It is capitalized for \$380,000. The first part of the system was constructed in 1878-79 and was about $3\frac{3}{4}$ miles long. Subsequent additions have brought its length up to nearly 12 miles at present, and there are under construction lines which will cover four miles more.

The Nantes system comprises 54 tram cars propelled by means of compressed air, known as the Mckarsky method. The cylinders under the cars carry an air pressure of 60 kg. to the sq. cm. The cars cost \$4,535, and the operating cost of the line per mile is 8 cents. The cars with full equipment weigh 10 tons each. The motors rest upon the two axles, which are about 5 ft. 11 in. apart. The diameter of the wheels is 27.50 in.

There are nine compressed air reservoirs, which are divided into two groups of unequal volume, and the reservoirs of each group are connected to each other by means of tubes. The first group, called "batterie," is composed of seven reservoirs used in running at ordinary speeds. The other two, called "reserve," are used for hill climbing or extra heavy work. The air coming from these reservoirs passes into an upright cylinder filled with water heated to a temperature of 356 degrees F. The air enters at the bottom, passes through the hot water to the top and after becoming thoroughly heated, enters the motor cylinders by means of a regulator operated by a motorman who stands on the front platform of the car.

NOVEL RAILWAY BRIDGE.

The following illustration shows the details of the new street railway bridge which is being erected on the Sea Beach line of the Brooklyn Rapid Transit system and which was mentioned in the "Review" for September 15. The bridge is of novel construc-

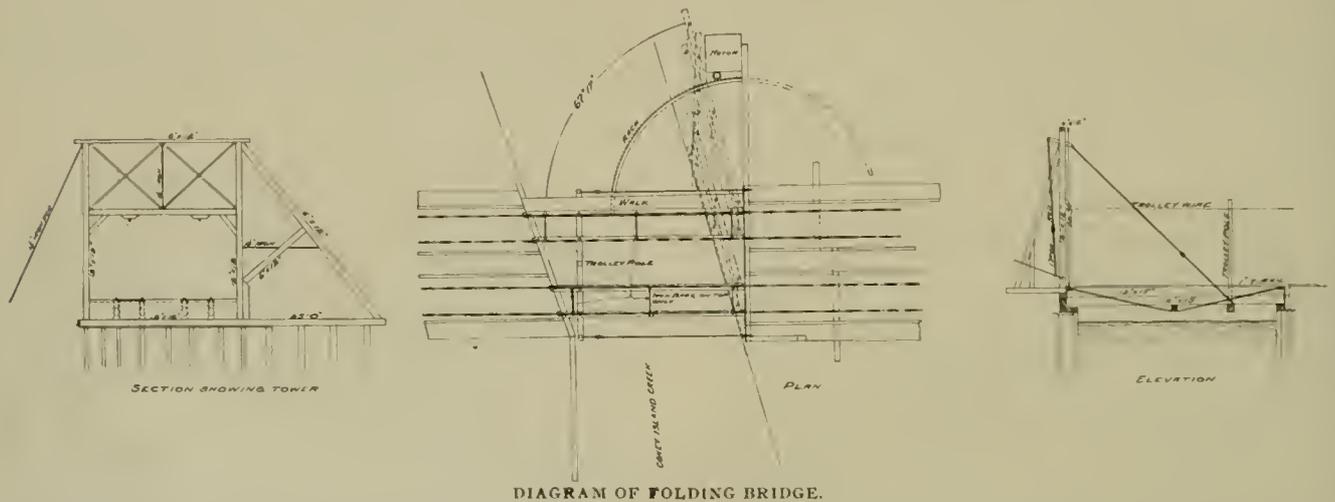


DIAGRAM OF FOLDING BRIDGE.

tion, as the rails are not laid upon the floor system as usual, but each one is laid upon an independent girder which is hinged at the gallows frame end and which swings in a horizontal plane with the hinge as a center when the bridge is open. As shown in the illustration these longitudinal girders on which the rails are laid fold back upon each other practically close together. The bridge may be said to fold like a fan, and there can therefore be no rigid lateral members. The cables for unlocking the bridge pass over the top of the gallows frame to the far end of the girders and are led down to a hand lever on each side. When the bridge is to be opened the bridge tender pulls down these levers, which raise the far end of the girders sufficiently to unlock the rails. The locking of the rails is effected by allowing them to fall into socket joints when the girders come in line. There is a circular arc, on which is bolted a casting with teeth, which leads from the far end to engage a gear wheel on a motor at the anchorage side. When the current is turned on this motor the revolution of the armature draws the toothed arc towards it and with it the bridge.

WIDE-AWAKE RELIEF ASSOCIATION AT NEW BEDFORD, MASS.

The employees of the Union Street Railway Co., of New Bedford, have a relief and social association that is conspicuous in showing the good to be derived by both employer and employes from an organization of this kind properly managed and financed. The



INTERIOR OF CLUB ROOM NEW BEDFORD.

society has been in existence about ten years and at the present time has a balance in the treasury of nearly \$5,000. Each member pays dues of 25 cents per month, and in case of sickness receives the attendance of a nurse and \$7.00 per week. In case of death \$100 is paid to the man's family for burial expenses.

The organization confines itself strictly to benefit and social

features and discussions on politics, trade unions and other topics likely to cause dissensions are not permitted nor encouraged by the men themselves. The street railway company is in full accord with the objects as declared in the by-laws, and furnishes free a commodious club room, light, heat, and a good library, including files of the "Street Railway Review" and other leading trade papers and dailies. The club provides for the care of the room and janitor duties. The furnishings include pool and billiard tables, card tables, and other games.

Once a year the members give a theatrical entertainment in the city opera house, and shortly after Easter time give a ball.

In speaking of the advantages of an employes' association from the standpoint of the company, Mr. E. E. Potter, superintendent of the Union Street Railway Co., emphasized the point that the men have an attractive place to spend their spare hours when off duty, and the street railway management can rely on being able to find a number of men on short notice should an emergency of any kind arise.

CAUSES OF FIRES.*

Fire occurs from all but incredible causes. The most common to railroad properties are: Sparks from locomotives, spontaneous combustion, defective chimneys, faulty electric wiring, carelessness, kerosene oil lamps, gasoline, fuel oil, sparrows nests, sawdust spittoons, surreptitious smoking, improper setting of stoves, steam pipes, air pipes, movable gas and lamp fixtures, hot bearings, matches, accumulation of rubbish. With many of these causes the mention of them suggests methods of avoiding the effect. Comment is made for the purpose of emphasis, as well as that through a fuller knowledge of them we may be enabled to make our fire service more efficient.

Spontaneous Combustion—A scientific study of this subject cannot be attempted within the limits of this paper. We will consider it as it commonly affects the fire risks of railroads. That vegetable oils when minutely divided, as on waste, rags or sawdust, ignites spontaneously is an accepted fact. Car oil, kerosene, gasoline, benzine, or any mineral oil will not ignite spontaneously. The dangers from oily waste, carelessly scattered about a round-house or shop, is not only that it assists the rapid spread of fire, but you cannot tell when there may be mixed with it waste or rags saturated with an oil that will ignite spontaneously. In nearly every shop and round-house paint materials are used, and the linseed oil used in mixing it is the incendiary material. Special precautions should be taken in paint shops to avoid accumulation of oily waste, old overalls or junk of any description. Discharge a foreman who, after receiving instructions to the contrary, permits the practice. It is not necessary. Do not permit a locked cupboard in your paint shop or painting section of round-house. Require regular inspection of the cupboard by the foreman. Require that overalls and jackets be hung up where air can circulate freely about them. Do not permit oil barrels to be set upon boxes or other raised support that is boxed in; the arrangement should be such that inspection can be readily made under and around them, and so that you can see what becomes of the drippings. The following are within my own experience: Painter had been rubbing up engine cab with oil; left waste which he had used in his jacket pocket. Hung jacket up against a wood partition at half-past five. Fire occurred before seven. Linseed oil barrels were upon support boxed in. Drip pans were provided for oily waste and emptied every night. Pails of sand provided for fire extinguishing. Rats made a nest from clean waste within the concealed space under the barrels. Oil dripped from the waste. The miracle in this case is that the building did not burn. Bituminous coal, carrying excessive quantities of sulphide of iron, will ignite spontaneously when stored away wet. The best way to handle it is to shovel out the heated mass. Do not put water on it if it can be avoided. Have your storage sheds well ventilated. Do not store in piles over seven feet in height without providing for ventilation through center.

Powdered charcoal will ignite spontaneously when in large masses.

Calcium carbide, while it will not ignite spontaneously, will, when brought into contact with moisture, give off very rapidly a very inflammable and explosive gas—acetylene. It should have a separate building for its storage and be kept dry. Mention is made of this, as some railroad companies are now using acetylene gas for headlights and in cars. The heating of unslacked lime, when wet, is well known. Keep it in a dry place.

Defective Chimneys—Chimneys should be inspected at least once a year. The danger from defects is greatest at the point where the chimney passes through the roof. If it sets over onto the roof, as is sometimes done to save flashing, or if any of the roof timbers are set into the chimney for purpose of support, any settlement of the building cracks the chimney directly under the roof boards. It is therefore essential that depot chimneys be inspected in the attic. Cut away all wainscoting or other woodwork six inches from pipe and soot pan openings, and bring to a flush finish with cement or mortar. See that all unused pipe openings are closed with a metal stopper—not with a board or stuffed with paper. Require brick chimneys for your round-house. They are safest and eventually cheapest. It may seem in some cases that the value of the building is not sufficient to warrant the expense of a brick chimney; but keep in mind that engines are worth from seven

to ten thousand dollars each, and that they are greatly discouraged by having even a worthless house burn over them. Do not run a stove pipe into an engine jack, as is sometimes done in small engine houses. It is particularly dangerous. Do not have your stove pipe enter a chimney vertically; always use an elbow. This avoids the danger of burning soot falling from the chimney, also back drafts from blowing fire from an open stove door.

Faulty Electric Wiring—This subject cannot be here treated exhaustively. If the installation is over five years old, or if you have had grounds or short circuits which you cannot locate, or any other trouble for which you do not know the cause, refer the inspection to an expert. He may make you more trouble, but you will feel safer. Almost all causes of fires from electricity are short circuits and grounds; but the number of causes for short circuits and grounds are many. Insulation and fuses are extra precautions, but there is no reason why the installation should not be perfect without them. Because a boiler has a safety valve is no reason why it should not be otherwise safely built.

In making your inspections consider the electric current as a heat producer. The heat is most intense where the current encounters the most resistance. It is the resistance of the carbon filaments in the lamp that gives you the light, because of the heating power of the current. Next treat the wires as bare; the insulation is simply an additional precaution. A great deal of trouble—most of it, in fact—is caused by poor workmanship. Pay especial attention, therefore, to the mechanical execution of the work—careful and neat running of wires, connecting, soldering and taping, and attaching of fittings. Do not call upon your tinsmith or boilermaker to install your electrical equipment, or to make extensions or changes to the one already in. Have it done by an electrician who knows his business. Rules have been formulated for safe wiring, and tests made of materials at a great expense by the National Board of Fire Underwriters. These rules and reports of approved materials are distributed gratuitously, and are obtainable by any electrician. Do not assume the wiring is all right because it works well. Look it over. See that it is kept clear from all other wires, pipes, metal, nails and injury. That it is tight enough to prevent swaying. That it is supported upon porcelain cleats or knobs. That where it passes through floors, joists, partitions or sides of buildings it is protected by porcelain tubes. Have wires looped downward where they enter buildings, to prevent water entering along the wires. Look out for wet places. See that staples are not used to fasten the wires. The wires should run clear in the air. Keep lamp cords clear of wires or metal. Be particular about this in your shops. Do not permit the ornamentation of your lamp cords or lamps with tissue paper. Keep lamps clear of woodwork or other combustible material. Within my own experience a 10-candle power lamp set fire to a varnished partition with which it was in contact. All cut-outs and fuses must be on a porcelain base and covered. If you have devices of this kind on wood bases, have them removed at once. When a fuse blows, try and find out what caused it. Do not have it replaced by a heavier plug; this is serious, as it destroys the safety of the fuse. Wooden switchboards are dangerous. If you cannot have it replaced by a slate one, you should at least see to it that the arrangement is such that the burning of the board will not set fire to the building. Keep your machines clean. When new work is installed by contract, stipulate that it shall be in accord with the rules and requirements of the National Board of Fire Underwriters. Then take the usual precautions to see that the work is up to contract.

Carelessness—The prevention of fires from carelessness is largely a matter of discipline. Look out for it in your tin shop—to my mind one of the most dangerous departments of railroad plants. See that proper care is taken of gasoline and charcoal fire-pots—that they are not carelessly set away in closets before cool. Notice how your men dispose of their torches, particularly in round-house.

I have noticed many wooden cupboards, the inside of which have been charred by hot torches. Note what disposition is made of hot ashes. Note the general order and cleanliness of the building. Be particularly careful in the shops where you have not had a fire for thirty years or more. You may be that number of years nearer one. Long immunity from fires seems to have a tendency towards carelessness.

Kerosene Oil Lamps—Require that these be filled and trimmed by daylight only. Provide facilities for this, and the storage of

*Extracts from a paper on "Fire Risks of Railways," read before the Western Railway Club, by W. B. Workman, fire inspector C. & N. W. Ry.

the oil supply, in a separate building if practicable. Provide dry sharp sand to take up oil drippings. Have the stand where lamps are filled and trimmed set out at least six inches from any woodwork. It is the usual custom of employes who care for switch lamps to leave the fonts of a number of the lamps burning on the stand while he is out distributing the others. Keep all oil cans securely corked. Do not allow accumulation of materials or rubbish around or over the stand where lamps are cared for. Provide an iron can to keep the oily waste in. Take the trouble to inform yourself how this feature of your fire risk is cared for. Empty kerosene and gasoline barrels are sometimes productive of fires. They are nearly always full of an explosive vapor, especially after standing in the sun.

Gasoline.—Gasoline gives off an explosive gas at an ordinary temperature. Great care must be exercised in handling it in buildings. Require separate, well ventilated buildings for its storage. Buildings should be ventilated at the floor as well as the roof. The gas is heavier than air. Be careful with your gasoline tire heaters. Place a check valve on both the inlet and outlet pipes. Require entire disconnection from air when not in actual service. When gasoline gas is used, as in car shops, see that air pressure is relieved every night. Have cut-off valve in gas pipe outside of but near to the building. Of course, have a cut-off at the carburettor also. Ascertain how much gasoline is kept in cans in your tin shop, and benzine in your paint shop; how it is cared for; whether the keeping of more than one day's supply in the building is avoidable. You will probably find much more of the stuff than you expected. If you discover any of the cans uncorked, or gasoline or benzine in open vessels—for washing brushes or other purposes—give the foreman the benefit of your professional advice, and his shop the benefit of a further inspection, because of having a careless man to deal with. Gasoline is always ready for business, and performs it promptly when the conditions are right.

Fuel Oil.—Much that has been said of gasoline applies with equal force to fuel oil. When it is inside the building you have a very inflammable, and when heated, explosive agent to help you along the wrong road in the event of fire accident. Arrange your apparatus to avoid the possibility of flow of oil into the building except as used. Do not pin your faith entirely upon one valve, especially if it is in close proximity to the burner. Do not feed by gravity pressure. Do not feed direct from a main supply tank of large capacity under air pressure. Have a supplemental tank outside the building, but near to if you please, where oil is used; the supplemental tank to be filled from the main supply tank. Feed the burners from the supplemental tank. Lay the pipes to the burners so they will drain back to the supplemental tank. Have a cut-off valve outside. Relieve the pressure from the supplemental tank every night. Be particular about this, or you will have the dangers of a gravity tank. Look at the location of your main supply tank, and consider whether in case of accident or leakage there is danger from the flow of oil towards your buildings.

Sawdust Spittoons.—Do not permit their use anywhere. If you must have spittoons, fill the boxes with sand.

Smoking.—This is a matter of discipline. Better prohibit it in your shops at least. It is probably the best you can do anyway. Do not allow the men to "light up" in the building before starting for home. The danger, of course, is in proportion to the laxity of discipline, and arises from smoking surreptitiously.

Improper Setting of Stoves.—Stoves should be free from cracks and have perfect doors over the ash pit as well as the fire pot. Floors should be protected by zinc, or an iron pan with an air space under it. Brick are not so safe. Should not be nearer unprotected woodwork than two feet. Protect exposed woodwork with bright tin or zinc which reflects heat. It is better than iron. If you use stoves in any of your woodworking shops, look out for the dust that settles on the upper surface of the stove pipe. Pipes should be riveted at joints and well supported. See that there is no woodwork within six inches of them where they pass through partitions. Do not run a stove pipe through a window, the roof, or the side of a building. Where wood is used for fuel, the pipes should be cleaned at least once in three months.

Steam Pipes.—There is considerable skepticism as to the danger from steam pipes, but the danger is there just the same. While steam pipes will not always set fire to boards or clothes carelessly laid upon them, they will heat and char such material, and it is only a question of confining the heat when fire will ensue. It is

an erroneous idea that a high degree of heat is necessary under all conditions to ignite ordinary combustible materials. The inspection of this hazard of your plant you will find laborious, but that of convincing your workmen of the dangers more so. The number of well authenticated cases of fires originating from steam pipes are numerous, and no argument should be necessary to convince you of the dangers of fires from this source. Keep the pipes free from woodwork, allowing an air space where they pass through floors, walls and partitions. Do not permit accumulation of material or dust on the pipes or on or behind the radiators. Do not permit the pipes or radiators to be used as drying racks—in fact, treat them as a stove. When a pipe is hot enough to be uncomfortable to the bare hand, it is dangerous to have combustible material in contact with it. Steam pipes are particularly dangerous where they pass between floors or through hollow partitions out of sight. Mice and rats build their nests of waste and rags near them, and if the pipes do not actually fire the mass, they are an active factor in promoting spontaneous combustion. Have your steam pipes in plain sight.

Air Pipes.—Your air pipes, particularly in close proximity to the compressor, may become as dangerous as steam pipes. Examine them and determine whether they are safely arranged. Keep in mind they have the additional power of spreading fire because of their oiliness. The following, within my own experience, is a curious instance of fire from this cause. A battery of pipes used for distributing air for operation of switches became coated on the inside with oil from the cylinder of the compressor. The pipes became sufficiently hot to ignite the oil inside the pipes, although the battery was over one hundred feet from the compressor. As the pipes were attached to the exterior of a brick wall in open air, no damage resulted other than the destruction of the iron pipes and disablement of the switching apparatus. In another case, however, the pipe became red hot at an elbow in close proximity to the compressor, and set fire to the surrounding woodwork.

Movable Gas and Lamp Fixtures.—Protect these with stops, to prevent swinging under or against inflammable material. This is a quite common cause of fires.

Hot Bearings.—While these may not be entirely avoided, the bearings can at least be kept free from oily accumulations, which spread a fire rapidly. Bearings in your woodworking shops should be examined every night after shutting down.

Matches.—The old "seven-day" match, or those that light only on the box, are the safest. It is dangerous to permit workmen to keep the ordinary parlor matches in the drawers of their work benches, the sliding motion of which, in opening or closing, frequently ignites them. They should be kept in metal boxes in your store rooms.

Accumulation of Rubbish.—Do not permit it in any of your buildings. Look out for it, particularly in your freight houses. It has a bad moral effect. If you must preserve your junk, build a shed for it; but usually, if material is usable, there is or should be a proper place for it; if it is not, it should go to the scrap pile. If there is anything in the shop or depot building, or freight house, that is not necessary in the conduct of the business carried on in the building, get rid of it. The trouble is, if you allow the accumulation, although it may at first look innocent, the corner or out-of-the-way place in which the pile starts, soon becomes the dumping ground for anything the workmen may want to get rid of handily. You cannot keep the locality clean, and, sooner or later, you will have conditions ripe for spontaneous combustion.

LAKE STREET EXTENSION PLANNED.

The Chicago Lake Street Elevated officials are considering an extension of the road to Wheaton and the plan is to be discussed at the meeting of the directors which will take place in the near future. The refusal of River Forest to allow the Lake Street company to go through that suburb unless a 5-cent fare to Chicago was granted is said to have kept the company from pushing this plan for an extension in the past. The company, however, has possession of the Chicago & Harlem tracks running from the western terminus of the elevated at 52nd Ave. to Oak Park and to the Harlem race track. If the plan for the line to Wheaton is carried out it will be an extension west of the present Oak Park surface tracks.

CAR HOUSE AT WORCESTER, MASS.

In the accompanying drawings is illustrated a car house now in course of construction for the Worcester Consolidated Street Railway Co., at Worcester, Mass. From the plan and sketch it will be noted that the designs call for several particulars which are rather out of the ordinary but are believed to be in the line of general improvement.

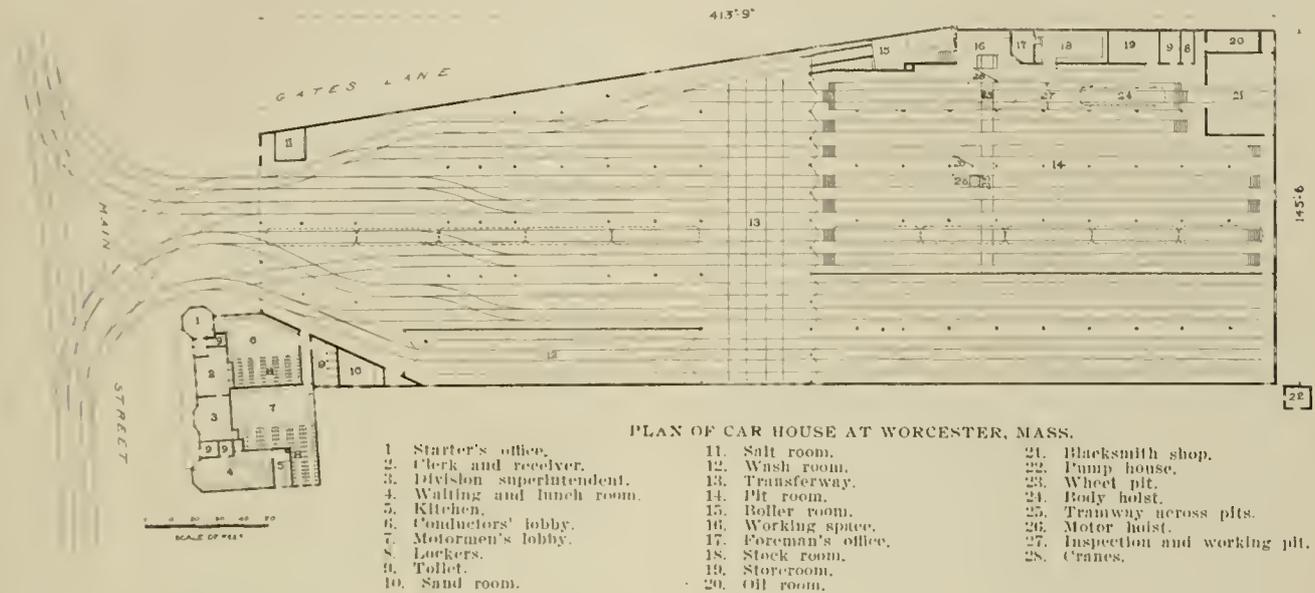
This car house covers about 11-3 acres and has capacity for

the foreman's office. At the lower end of the inspection pit is the car body hoist, with the blacksmith shop just beyond. In this way a car body can be raised and the truck or wheels rolled direct into the blacksmith shop for repairs.

Ample toilet and locker rooms are provided for the pit men.

A fire proof oil room is partitioned off from the main room for the storage of oils.

The pit, wash room and lobby building are heated by steam from the boiler room, located on one side near the center of the



100 35-ft. cars. The lobby building at the front, beside having locker accommodations for about 350 men, contains an office for division superintendent, clerk, receiver and starter, a large waiting room, and lunch room.

The layout of tracks at the entrance is such that each track in the house has virtually an individual connection to the main line, the entering tracks being so arranged in pairs that cars coming in and going out will not interfere with each other. This feature would greatly facilitate running cars out in case of fire.

A large sand room and a salt bin are provided for in the front portion of the house, with a long wash room along the side.

A transferway across the center of the house makes possible greater dispatch and freedom in moving cars.

PITS.

Nearly the entire rear half of the house is arranged with pits. These pits as a whole, do not differ greatly from ordinary pits, but some features are combined to considerably expedite repair work on car bodies, trucks and car equipment.

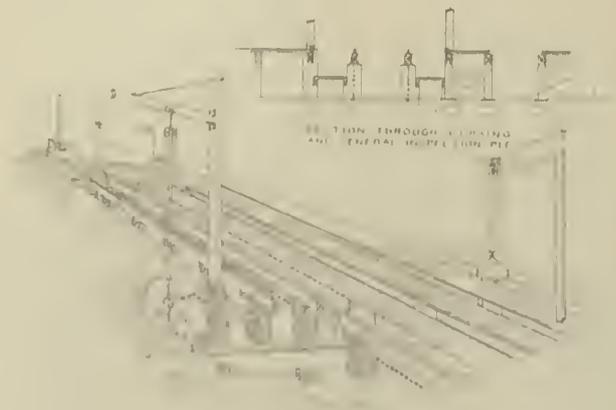
First in importance is the inspection and working pit which is novel inasmuch as the floor on each side of the track, as shown in the sketch, is dropped a little over one-half the depth of the pit. This allows an employe, without being forced into a cramped position, to get at the side of the car for renewing running boards, tightening nuts, and doing any other work that has to be reached from the sides of the car. The arrangement also gives the maximum amount of light around the lower parts of the car. Under the car house floor and running crosswise of the pits is a set of tracks giving communication from one pit to another. A four wheel truck or carrier runs on these tracks, and the rails are sunk below the pit floor level so as to bring the platform of the carrier flush with the pit floor.

Along the line of the cross tracks are arranged the wheel pits and motor hoist. Wheels and motors can be dropped on the carrier, taken to the side of the pit, and hoisted out for repair, with the least amount of work and without moving the car. Over one end of the cross track or tramway and on the same level as the car house floor is a large space fitted with work benches and tools for making various car and truck repairs, giving a working space convenient to the point where the bulk of the work is to be done. This space is located near the stock room and is in plain view from

building. As will be seen, the coal pocket is arranged so that the coal car can run in over and dump its load directly into the bins.

The main water supply for washing and plumbing comes from a small pond on the premises. The water is to be pumped to a 30,000-gallon tank on the roof and distributed by pipes to all parts of the building.

The interior of the house is well lighted by monitors on the roof, the sashes of which are glazed with ribbed glass.



We are indebted for the accompanying drawings to Mr. Frederic F. Low, architect, of 101 Milk St., Boston, Mass. Mr. Low has done a large amount of architectural work for the Boston Elevated Ry., and is an authority on designing tower and car houses and general street railway work.

The St. Louis Transit Co. has ordered 100 new cars for the Broadway line to be put in commission May 1st by which time the new power house on Salisbury St. shall be completed. General Manager de Pont is quoted as stating that the Broadway line will be the latter branch of the company's system.

ELECTRIC TRACTION ON RAILWAYS.

Is electric traction, which is being so rapidly developed in towns, to prove of service to our railway (steam railroads) systems?

With the economies which might be fairly anticipated, were our main lines of railway operated by electrical energy instead of by numerous steam units as at present, I have, to some extent, dealt previously. The conservation of our coal; the greater purification of the atmosphere; the increased cleanliness of all things forming part of or bordering upon the railway, are natural advantages contributing to the welfare of the community at large.

If such a change could be effected at once, very many improvements in the mode of dealing with the traffic would appear feasible. Thus trains might be despatched at more frequent intervals—trains of lesser magnitude, capable of traveling at a higher rate of speed. It is obvious that this might also, to some extent, be accomplished by the steam locomotive, but to do so would mean a large increase in the number of engines and tenders, increased engine shed accommodation, and all attendant expenses.

In my official capacity it is not my duty to determine the speed at which trains should travel, but I cannot refrain from expressing my conviction that if it were possible to lessen the enormous difference which now characterizes the speed of passenger and goods trains great advantage would follow. This can only be accomplished by lessening the mass of the goods and mineral trains, and bringing it more under the control of the brake—a result which probably will never be attained under the steam locomotive regime.

The advantages that would accrue from a facilitation of the traffic scarcely call for demonstration. Wherever the traffic is of a mixed character, involving the movement of trains at speeds varying from, say, 20 to 60 miles an hour, time must, even where scheduled time is observed, be sacrificed; and this loss must be greatly aggravated by the shunting of the heavy trains for the passing of those of a preferential character. The magnitude of the results arising out of this is not, perhaps, fully appreciated, for the existing mode of working the traffic scarcely admits of its consideration. But let us assume that in shortening these slow and heavy trains we are able to run them at a speed of not less than 40 miles an hour. As there would be no shunting for the reason that, with the exception of the express trains, all would be moving at about the same speed, it is clear we should practically double the capacity of the line, and that without increasing the labor charges, because, although we double the trains, we halve the time. The number of trains that would come under this category would probably be 75 per cent of the entire number, and if the method would admit of the acceleration of the expresses also, it may well claim an increased capacity of 100 per cent. In other words, such a result would avoid that duplication of lines which is now unavoidable, and which is adding so many millions, year by year, to the capital account.

The operation by electrical means of the passenger traffic, as it is conducted to-day, would appear to present no difficulty, for if necessary, each carriage could be provided with the necessary motors for its propulsion; but to work a railway economically—to reap the full advantages of an electrical service—it is necessary that the entire traffic of the line, goods as well as passenger, should be worked by the same means. To work one class of traffic by electricity, and the other as at present, by steam units, although such a course is quite practicable, would involve a large increase in both capital and current charges; for the cost of establishing and operating electrical working for the passenger traffic would be very little less than it would be if dealing with the entire traffic, and there would still remain the cost attending that portion worked by the steam locomotive. Such a course appears to me impracticable. Therefore, in considering the initiatory stage of replacing the steam by the electric locomotive, we have to face the present condition of traffic—to deal with the trains as they are made up for the former type of motor. Assuming it were determined to test the possibilities of electricity on a given section of a line of railway, whatever that section might be—whether terminal or intermediate—the electric motor would require to haul the trains that might reach that section of the line as they were handed over from, or required to be carried forward by, the steam locomotive. It would, in fact, have to take the place of the latter, and do its work. It may be said its capabilities to do this under all conditions have not been

proved. It will, however, be clear that, assuming one electric locomotive incapable, there is no reason why two should not be coupled together in the same manner that steam locomotives are coupled. And in doing so, it is worth while noting that we should reap some advantage, for not only would it be possible for the two to be controlled by one man, or one set of men, but in distributing the weight over a great wheel base, we should, to that extent, reduce the impact on bridges and other structures over which the vehicles pass. The importance of this will be apparent when we realize that the total weight of a modern locomotive and tender loaded exceeds 100 tons; that of this weight some 34 tons is comprised within a wheel base of 9 ft. 6 in.; 26 tons and 24 tons each within 5 ft. 6 in. The tendency of the day is to increase the speed of passenger trains and the load of the goods and mineral trains, and to this end to employ larger and more powerful engines. In either case this course must involve greater stress on both permanent way and structural works; and to this extent it would appear that the two electric locomotives would be more acceptable to the engineer of the line than would the steam locomotive.

Much interest no doubt attaches to those railway conversion problems in hand here and in other countries; but assuming them proved—assuming them to be a success, would that success be deemed sufficiently definite to lead to its adoption on main lines generally? I scarcely like to commit myself to that opinion. I have full faith that our railways will be worked by electrical agency, but I want, with you, to look the probability squarely in the face. Every line of railway has its own mode of dealing with its traffic, and the character of the traffic is not the same on all lines. The only satisfactory way to prove the power of electricity to meet existing conditions is to impose upon it the work to be done. To do so on a suitably selected section of line would not be a great tax upon the resources of any one of our great railway companies, especially as it need not in any way, for the time being, derange the steam-worked traffic passing over that section of line.

Now let us look at the subject from another point of view. Electricity is credited with the power of accomplishing greater speed at a less cost than steam. An impression is abroad that greater facilities for rapid transit between large centers of commerce are a necessity of the day. If it should transpire that electrical propulsion is inapplicable to main line traffic as a whole—a conclusion which few would, even at the present moment, accept—it will unquestionably lead to the establishment between the chief commercial centers, of high speed passenger electric traction on independent lines. Communication between Manchester and Liverpool has, so far, been met—and one would say, amply so—by three lines of railway, all running a good train service, yet the construction of an electric line on the mono-rail system has received Parliamentary sanction. It is an object lesson, and tempts me to ask whether the requisite powers would not have been preferably granted to one of the existing lines of railway—a line of railway capable of interchange of stock and of connection with other lines—to employ electrical agency as its motive power, had powers for that purpose been sought.

Nothing could be more disastrous than that competition of such a character as, for instance, that thus initiated between Liverpool and Manchester should arise. Whatever success may attend competitive electrical enterprise in this respect must be, to some extent, prejudicial to the established systems. If the former should prove a pecuniary success, the reverse must be the condition of the latter. The capital invested in existing railways exceeds thirteen hundred million pounds. The wholesale depreciation of such a vast sum, the interest of which forms the income of numerous families and annuitants, would be little short of a national calamity. Naturally, were independent electric lines of railway to be established between the chief centers of commerce it would still leave a large mileage of the existing lines of railway unaffected by them, but is it from those parts of a railway system that the earnings come? The consequence must be, at the least, a decreased dividend, and probably in the end an enforced establishment on the older lines of a similar electric service between large towns.

The work of the railway engineer is to construct railways; and if the opportunity arises he will not be deterred from doing so by any consideration of the injury his work may inflict upon existing interests. The way to prevent him from doing so is to make it clear that there is no profitable need for any such addition; and this can only be accomplished by the existing system showing that they are

*Extract from the inaugural address by W. Langdon, president of the Institution of Electrical Engineers.

prepared to avail themselves of the same means—to afford as far as possible the same facilities and advantages as are to be derived from independent electrically worked lines.

It has been advanced that the existing lines of railways are unsuitable for higher speed; that the stock is cumbersome, and that the system is generally unsuitable. This has to be proved.

Railways have to face the fact that electricity as a motive power is before them. That if it is not applied to the existing systems—if they do not elect to avail themselves of it, it will come independently, and in competition with existing interests.

To attempt to approach the subject in a piecemeal fashion by dealing with a branch line here or there may be of service, but it can scarcely affect the main issue. While a small branch line is being converted, new lines between important centers will be constructed, and the passenger traffic between those centers will at least be split between the old and the new service. No one doubts the ability to apply electrical energy to branch lines, but many will doubt whether the traffic of a branch line can be so regulated as to form a continuous and remunerative service throughout the day. With main lines there can be no doubt of a regular demand, while most branch lines can with convenience be dealt with from the main line power station. Manifestly, however, if the trunk lines are eventually to be operated electrically, whatever may be done in relation to branch lines should be done with a view to harmonize with that system which will be ultimately employed on the main lines. I do not presume to indicate what that system may be—whether alternating or direct current—but it is clear that for main lines an overhead electrical service is inadmissible; and equally, to my mind, is a rigid or semi-rigid rate of speed. With a line carrying one class of traffic this latter question may not be so important, but on lines carrying a mixed traffic this cannot be so, for the power to vary the speed is a factor which must have an important bearing upon the working of the line. The speed, subject to a maximum limit, must be in the hands of the driver.

To those with whom may rest the privilege to establish electrically worked lines I would, with all respect, venture to say: Be careful that you do not retard that great work which sooner or later must invite attention. In the establishment of light high-speed point-to-point passenger lines, little difficulty may be encountered. It is not with them, however, that the interest of the country needs your aid so much as in the conversion of those lines which are already established. It is where competition of a fruitless character—fruitless in that it will not prove productive of a return to the shareholder of the new more than to the shareholder of the old—steps in that capital will be squandered.

LOCATING FAULTS IN UNDERGROUND DISTRIBUTION SYSTEMS.

A paper on the subject of locating faults in underground cables was read by Mr. Henry G. Stott at the November meeting of the American Institute of Electrical Engineers, in which he pointed out a number of the difficulties as well as the advantages of several systems commonly used in underground cable testing. He pointed out that, as a matter of fact, it is impossible to use a sensitive galvanometer in any test involving the use of the earth as a part of the circuit owing to the leakage of street railway currents from the rail through the earth.

The distance between manholes is evidently the practical degree of accuracy essential to any successful method. These distances will average about 350 ft. Assuming that 25 ohm is the limit of accuracy obtainable in the loop test, this means that the method is not applicable to any conductor larger than No. 9 B & S gage. It is therefore of no practical value for lighting and power purposes.

The resistance measurements being eliminated there remain three other methods, which are called the "cut-and-try" method, the "smoke" method and the "compass" method. The cut-and-try method is dismissed with a few words as being too bad to merit much description. It simply means cutting the cable into as many sections as is necessary until the fault is located in the length between manholes. This is a slow and very expensive method and should only be used as a last resort. A three conductor high-tension cable joint costs from \$5 to \$10 and a joiner and helper cannot make more than two joints per day, so that if the cable is

long it may take several days to put it into service after removing the fault by the cut-and-try method.

The smoke method is also crude and simply consists of putting a current of sufficient magnitude into the cable through the fault to burn the insulation and give out volumes of smoke by which the location of the fault may be discovered upon opening up the manholes. The method is more rapid in attaining results than the former one as no unnecessary cuts are made in the cable, but it may give rise to serious trouble to other cables especially if the fault be in a manhole, as the flames would burn not only a large length of the cable itself but also other cables, or cause explosion due to the ignition of gases ever present in city conduits. The compass method in the writer's opinion is the only practical and safe means of quickly and accurately locating the grounds in large cables. This method consists briefly in sending a constant, continuous current of about 10 amperes into the cable through the ground. The current is first passed into an automatic reverser which reverses the direction of the current flow every 10 seconds. A manhole is then opened near the center of the cable length and a pocket compass laid on the lead sheathing of the faulty cable and observed for say, a half minute. If the ground is farther from the source of the reversed current the compass needle will swing around approximately 180 degrees, upon every reversal at the end of each 10-second interval. The manhole is then immediately closed and another one opened say a mile farther away from the source of test current, and if no motion of the compass needle occurs then the fault has been passed, and another manhole is opened between the first two positions and so on until the fault is finally located in the section between two manholes. It will be noticed that by this method the cable is not cut, thus causing no delay or expense in rejoining; the number of manholes opened is a minimum and the time spent in each is only about one minute; the amount of current used is so small that no arcing or burning occurs and no explosions.

Before putting on the reversed current to make these tests it is advisable to break down the fault resistance by the application of a high potential testing transformer to the cable for a few seconds.

FROM THE MEDITERRANEAN.

The accompanying illustration is reproduced from a photograph for which we are indebted to Mr. John T. McCutcheon, the artist-correspondent, whose cartoons and letters from the Philippines are



A STREET CAR IN PORT SAID.

doubtless well known to our readers. This photograph is a snap shot, taken in Port Said at the entrance to the Suez Canal by Mr. McCutcheon when he was heading for the Pacific on board the McCulloch—to join Dewey as events turned out.

A French syndicate is reported to project a new system of electric railways in Mexico City. Capital to the amount of \$16,000,000 has been subscribed for the purpose.

MAIL ON STREET CARS.

Mr. George B. McAllister, who we believe is the originator of the street car mail service in the United States, has proposed a new plan for improving the efficiency of post offices in large cities by utilizing the entire electric railway service for the constant collection of mail and, in a measure, for its distribution. The system proposed has been tried to a certain extent in Grand Rapids, Mich., and is considered a success in that city. The plan is to have a long slot on the side of every car into which letters may be dropped while the car is in motion. This will be provided with a special mechanical device to insure protection against rain. In this way it is expected that mail matter will be taken into the main office in a steady stream and never too much at a time to prevent the quick sorting and redespach to its destination again by trolley car to its proper sub station. The mail collectors will pass over their route continually without the necessity of going to the post office with their collections, as wherever they cross a car line they would drop their letters in the slot on the car going towards the post office.

The letter boxes on street corners would not be abolished by this system, but collections from them could be made at short intervals, their contents being deposited in the most convenient car by the postman as often as he happens to pass the box.

It is believed that this arrangement would avoid the congestion and rush at the distributing centers with each delivery of the collection there, and that the mail matter reaching the post office in a steady stream would greatly simplify the work of the sorters. The scheme is a modification of the arrangement which Mr. McAllister has employed in the Grand Rapids system of electric mail car service.

SNOW PLOW USED AS LOCOMOTIVE.

The Saratoga division of the Hudson Valley Railway Co. tried an experiment in handling its heavy traffic last season which worked very successfully. The accompanying illustration tells the whole story. Taking the nose off its snow plow, which is equipped with two G. E. 57 motors, the company replaced it with a crude fender



UTILIZING SNOW PLOW FOR SUMMER SERVICE—HUDSON VALLEY RAILWAY CO.

and pressed the plow into service as a locomotive. Five trail cars loaded with about 600 passengers were made into a train and hauled to and from Saratoga Lake with comparative ease and without accident by this locomotive. Six empty trailers have frequently been handled in the same way, and the innovation has proved very satisfactory. This division of the road reported one-third better business for last season than in any previous year.

REBUILDING OLD ROADS.

BY J. A. P.

When one starts to build a new electric road he can figure very closely and with comparative ease just how much it should cost and what material he will require, but when he starts with an old road which has run down until little is left of it that hangs together, it becomes a different matter.

If the road is still in operation you can form a better idea of it because then you can tell about what condition your machinery, roadbed and rolling stock are in. If, on the other hand, such road has been shut down for several years appearances may be very deceptive, and what may look to be in good condition may turn out absolutely worthless.

To estimate the cost of reconstructing such a road a fixed plan of procedure should be adopted. Start out by making a thorough examination of the engine and dynamo room. See what condition everything is in. If the road has been shut down for some time, don't take somebody's word for it that the machines were in perfect condition when the road was closed. Perhaps they were, and yet you may find on starting up that your engines will need rebuilding, valves leak, pipes out of repair, etc. The dynamos may look and test out satisfactory, but will the insulation stand a continuous and heavy load? Sometimes defects will not show for some time after you have started.

In the boiler room the pipes, pumps, valves, flues, walls, etc., should receive careful attention and be thoroughly tested, otherwise a bad leak may be found where least expected after you start up, and then it means either a shut down or costly overtime work to repair it.

If the line is equipped with old open motors the sooner you scrap them and put in iron-clad motors the less expense and annoyance you will have. It hardly pays to repair such old motors, as the parts may be exceedingly hard to get and as a rule are far more expensive than those of later pattern.

You may attempt to start with such old motors, but if they have been standing idle, perhaps in a damp car barn, for any length of time, the chances are very much in favor of the insulation being

rotten. The motors may run for a short time and then comes a time when you want every car, and at this time your troubles commence and you wonder when burn-outs and short circuits will ever let up.

My experience has been that when such old motors once commence breaking down the sooner they are discarded the cheaper it will be for the company; the better plan is not to waste money or

time on them, because to rewind and generally overhaul them will cost more than buying a modern enclosed motor, even though it is second hand.

On track rebuilding, if a majority of the ties are rotted out, it does not pay simply to put in a few ties here and there to hold the track together until some future time. This may work for a few months, but if you stop to figure up the time it then takes to put the track in proper shape you will find you are paying double for the work. If it is a buried track you will be obliged to open up spaces which have been filled in in order to put in new ties, bolts, plates, etc.

Old poles are even more deceptive than ties. In rebuilding a road last summer I found the poles set 6 ft. in the ground, with 1 ft. of concrete at the base, then filled in with dirt, and another foot of concrete just around the pole 4½ ft. from the base. This left a 6-in. dirt fill at the top where the concrete had acted as a basin for water, and every pole, no matter how good above the ground between the concrete fillers, was rotted to such an extent at the surface of the ground that it required only a slight pull to break it off. Poles were found with but 2 or 3 in. of solid wood in this 6-in. space. Had this top filler of concrete been placed on a level with the ground, or slightly above the ground, it would have accomplished what had been desired, namely, to keep the water from soaking into the poles near the surface. In regard to bonding, I have found that bonds covered by cinders are rapidly eaten away. This action seems to vary, however, in different localities, and is perhaps due to the acids or other substances in the cinders.

Cinders taken from glass plants have a decided tendency to burn off bond wires, and also where bonding is defective to quickly burn or eat half oval spaces out of the rails around the spikes.

In rebuilding a road a thousand and one things come up which a person does not have to contend with when constructing a new line. When building new you know just how much and what kind of material you want; but when rebuilding an old road you have to contend with what you have to match, and this is often as difficult as matching a ribbon. Then there are little things here and there which require attention, and these soon run up into money.

Then perhaps a line was originally laid out to sell real estate, and you may have dead lines to contend with. In such cases it is advisable to "make haste slowly" and thoroughly study the conditions of the town and locate your lines where it is evident people will patronize the cars.

This is not always in the most densely populated districts, as the class of residents, occupations, etc., must be studied before one can determine whether they will patronize a line or not. Some may do so on Saturdays or Sundays, but the balance of the week your cars may run empty. The people to reach are those who are most apt to be regular passengers every day in the week.

All these matters must enter into the consideration for rebuilding such roads, and it is evident, therefore, that it is no easy task to decide on what is best to do in all cases and yet keep the cost down as low as possible.

THE CABLE IN EDINBURGH.

The municipal cable system which was installed in Edinburgh in 1847 has proved a costly failure to the city both financially and mechanically. In 1892 the municipality acquired the horse tramways for the sum of \$1,070,000. The council decided that the citizens would not permit the streets to be disfigured with the overhead trolley system and the underground trolley system was considered too expensive, so the cable was finally adopted although it was pointed out at that time that cables were being abandoned all out of date in the United States. It was estimated that a cable plant could be put in operation for about \$3,000,000, but the expense has already reached \$5,840,000 and the system is not yet complete. A number of costly mechanical devices for conducting cars around complicated curves have been tried and abandoned. Following these mechanical failures comes the failure of the company which leased the tramways to pay the agreed 7 per cent on the capital expenditure, which amounted to about \$200,320 a year, and which the leasing company declares it cannot pay out of the earnings. It has therefore applied to be relieved of its lease, and the city is suing for a large amount of arrears.

McKINLEY AT AUSTIN, TEX.

The accompanying illustration is from a photograph which was received through the courtesy of Mr. Frank E. Scovill, superintendent of the Austin Rapid Transit Ry., and was taken at Austin at the time President McKinley passed through that city on his trip to California. On that occasion he was entertained at Austin for about six hours, in which time he made one speech at the State University and another at the Capitol, where the ladies of Austin entertained the ladies of the Presidential party.

The photograph shows Joseph D. Sayers, governor of Texas, with Mr. McKinley, and was taken at the foot of the Capitol walk. The city was handsomely decorated, and as Mr. McKinley was the



McKINLEY AT AUSTIN, TEX.

first president to visit it, the entire country tributary to Austin turned out to do him honor. The arch shown in the picture was erected at the foot of the Capitol walk and in the circle above were the words "Our President" shown in electric lights, while at the depot there was an arch of the same size and style containing the words "Welcome to Austin" on one side. The reverse was in electric lights spelling the words "Au revoir." Every span wire on the line of the Austin Rapid Transit Ry. for 12 blocks on Congress Ave. supported a row of 15 incandescents lamps and there were four flags between each two suspension poles, the latter being handsomely decorated.

STREET RAILWAY ACTIVITY IN CANADA.

The Canadian Legislature has recently been asked to charter 1,046 miles of track by 12 different companies. The territory in which these companies are interested extends from Cornwall to Windsor and if all the lines were built there would be a continuous line between these two points with the exception of a short stretch from Glencoe to Tecumseh. On the north another system is being promoted which will reach from London to Owen Sound, skirting the shore of Lake Huron.

The following list gives the names of the companies and the length of roads for which franchises are desired: Ontario Electric Co., 321 miles; Hamilton Suburban Ry., 76 miles; St. Thomas Street Railway Co., 33 miles; Aylmer, St. Thomas & London Electric Ry., 33 miles; London Railway Co., 114 miles; Sandwich, Windsor & Amherstburg Ry., 16 miles; Morrisburg Electric Ry., 29 miles; Petrolia Rapid Railway Co., 18 miles; Goderich Radial Lines, 270 miles; Hamilton Radial Electric Railway Co., 6 miles; Rapid Electric Railway Co., 40 miles; Toronto & Hamilton Electric Ry., 40 miles.

The Fairhaven & Westville Railroad Co. has put six new double truck cars, manufactured by J. G. Brill & Co., in commission on its lines in Fairhaven, Conn.

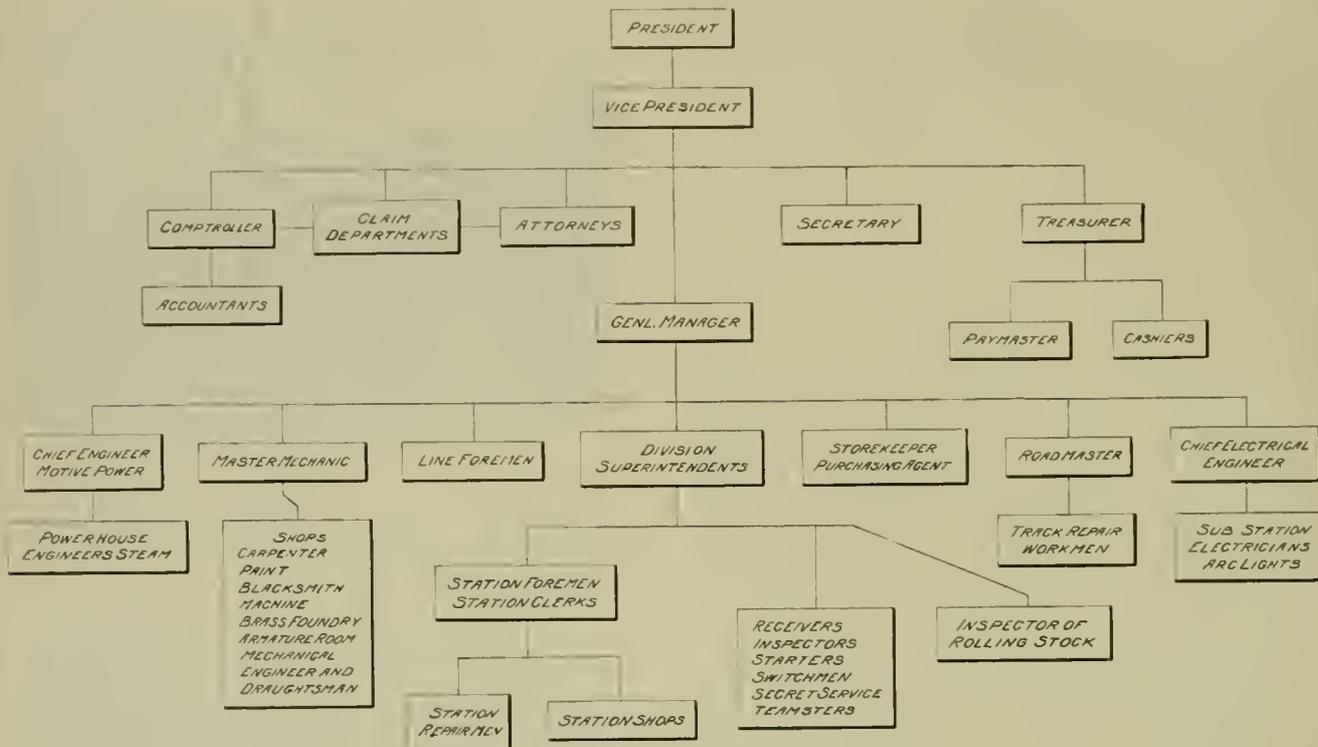
January 6th the Cleveland council passed an ordinance granting a franchise to promoters of a street railway to be operated on a 7-cent fare basis in Cleveland. Mayor Johnson is interested.

ORGANIZATION OF THE TWIN CITY RAPID TRANSIT CO.

We have received through the courtesy of Mr. J. F. Calderwood, comptroller, the following diagram which represents the relations of the various officers and employes and shows the distribution of authority which has been established in the management of the Twin City Rapid Transit Co. The president is the executive head of the company, the vice-president being the only officer reporting directly to him. Each principal department head of the company reports directly to the vice-president, including the general manager, who, as the diagram shows, stands in the same relation to the operating and construction departments as the vice-president stands to the legal financial departments. The relations of all the different employes and

CONSOLIDATION IN SAVANNAH.

The Savannah Electric Co. has assumed charge of all the electric railway, light and power interests in the city of Savannah, and the operation of the trolley lines will hereafter be in the hands of the new company. By the terms of the consolidation the Savannah Electric Co. becomes the owner of the real and personal property rights and franchises of the Savannah, Thunderbolt & Isle of Hope Railway Co., the Savannah & Isle of Hope Railway Co., the City & Suburban Railway Co. and the Edison Electric Illuminating Co. The officers of the new company are: President, George J. Baldwin; treasurer, J. H. Johnston; secretary, Edward J. Thompson. George O. Nagle, formerly superintendent and assistant general manager of the Chicago City Ry., has been appointed general manager, and C.



ORGANIZATION OF TWIN CITY RAPID TRANSIT CO.

officers is clearly shown in the accompanying diagram, from which it will be seen that the men employed in each department are controlled by the head of that department, who alone reports to his superior officer.

STREET CAR TELEPHONES.

A street car telephone has been recently invented by Mr. Benson Bidwell and has been given a test on the lines of the Muskegon Traction & Electric Co., which it is said resulted to the entire satisfaction of the inventor. For use on an electric road with an overhead trolley, the latter is used as a portion of one side of the telephone circuit. A second wire is strung on blocks which are attached to the poles along the road. This wire is parallel with the other and a few inches distant from it. To the trolley pole of the car is attached a second metal pole and this makes contact with the second wire by means of a revolving wheel with deep flanges. Two ordinary telephone wires are connected to the trolley poles and these wires are run through the roof of the car and attached to the transmitting and receiving instruments. Two cars equipped in this manner were used in the test and with either one or both of them at rest or in motion the passengers were able to call up and talk to each other in an ordinary tone of voice. It is stated that an effort will be made to organize a company for the manufacture of telephones to be used on street cars and railroad trains.

B. Kidder assistant manager. T. P. Keck is superintendent of power stations and transmission lines.

A circular addressed to the employes was issued by Mr. Nagle in which he stated that there would be no present change in the personnel of the inferior officers and employes of the old companies. President Baldwin also stated that it was the wish of the company to retain in their present positions those of the employes of the old companies who are competent and faithful, and dismissals will only be made for cause.

The company has arranged for an issue of \$3,500,000 of 50-year gold bonds; \$1,250,000 of this sum will be used for acquiring properties and making improvements; \$250,000 more will be used to take up the bonds of the Edison Electric Illuminating Co., and \$1,000,000 of the remainder for the bonds of the Savannah, Thunderbolt & Isle of Hope Ry. The remaining \$1,000,000 of bonds are to be turned over to the company by the trustee from time to time as required under the condition that no part of the bonds is to be paid over until the company has made permanent improvements to the property, and then the bonds turned over shall not represent more than 80 per cent of the value of these improvements. The company agrees to spend each year, beginning with 1906, for permanent improvements, exclusive of the cost of operation, not less than \$20,000. The first extension to the present line of the company to be considered is from the present terminus of the company's line to the manufacturing district west of the city. It will be the policy of the company to do everything possible to develop the suburbs of the city to the greatest extent.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ABUTTER MAY ENJOIN BUILDING OF ELEVATED TRESTLE UNTIL HE IS COMPENSATED.

State ex rel. Smith v. Superior Court of King County (Wash.)
66 Pac. Rep. 385. Oct. 14, 1901.

This suit was brought to enjoin the Seattle Electric Company from building a trestle and elevated railway in a public street in front of the relator's property. The trestle was to be constructed at a height of about 25 feet at one end of his property, and 15 feet at the other end thereof, above the grade of the street, and to occupy about 25 feet in the middle of the street, which was 66 feet wide. He averred that this would cut off the access to his property and interfere with his light and air. A temporary injunction was granted, with a proviso that it should cease to be operative upon the company's executing a bond for \$30,000 conditioned that it would pay him any damages which he might suffer by the construction of the trestle and railway tracks. But the supreme court of Washington holds that it was error to attach this proviso, and that it had jurisdiction to issue a writ of certiorari or review, under the constitution and statutes of the state. It holds that through this proviso the relator was denied the constitutional guarantee that "no private property shall be taken or damaged for public or private use without just compensation having been first made or paid into court for the owner." It also holds that the remedy by appeal, which he had, was not adequate, because by the time the appeal would be reached in the ordinary course of law the structure would be completed, and the damage worked.

LIABILITY FOR ASSAULTS OF EMPLOYEES AND OTHERS—DUTIES IMPOSED BY CONTRACT OF CARRIAGE—ON EMPLOYEES—WHEN CONDUCTOR MAY USE FORCE.

Birmingham Railway & Electric Co. v. Baird (Ala.), 30 So. Rep. 456. May 31, 1901.

The law is well settled, the supreme court of Alabama says, that for torts, such as assaults and the like, committed by the agents or employes of a common carrier upon persons who are not passengers the employer is not liable, unless the act was in a sense in the line of duty imposed by the employment.

But as between the carrier and its passengers an entirely different rule prevails. As to them the contract of carriage imposes upon the carrier the duty not only to carry safely and expeditiously between the termini of the route embraced in the contract, but also the duty to conserve by every reasonable means their convenience, comfort and peace throughout the journey. And this same duty is, of course, upon the carrier's agents. They are under the duty of protecting each passenger from avoidable discomfort, and from insult, from indignities, and from personal violence. And it is not material whence the disturbance of the passenger's peace and comfort and personal security or safety comes or is threatened. It may be from another passenger, or from a trespasser or other stranger, or from another servant of the carrier, or from the particular servant upon whom the duty of protection peculiarly rests.

In all such cases the carrier is liable in damages to the injured passenger. And it is of no consequence, when the wrong is committed by the carrier's own servant—even that servant particularly charged with the duty of conserving the passenger's well-being en route—that the act bears no connection or relation with or to the duties of such servant to the carrier, and is not committed as an incident to the discharge of any duty; but is utterly violative of all duty, and apart and away from the scope of employment as that term is understood in the class of cases first above referred to. The carrier is liable in such cases because the act is violative of the duty it owes through the servant to the passenger, and not upon the idea that the act is incident to a duty within the scope of the servant's employment; and it is manifestly immaterial that the act may have been one of private retribution on the part of the servant, actuated by personal malice towards the passenger

and having no attribute of service to the carrier in it. It is wholly inapt and erroneous to apply the doctrine of scope of employment, as ordinarily understood, to such an act. Its only relation to the scope of the servant's employment rests upon the disregard and violation of a duty imposed by the employment. This is, beyond question, the court thinks, the true doctrine or principle; and while there are adjudications against it, the great weight of authority supports it.

Of course, the court further says, a conductor has the right of self-defense against the assault of a passenger; but the right is the same in this connection as in criminal law. He must be imperiled, and he must be without fault. To be sure, he need not retreat from his car. And he may assault a passenger when necessary to protect other passengers from assault, using no more than necessary force, and this may become a duty—indeed, it is a duty whenever it is a right. But he cannot assault a passenger in retaliation for an assault committed upon himself or upon another passenger, and, all the more, he cannot assault a passenger for abusive words, or in revenge or punishment, under any circumstances. And if he does assault a passenger otherwise than under a necessity to defend himself or a passenger from battery, or in rightfully ejecting a passenger, who, by his conduct towards other passengers, has forfeited his right of carriage, the carrier is liable. The fault of the passenger, short of producing a necessity to strike in self-defense, will neither justify the conductor in striking, nor relieve the carrier from liability for his act. Possibly, such fault could be considered in mitigation of damages.

CONTRACT SATISFIED AS TO THE TIME OF BEGINNING OPERATION OF ROAD—MAY DIG DITCHES ON RIGHT OF WAY TO RAISE ROADBED—POWER TO RECEIVE CONVEYANCE OF RIGHT OF WAY NOT DECIDED.

St. Louis & Belleville Railway Co. v. Van Hoorebeke (Ill.), 61 N. E. Rep. 326. Oct. 24, 1901.

For \$1 in hand paid, and the benefits to be derived from the construction and running through their land of a double track electric railway, and for the further consideration of the performance of certain conditions set forth, the owners of a tract of between 70 and 80 acres of rather low land contracted to convey a right of way 100 feet wide through said land. One of the conditions of the contract was that on or before May 1, the company should construct and operate continuously, regularly, and daily a double track electric railway on said right of way. It was conceded that the road was finished and in operation May 20. Moreover, the evidence showed that the road was operated as early as May 1, and before that time, by the running of one or more construction cars upon the track, which construction cars also carried passengers. Yet, on May 15, the landowners gave notice declaring the contract void. But the supreme court of Illinois, after a careful examination of the evidence, thinks that the company complied with the terms of its contract. It says that these parties permitted the company to take possession of the ground, which they agreed to convey to it for a right of way, and to spend an immense amount in grading the road, in laying rails, in building a power house, in erecting poles necessary to hold the wires used in the construction of an electric railway, in stringing the wires, and in otherwise perfecting the construction of the road. They permitted the company to do this for 15 days after they knew of what they claimed to have been a default on its part. Under these circumstances, it certainly would be a great wrong and injustice to the company to enforce a forfeiture of the contract.

Nor does the court think that there was any excuse for the landowner refusing to comply with their contract to convey the right of way by the manner in which the company had constructed the road thereon, or by its having so made use of that portion of the right of way lying outside of the railroad bed, by making excavations or digging ditches to get dirt for the construction of the roadbed, as to injure the balance of the tract of land. That is to say, it is of the opinion that the elevation of the roadbed from two to four feet above the surface of the ground, in this case, and the

settling of water in the places where the excavations for dirt to do this with were made, were not circumstances which would justify the landowners in refusing to comply with their contract. It accords to the company the same rights in this respect that it would grant to any railroad company.

The court wants it understood, however, that it was assumed by counsel on both sides that this company had power to receive a donation or conveyance of a right of way, and to condemn land for such right of way, and that it passes no opinion upon that subject, as it was not a contested question, but when a disputed question arises as to the existence of such power, it does not intend to be cut off from considering it by anything here said. It merely holds that, assuming such power to exist, because counsel on both sides seemed to concede it in this case, it does not think that the company had so failed to perform its contract, or had performed it in such an improper manner, as to justify the landowners in refusing to execute a deed to it. The corporation was organized, under the general railway act of Illinois, for the purpose of building and operating a double track electric railway between the cities of East St. Louis and Belleville.

INJURY OF PASSENGER BY ELECTRIC SHOCK—EVIDENCE OF SAME—OF NEGLIGENCE.

Buckbee v. Third Avenue Railroad Co. (N. Y. Sup.), 72 N. Y. Supp. 217. Oct. 4, 1901.

A shock occasioned by contact with an electric current, the second appellate division of the supreme court of New York holds, must be regarded as a direct physical and personal assault, for which a negligent defendant may be held liable. And it affirms in this case a judgment for damages for injuries alleged to have been sustained by a passenger in stepping on or over the metal door sill at the rear of the car as she left the same on becoming alarmed at the sight of flames shooting from the controller box. The car was operated by electricity communicated from underground, and one witness testified that the flames extended beneath the car its entire length. The appearance of the flames was preceded by a loud report or explosion. Another witness testified that the flames started in front, and went underneath the car, burning a long while. The plaintiff herself testified that she received an electric shock, and described the sensations she felt indicating it. At the time, she was in perfect health and vigor, and a physician who examined her within two hours of the occurrence, after stating her condition then, testified that an electric shock received as claimed would be an adequate cause for it, although he admitted that a blow or any injury in the lumbar region might also be an adequate cause, but said that he found no evidence of such injury. Two other physicians, who made examinations, gave evidence of the existence of a permanent injury, which they said an electric shock received as claimed would be sufficient to produce. The court holds that this was abundantly sufficient to establish a prima facie case of injury resulting from electric shock. Then, it holds that the company's negligence was not only established by this evidence, but also by proof that the phenomenon described could not have existed if the electrical appliances of the car were in proper shape. It is true, there was evidence that the car, after the accident, was used the same day on four through trips without further harm; but there was no evidence of any subsequent inspection, and no direct evidence that it was not out of order. Under these circumstances the positive evidence was not sufficient, the court holds, to justify the assumption that the company was free from blame as matter of law.

LIABILITY FOR DAMAGES OF POWER HOUSE TO ADJOINING PROPERTY—AS TO ITS BEING A NUISANCE.

Chicago North Shore Street Railway Co. v. Payne (Ill.), 61 N. E. Rep. 467. Oct. 24, 1901.

The supreme court of Illinois affirms here a judgment for \$2,000 damages to property from the establishment on adjoining premises of an electric power house for the operation of this railway. It says that such structures of a railroad company, erected in pursuance of lawful authority for the uses of its road, are permanent structures. This company, acting within its charter, had a legal

right to maintain its power house at that place, and the party suing had no lawful right to interfere or compel a change. In such a case, in legal contemplation, all damages which will be sustained as the effect of the act are sustained immediately, and the measure of damages is the depreciation in market value. If the president or some other individual had built the power house, and operated it himself, and sold the power to the company, the use would have been a private one, but the thing would have been a nuisance, and the owner of it liable as an individual. At common law the power house and the business carried on adjoining the dwelling house of the party suing would be such a nuisance as could be remedied by an action on the case for damages, or, perhaps, by an injunction against its continuance. If, however, the erection and maintenance of the power house were things which the company's charter authorized it to do in the operation of its road, and they were performed in a reasonably skillful and proper manner, although of such a character as to injure and annoy the party suing as the adjacent property owner, they would not constitute a nuisance, and could not be abated as such. Nevertheless, the company would be liable for the damages to the same extent and under the same rules as though the power house were a nuisance. The charter of the company does not, under the present state constitution, take away from the adjoining owner the right to recover for the noise, jarring, smoke, and disturbance resulting from the power house.

DUTY TO PERSONS ON PRIVATE RIGHT OF WAY WHEN THROWN OPEN TO THE PUBLIC.

Liekens v. Staten Island Midland Railroad Co. (N. Y. Sup.), 72 N. Y. Supp. 162. Act. 4, 1901.

People making use of thoroughfares which are thrown open to the public, and upon the surface of which street railroads are being operated, the second appellate division of the supreme court of New York holds, may properly assume that the way is a public highway, and that it is subject to the same rules of law, in so far as the active duty of the street railroad company is concerned, as though in fact it were a public highway. They may use such public way in the manner customary upon other highways similarly situated, in the absence of notice to the contrary by the owners of the fee or legal title; and the street railroad company is bound, as in the case of other highways, to exercise a reasonable degree of care to prevent injury to persons so using such ways. The company, owning the way, as where it is on its purchased right of way, may protect its right of way for its cars by fencing it in, or by erecting barriers of any kind; but so long as it presents to the public an open street, differing in no essential particular from any other public highway, it cannot, consistently with law, be relieved of the duty of exercising the same degree of care which would be incumbent upon it if the way was in fact a public highway. Here was a passenger in a coach, which was traversing what the court says the company held out to him as a public thoroughfare, and which it admitted he had a right to travel, except that it undertook to say that, inasmuch as it was on a right of way which it owned leading to a summer resort, in so far as its tracks were concerned, its right was exclusive, and that upon that portion of the way it owed him no duty, or at least none other than not to wantonly, willfully, or intentionally injure him. But such a rule the court declares would be shocking to the sensibilities of the community, and would permit transportation companies to invite people to public resorts upon the private property of the corporations, and to slaughter them without any adequate responsibility. This party was not a mere licensee upon the private premises of the company.

RIDING ON REAR BUMPER—WARNING AND PERMISSION OF CONDUCTOR.

Nieboer v. Detroit Electric Railway (Mich.), 87 N. W. Rep. 626. Oct. 22, 1901.

A man desiring to take a car at about 6 o'clock p. m., under the plea that it was crowded, climbed upon the rear deadwood or bumper. Two others also got on it. Then, the car stopping at a point evidently not anticipated by the motorman of the car behind it, the latter struck it. The blow was not a severe one, and no one in either car was injured but this man, who in some way had his ankle hurt, the other two referred to saving themselves by

jumping from the car. He obtained a judgment for damages, but the supreme court of Michigan reverses this, ordering no new trial. It says that he was not invited to ride upon the deadwood. No custom was shown permitting him to ride there. The company had instructed its employes not to permit it. It was not intended or sanctioned for the use of passengers. It needs no argument to demonstrate that the position was a dangerous one, and never intended as a place for passengers to ride. There was neither an express nor implied assent for him to ride in this dangerous position. The conductor advised him not to ride there, by telling him that he better get off and wait, or get inside. This language cannot be construed into an invitation. It was a busy time. The conductor was not called upon to stop and put him off. He had done all that was required in warning, if, indeed, he needed any warning. He knew that, if the car was crowded, others were coming within two or three minutes, which he could have taken, and the testimony showed that there was room on the next car. He voluntarily, and without invitation or permission, chose to ride in a dangerous place, rather than attempt to get inside or wait a few minutes for another car. His negligent act was a continuing one, and directly contributed to the injury. When a place is one not provided or intended for passengers to ride upon, and is in itself dangerous, the employe who assumes to permit a passenger to ride in such a place acts without authority, unless such authority be shown expressly or by common custom.

INJURY OF DEAF-MUTE WALKING ON TRACK ON PRIVATE RIGHT OF WAY—DUTY OF MOTORMAN—DECLARATION OF AS EVIDENCE.

Floyd v. Paducah Railway & Light Co. (Ky.), 64 S. W. Rep. 653. Oct. 17, 1901. "Not to be officially reported."

A deaf-mute was run down by a car on a street railway track built on a strip of land at the side of the highway. It appeared from the evidence and admitted facts that the motorman saw the man when 150 yards from him. He repeatedly and continuously sounded his gong, but the man walked on, paying no attention. He then blew his whistle repeatedly, and still the same result. Yet, the court of appeals of Kentucky says, he set no brake, and did not get his car under control, though he could not reasonably expect his continued soundings of the gong and whistle to be more effective than the signals he had given. When he saw the man in front of him on the track he had the right to suppose he would get out of the way, but when he saw he was unaware of the approach of the car, and that the sound of neither the gong nor the whistle affected the man, it was his duty to know what was apparent to a person of ordinary care, situated as he was, and he should have taken such steps as ordinary care required to get his car under control; for after he saw the man on the track, and perceived this, or in the exercise of ordinary care should have perceived it, after seeing the man on the track, and being aware of his danger, he could, by the exercise of ordinary care, have avoided the injury. The question of contributory negligence on the part of the man should also be submitted to the jury. Proof offered to the effect that the car track was much used by persons walking between the suburb and city which it connected the court holds was immaterial, and properly excluded, as the car track was not in the highway, and such use gave the public no right to it. A declaration made by the motorman at the scene of the injury, just after the wounded man was got from under the car, the court holds was a verbal fact directly growing out of the transaction and a part of it, and should have been admitted in evidence.

CARE REQUIRED OF PERSONS CROSSING TRACKS WHEN MUST "STOP, LOOK, AND LISTEN"

Tacoma Railway & Power Co. v. Hays (U. S. C. C. A.), 110 Fed. Rep. 466. Aug. 19, 1901.

It was contended here that the rule usually applied to the conduct of persons crossing the tracks of steam railroads is applicable to street railroads as well, and that the omission of the party suing to "stop, look, and listen" before crossing the track of the electric street railway was negligence as a matter of law. But the United States circuit court of appeals, ninth circuit, says that the rule, even in the case of steam railroads, is not inflexible, but is dependent upon the surrounding circumstances to a greater or less

degree, and is only applicable to street railways where the attending conditions are such that reasonable care and prudence would dictate such precautions. The duties of persons with respect to steam railroads and street railroads are not so analogous as to be governed at all times by the same rule. The rights of the person are greater, and the dangers less, in connection with the latter; the rights of street cars, no matter by what power impelled, not being superior to those of other vehicles, save in the one instance where a vehicle is bound to get out of the way, and not to obstruct the passage of the car, owing to the inability of the car to travel in any other part of the street. The element of trespass is entirely absent in the case of a person crossing a street railway at any point, and the only care required of him is that which a reasonably prudent man would exercise, having due regard to the rights of others, and assuming that others (including the street car companies) will exercise the same care in fact, knowing that such care is imposed by municipal regulation upon the persons operating the street cars. This assumption does not, of course, warrant such a reliance upon it as to neglect means of self-preservation, but is an element of consideration in arriving at the standard of care to govern the particular case. Here, a man, with a double team attached to a farm wagon covered with canvas, closed behind, looked up the street just as he left the grocery, but could see no car on the track for a distance of a quarter of a mile, and, after proceeding along the line of the track at a moderate speed for 400 feet, turned to cross the track, without again looking for a car, not having heard any warning signal of the approach of a car, and not believing that a car could overtake him in that length of time if running at the rate of speed (limited to 12 miles an hour) required by municipal ordinance. Under these circumstances, the court holds that the question of contributory negligence was for the jury, and affirms a judgment for damages.

INJURY OF PERSON ATTEMPTING TO BOARD CAR WHEN IT FIRST REACHES A CROSS STREET—TIES IN STREET NORMAL STOPPING PLACE—MOTORMAN AND NEGLIGENCE—INCREASE OF SPEED.

Schmidt v. North Jersey Street Railway Co. (N. J. Sup.), 49 Atl. Rep. 438. June 10, 1901.

The evidence showed that at the lower corner of a street, intersecting that on which ran the line of the railway, a group of intending passengers stood awaiting a car; that the plaintiff crossed to the upper corner, and stood there with others, as a car was approaching; that he waved his hand towards the car, which slackened its speed, but did not stop; that two passengers got safely on the car; that the plaintiff seized the hand rail, and placed one foot on the step, and, with the other on the ground, was dragged along until he came in contact with some railroad ties near the track, in the middle of the intersecting street, when he lost his hold, and received severe injuries. He and one witness testified that the speed of the car increased after he had taken hold of the railing; another witness for him and several witnesses for the company testified that there was no increase, but instead a decrease of the speed of the car. No proof was offered that the motorman in any way indicated that he meant to stop at the upper corner, and he testified that he did not notice any one there. Under these circumstances, the supreme court of New Jersey holds that a verdict in favor of the company should have been directed, (1) because, on the facts stated, a jury could not fairly find negligence chargeable to the company; and (2) because, with the railroad ties in full view, the plaintiff assumed all risk of injury from them when he attempted to get on the moving car.

The court says that if the company could, for any purpose, be held responsible for the maintenance there of the ties, it was quite clear it could not be chargeable with negligence towards an intending passenger; for they were not at a place where it could reasonably be supposed by any one that a car would stop to receive or discharge passengers. In the absence of any contrary indication, the place for a car to stop at an intersecting street is opposite a sidewalk. It is almost common knowledge that the normal stopping place of an electric car at an intersecting street is after crossing the roadway of that street. And the court holds that it is too much to expect that in the operation of stopping a car where there may be a miscalculation as to how far the mo-

mentum will carry it, or it may be necessary to check, and then accelerate, the speed on account of the movement of persons or vehicles in the street, that the motorman must always anticipate that persons standing on the upper corner of the street might be expecting to board the moving car.

While it is not necessarily a negligent act to get on or off a slowly moving street car, yet, in order to charge negligence upon the person controlling the propulsion of the car, some affirmative act of his, showing a lack of due care for the probable contingency of passengers so getting on or off, must be proved. In this case, for example, it would have been necessary to prove that the motorman increased the speed of the car when he had reasonable cause to suppose that a passenger might be in the act of getting upon it.

Then, the court says that there was hardly enough proof to go to the jury of an increase, after slackening, of the speed of the car. It says that the plaintiff's belief that the car did go faster is easily understood by any one who has ever tried to board a moving car propelled by electricity. It is very easy to underestimate before the act the rate of speed which is found to exist after the attempt is made.

OPERATION OF CARS DURING STRIKE.

Fewings v. Mendenhall (Minn.), 86 N. W. Rep. 96. May 17, 1901.

The question as to when and under what circumstances street railway companies will be held, as to passengers, guilty of negligence in attempting to operate their cars at all during a strike of their employes, is, the supreme court of Minnesota says, an important one to them, and to the public as well. To the former, for, if they are to be held guilty of negligence in attempting to operate their cars whenever force and intimidation are used by their striking employes to compel them to suspend the running of their cars, then they must submit to such unlawful force and cease to discharge their duties to the public, or yield to the demands of the strikers, whether just or unjust. Especially important is the question to the public, for the uninterrupted operation of an efficient street car system has become a practical necessity to a large number of our urban population. They have established their homes, arranged their business and work with reference to it, and their comfort, convenience, and pleasure are largely dependent upon it. Therefore those who are charged with the public duty of operating street cars, in consideration of valuable franchises, cannot be permitted to omit the duty for any cause save the most pressing, such as the practical impossibility of discharging the duty, consistent with the further duty to exercise the utmost vigilance and care in guarding their passengers against violence, from whatever source arising, which may be reasonably anticipated or naturally be expected to occur, in view of all of the circumstances of each particular case. It then necessarily follows, the court holds, that a street railway company is not guilty of negligence, as to its passengers, in attempting to operate its cars during a strike of its employes, unless the conditions are such that it ought to know, or to reasonably anticipate, that it cannot do so and at the same time guard from violence, by the exercise of the utmost care on its part, those who accept its implied invitation to become passengers.

Again, it was contended in this case that, because the stone which injured the plaintiff, a passenger, was thrown by a third party, who was not one of the strikers, the defendant, who was operating the road as receiver, was not in any view of the case responsible for the resulting injury; that the defendant had a right to assume that all persons, except the strikers, would not only refrain from any acts of violence or lawlessness, but, on the contrary, would use their best efforts to suppress them, and hence the defendant had no reason to anticipate the act which injured the plaintiff, and therefore could not be charged with negligence for not guarding against it. But this course of reasoning the court says ignored the actual conditions existing at and before the time of the injury. If the conditions had been normal, if there had been no strike, no mobs, no excitement, and no resentment on the part of the strikers and the many who sympathized with them, the contention would be correct. The evidence, however, tended to show that the actual conditions were the reverse of those sug-

gested, and that lawlessness, not order, reigned in and near the place of the injury. It was therefore, upon the evidence, the court holds, a question for the jury whether the defendant ought not, under the circumstances, to have reasonably anticipated violence from persons not directly connected with the strikers, and to have exercised due care to protect his passengers therefrom. Furthermore, the court holds that evidence tending to charge the defendant with notice of the conditions existing and events occurring before the plaintiff was injured was properly received.

RIGHTS OF CLAIMANT WITH DISTORTED EVIDENCE—DIRECTING VERDICT—RUNNING OF CHILD ACROSS STREET—DUTY TO CHILD CLINGING UPON STEP TO AVOID INJURY—FAILURE TO SOUND GONG WHEN TURNING INTO STREET.

Aiken v. Holyoke Street Railway Co. (Mass.), 61 N. E. Rep. 557. Oct. 18, 1901.

The supreme judicial court of Massachusetts says that every one is aware that among the many suits brought to recover for personal injuries there are cases, of which, however, it does not mean to intimate that the present one was an instance, in which unjust claims are sought to be sustained by testimony which, if not wholly false or manufactured, is so colored and distorted as to tend to mislead juries and judges and to pervert justice. Yet the plaintiff in such a suit has the right to have his alleged cause of action determined by a jury, if upon any reasonable view of the conflicting evidence it can fairly be found as a fact that he was hurt while in the exercise of due care, and by the defendant's fault. If in any jury trial there seems to be danger that the jury will give an unjust verdict upon evidence which in law ought to be submitted to its decision, the proper course is to take the verdict, and then to set it aside as against the evidence, or the weight of the evidence, rather than to order a verdict. There is no justification for the latter course in a suit in which it does not appear that any wrong verdict has ever been taken.

The court further maintains that it cannot be held, as matter of law, that for a child of six or seven years to run across a street on his way home from school is of itself negligence. Here the boy in question was about six and one-half years of age, and testified that his attention was attracted by the whistle of steam cars which were crossing the same street at a more distant point; and the court holds that neither the fact that he was running, nor that he did not see the electric car, precluded a finding that he was in the exercise of such care as might be expected from an ordinarily prudent child of his years.

Again, the court holds that while at play he carelessly ran into the car, and if in attempting to save himself from the consequences of such a collision he found himself upon the car, the company could not rightfully disregard his peril, if informed of it, and run its car as if nothing had occurred. There was abundant testimony that before the boy was finally thrown from the car he was upon the step, in a place of comparative safety, very near and in full view of the motorman, and requesting the motorman to let him off, and that the motorman, instead of stopping or attempting to stop the car, increased its speed, and so caused him to be thrown to the ground and run over. To be sure, this testimony was contradicted. But whether it was true or not was a question for the jury. If it was true, and if the boy was not a trespasser attempting to steal a ride, to disregard the peril of a child of less than seven years of age, who by his own careless collision with a street car was clinging, frightened, upon the step and to the handle of the car, instead of attempting to comply with the child's request, was a course of conduct of such a clear and direct tendency to inflict serious injury as to be actionable, when practiced by one traveler towards another in a public street, where both were lawfully present.

Then there was evidence which would justify a finding that the car turned into the street across which the boy was running without sounding the gong, and at a speed variously estimated at from two to five miles an hour. Whether due care on the part of the company would require it to give warning of the entrance of the car into the street by ringing the gong, the court holds, was a matter peculiarly within the province of the jury to determine. It could not be said, as a matter of law, if the gong did not sound, that the omission was not negligent.

THE FT. WAYNE-CINCINNATI INTERURBAN.

The accompanying map shows the system of the Ft. Wayne, Dayton & Cincinnati Traction Railroad Co., which was described in the "Review" for December, 1901, page 926. The heavy lines on the map show the proposed divisions of this system, which includes about 400 miles and connects cities between its terminals aggregating about 1,000,000 inhabitants. Ground was broken at

vided for and ground for freight and cattle yards has been secured in all of the principal towns along the line.

HARTFORD-SPRINGFIELD INTERURBAN.

The opening of the interurban trolley line between Hartford and Springfield, Mass., occurred on January 13th, under the auspices of the Hartford & Springfield Street Railway Co. The first cars over the line left Hartford having on board a number of the officers of the road and officials of the two terminal cities and intervening towns who were guests of the company. When the car reached Warehouse Point the party stopped at the power house which they inspected and lunch was served in the car barn. The trip over the remainder of the road was then resumed. The building of a small stretch of road four miles long from Warehouse Point to connect with the South Windsor branch of the Hartford Street Ry. supplies one of the missing links of an almost complete trolley line between New York and Boston. This gap has been built by the company which controls the portion of this line between Hartford and Springfield.

ST. LOUIS CAR SHEDS BURN.

January 11th the St. Louis Transit Co.'s Bellefontaine car barn at 19th and Farragut Sts. was burned, together with over 50 open electric cars which were stored there. The fire entailed a loss of \$65,000 which was covered by a blanket insurance policy carried by the company. The power house and other property of the company adjoined the burned building, but were not damaged to any extent. Traffic was not delayed, as it was not found necessary to shut down the engines while the fire was in progress. The origin of the fire is unknown, but it made such rapid headway after it was discovered that when the firemen arrived the building was beyond the hope of saving and the attention of the men was turned to the more valuable property adjoining which escaped any damage.

SNOW FIGHTING EQUIPMENT AT WORCESTER, MASS.

The Worcester Consolidated Street Railway Co., with 130 miles of track to cover, owns the following snow fighting equipment: One Peckham rotary plow, fitted with two independent 40-h. p. motors for driving the fan; three Smith & Wallace double truck plows; three Wason double truck nose plows; and two Wason single truck shear plows.

With the Peckham rotary plow it was found that sometimes when working in very hard snow the four motors on the plow would drive it faster than the fan could eat its way into the drifts with the result that there was danger of overloading the fan motors. To avoid any chance of this an ammeter is placed in the fan-motor circuit enabling the operator to tell just what load the motors are carrying and he can regulate the speed of the plow to correspond with the speed with which the fan is cutting into the snow. A heavy red line on the scale of the ammeter designates the danger point above which the fan-motors will be overloaded.

INCIVILITY.

The New York, New Haven & Hartford R. R. prints on its time tables the following suggestion:

"Passengers are respectfully requested to report to the general passenger agent any instance of incivility on the part of employes of this company. While it is the aim of the company to redress just grievances, it is suggested that courtesy is equally commendable, whether practiced by the railroad employe or the passenger."
This ought to make a good notice to post in street railway cars.

Service on the Metropolitan West Side Elevated Ry., Chicago, was suspended from nine till eleven o'clock on the evening of January 12th, owing to a fire in the controlling tower at the railroad bridge from which the switches on the approach to the bridge are operated



ROUTES OF THE FT. WAYNE-CINCINNATI INTERURBAN.

West Elkton, O., Dec. 15, 1901, for the construction of this road which the company states will be pushed ahead as rapidly as possible. Two important features of this system are that the lines do not parallel any existing railroad and that a private right of way will be used throughout. It is to be operated on the third rail system and the conditions favor running at high speed. The train service is promised to be thoroughly modern in every respect and to include vestibuled express trains between the terminals. It is expected to conduct the road on the basis of a main line railroad and an extensive freight and cattle transportation is being pro-

IN THE POWER HOUSE

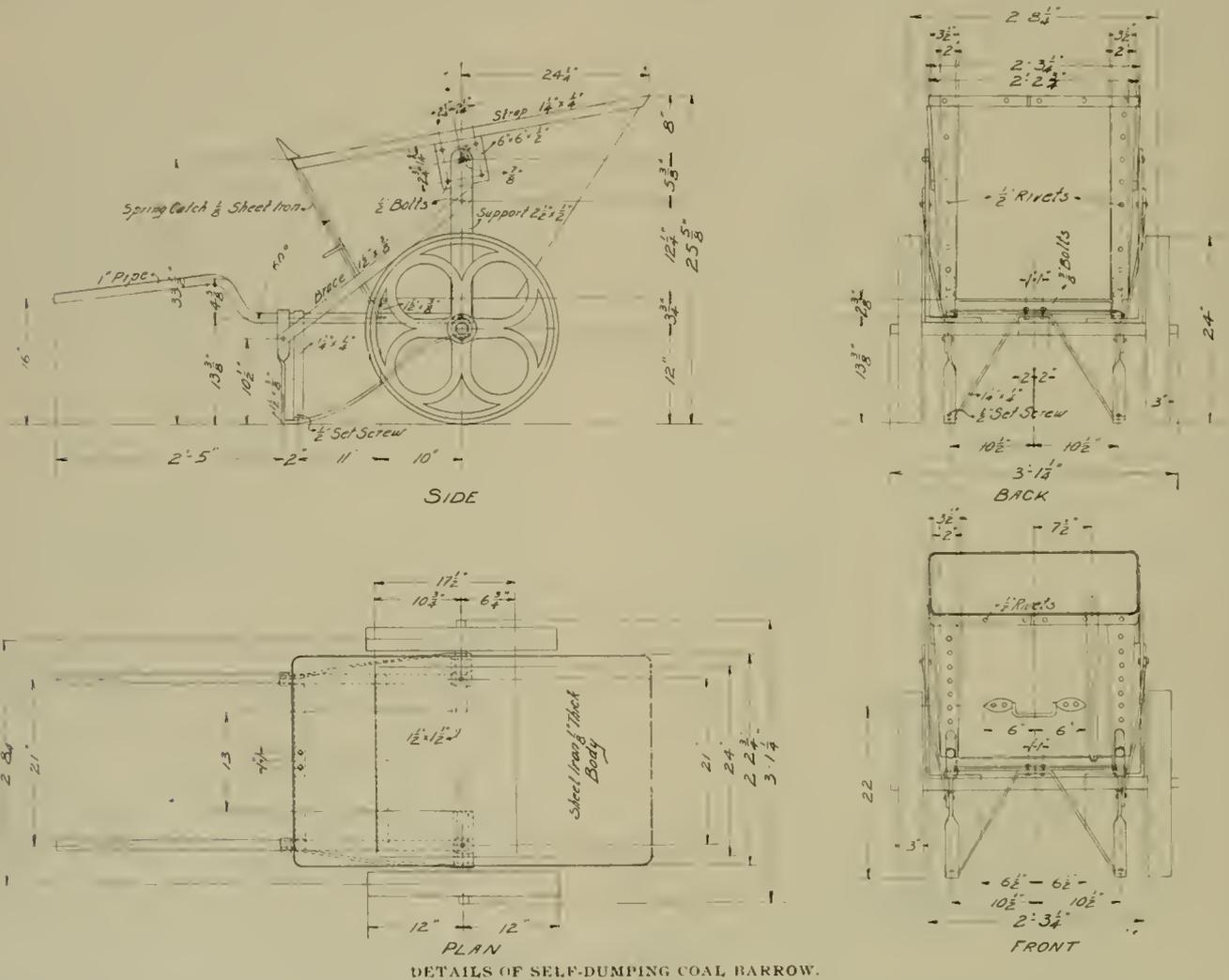
This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

TELL-TALE ATTACHMENT FOR CIRCUIT BREAKER.

A small device that will tend to relieve the power station engineer of some of his care and worry is an arrangement for automatically giving notice when a switchboard circuit breaker goes out. An attachment of this kind is used at the power house of the Union Street Railway Co., at New Bedford, Mass. In this particular

brass knob on the handle. The collar on the handle and the brass strip on the bolt are each connected by wire with a small cell-battery, the two wires constituting when the breaker is closed a normally open circuit.

It will be understood that as long as the breaker remains closed the local battery circuit will be open but when the breaker goes out the handle will fly upward, bringing the knob against the projecting strip, closing the battery circuit and thereby causing a bell or



DETAILS OF SELF-DUMPING COAL BARROW.

instance the device is applied to a breaker of the G. E. type but the idea can be carried out with almost any type of circuit breaker on the market.

To the handle of the breaker is fitted a 1/2-in. collar or ring, this collar carrying a brass knob or projection that may be a nut or any other small piece of metal that can be conveniently attached to the collar. The nut or knob is placed so that when the breaker is in the "open" position the knob will press against a small brass plate spring fastened to the lower right hand bolt that helps to secure the circuit breaker to the switchboard panel. The plate spring is merely a strip of brass placed under the nut of the bolt and having one end bent forward to come in contact with the

buzzer to signal the fact that the breaker has been actuated. The bell may be placed at any advantageous point in the station and will continue to ring until the offending breaker has been reset.

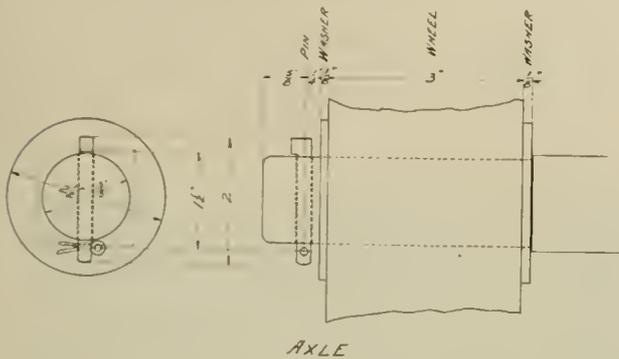
In the "Review" for June, 1901, page 360, a device for accomplishing the same result was described and illustrated. In that arrangement a small metal pin is attached to the toggle arm of each breaker on the board so that when the breaker goes out the arm will carry the pin into contact with two wires stretched along the face of the switchboard and thus close a bell circuit.

Five thousand employes of the Brooklyn Rapid Transit Co. were vaccinated, January 12th, by the company's physicians.

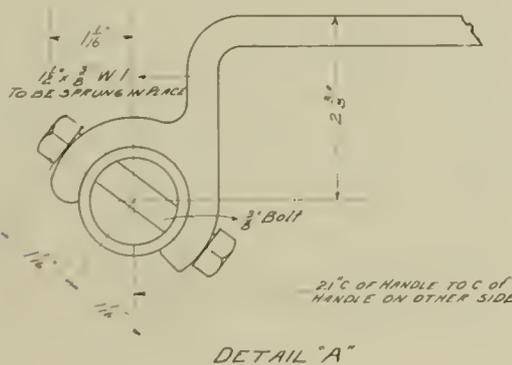
SELF DUMPING COAL BARROW.

To more easily handle coal from the coal bins to the furnace door, the Union Traction Co., of Philadelphia, provides at its power houses self-dumping wheelbarrows which have been devised by its engineering department. Mr. W. S. Twining, chief engineer of the company, has kindly furnished us drawings of this barrow and states the company has found the dumping feature quite an improvement over the ordinary hand wheelbarrow.

These barrows are designed to hold 600 lb. of coal each, and one man handles a load of that size without difficulty. The body,



which is made of $\frac{1}{8}$ -in. sheet iron, has a long projecting lip and is hung upon the frame with the pivots so located with reference to the center of gravity that the body when empty will remain in its normal position, but when filled with coal will have a strong tendency to tip forward and dump. It is prevented from doing so by a spring catch at the back consisting of a strap of $\frac{1}{8}$ -in. sheet iron rigidly fastened at its lower end to the frame, and having a projection at the other end, which is designed to hook over the top edge of the barrow. When the barrow is full and the attendant wishes to dump the coal he jerks this spring strap backward. The weight of the coal causes the body to tip forward and dump, but



as soon as it is empty the body automatically returns to the horizontal position and the spring snaps into place, securely holding the body.

The two iron wheels are 24 in. in diameter and have flat tires 3 in. wide. The handles are made of 1-in. pipe. The details and dimensions of the spring catch, the bearings, and the bracings, are set forth in the drawings.

The Chicago City Railway Co. has ordered five 500 h. p. Babcock & Wilcox water tube boilers which will be installed at its 22d St. and Walsh Ave. station; these boilers will all have B & W chain grate.

A street railway company in New England utilized a lot of old 3 1/2 and 4-in. axle that had been discarded, by cutting them in two and turning the pieces down for armature shaft. The key bolts in the original axle were eliminated by mounting each axle in the lathe sufficiently off center to bring the key seat within the portion of metal to be cut away.

TESTS OF TEXAS OIL.

A series of tests has recently been made under the direction of Prof. J. E. Denton, of Stevens Institute of Technology, on the comparative fuel value of coal and Texas crude oil. Tests were made under a boiler in the plant of the American Ice Co., of New York, which has been fitted for the use of oil about a year and a half ago by the National Gas & Fuel Co., of Chicago. The burner used was the Williams patent oil burner which has three supply openings, oil entering at the top, steam at the second opening and hot air from the ash pit through the third opening; thus a gaseous mixture of oil, steam and air is blown through the forward end of the burner into the furnace and meets with partly heated air drawn from the ash pit through the forward part of the grate which is left open.

The tests of the oil were made at boiler capacities varying from 112 to 220 h. p. which was the limit of satisfactory air supply for the chimney draft with wide open dampers. At this rate of working no smoke was shown at the top of the chimney, but by forcing the boilers beyond this streams of smoke were formed at the edge of the flame and a light vapor was shown at the chimney top.

The tests with coal were made at from 93 to 119 h. p. the former being the demand on the boiler for regular work and the second the greatest amount that could be obtained with dampers wide open. The boiler was under test with oil for fuel from November 25th to December 5th. Starting with the boiler setting cold and the water in the boiler at 64 degrees F. the time required to raise steam to 85 lb. pressure was 50 minutes with oil and 1 hour and 17 with coal, the fire being started in the latter case with a very liberal amount of dry wood.

For the range from 112 to 120 h. p. the total evaporation from and at 212 degrees per pound of oil varied from 15.71 to 15.29 lb. of dry steam and the burner consumption varied from 3.1 to 4.8 per cent of the boiler output. This gives the net evaporation from 14.74 to 15.16 lb. of water per pound of oil. The combustion of the oil by the burner was practically perfect. The boiler utilized about 78 per cent of the heat of the fuel which represents the best average boiler practice and the percentage of steam consumed by the burner is a minimum for steam jet burners.

The comparative fuel costs of oil and coal under the conditions at the factory where the tests were made are as follows:

For producing the horse-power required by the factory, or 1 horse-power per about 20 square feet of heating surface, with the moisture and ash as found:

1. Moisture in coal per cent.....	6.2
2. Ash, per cent.....	16.2
3. Weight of oil per gallon, pounds.....	7.00
4. Weight of oil per barrel of 42 U. S. gallons, pounds.....	322
5. Evaporation per pound of wet coal from and at 212 degrees, pounds.....	9.17
6. Net evaporation per pound of oil from and at 212 degrees, pounds.....	15.1
7. Ratio of oil to coal.....	1.65
8. Number of barrels of oil equivalent to 2,240 lbs. of coal.....	4.23
9. Price of coal per 2,240-lb. ton, without cartage and cost of ash removal.....	\$3.00
10. Equivalent price oil per barrel of 42 U. S. gallons.....	\$0.71

For producing horse-power upon the commonly guaranteed basis of 1 horse-power per 10 sq. ft. of heating surface, and with an average percentage of moisture and ash in the coal:

1. Moisture in coal, per cent.....	3
2. Ash, per cent.....	17
3. Evaporation per lb. of wet coal from and at 212 degrees, pounds.....	8.75
4. Net evaporation per lb. of oil from and at 212 degrees, pounds.....	14.8
5. Ratio of oil to coal.....	1.60
6. Number of barrels of oil equivalent to 2,240 lbs. of coal.....	4.12
7. Price of coal 2,240 lb. ton, without cartage and cost of ash removal.....	\$3.00
8. Equivalent prices of oil per barrel of 42 U. S. gallons.....	\$0.73

Considerable saving in labor is noticed with the use of oil. It is probable that one fireman can attend to 30 oil burners of 100 h. p. each. There is also a saving in ash handling labor and helpers in the fire room and the cost for handling oil will probably be less for machinery than with coal.

ELECTRICAL EQUIPMENT OF THE MANHATTAN RY.

The operating of the Second Ave. line of the Manhattan Elevated in New York City by electricity marks the opening of the largest electric generating plant which has been built up to the present time in this country. The substitution of electricity for steam locomotives involved the building and equipment of a generating plant of enormous size, the building of sub-stations for transformers and rotary converters, the installation of an elaborate transmission system, the equipment of the cars with electric motors, the construction of a lighting system for the trains, yards, platforms, offices, etc., and the use of electric motors in the company's repair shops.

The building for the central generating station is a substantial structure situated at 74th St. and East River, and was described in the "Review" for September, 1901, page 545. It will be remembered that the plant is arranged in eight generating units, each consisting of an engine and an alternator, all the units being practically independent.

The boiler equipment comprises 64 Babcock & Wilcox boilers, of 525 h. p. each, tested to carry 200 lb. working steam pressure. Roney mechanical stokers are used. Green fuel economizers, and Sturtevant blowers to furnish forced draft when needed. The most notable feature of the installation is the generating machinery, comprising eight 5,000-kw. Westinghouse alternators direct connected to Allis-Corliss engines. The accompanying illustration, Fig. 1, gives a general view of one of these units, two of which are now in operation. Each of these units has a maximum capacity of 10,000 h. p. and the electrical generators are the largest ever erected.

The steam engines, which are built after the design of Mr. Edwin Reynolds, of the Allis-Chalmers Co. consist of a pair of compound engines working upon a single shaft. The high pressure cylinders are horizontal and the low pressure vertical. The high and low pressure piston rods at each end are connected to one crank pin. The principal dimensions of the engines are as follows: Diameter of high pressure cylinders, 44 in.; diameter of low pressure cylinders, 88 in.; stroke of all pistons, 5 ft.; revolutions, 75 per minute; piston speed, 750 ft. per minute; diameter of piston rod, 8 in. The cranks are set 135 degrees apart. With this location of the crank pins the shaft receives eight impulses per revolution which makes the turning force so uniform that the revolving field of the generator suffices to take the place of the fly-wheel. This arrangement also avoids any dead center, and the engine may be started from any point without any attention being paid to the position taken by the cranks in stopping. Steam jackets are not used but the placing of the valves in the heads of the low pressure cylinders make a partial jacketing effect in these heads. The ordinary Reynolds-Corliss valve gear is employed, with a single eccentric on each high pressure cylinder and separate eccentrics for the steam and exhaust valves of each low pressure cylinder. The two sides of each unit are entirely distinct, and one can be run with the other uncoupled without reducing its efficiency. The high pressure cylinders admit steam at 150 lb. gage pressure, and from these cylinders the steam passes to receivers which are prolongations of the steam chests of the low pressure cylinders. The receivers on each side of the engine contain 773 sq. ft. of re-heating surface composed of 2-in. copper pipe through which steam at boiler pressure circulates. From the low pressure cylinder the steam exhausts through 30 in. pipes into

a 40 in. main leading to the condensers, one of which is provided for each unit.

The Westinghouse alternating current generators deliver three-phase currents at 11,000 volts which if desired, may be raised to 12,000 volts. The wave form generated is practically a true sine curve under all conditions of load and power factor, and the regulation from no load to full load is guaranteed to be within 6 per cent. The rise in temperature under full load for 24 hours is not to exceed 35 degrees C., and at 50 per cent overload it is not to exceed 55 degrees C. The efficiency at full load is 96½ per cent. The revolving parts of the dynamos are particularly designed to secure unusual strength, so as to resist the tendency to burst in case of temporary abnormal speed. The hub of the revolving field is of cast steel and the rim is carried by two webs of rolled steel. The field is 32 ft. in diameter and at 75 r. p. m., its peripheral speed equals 7,540 ft. per minute. Its weight is 370,000 lb. The machine contains 40 field poles built up of laminated steel. These are wound with copper strap on edge, one layer deep, and the insu-



FIG. 1—GENERATING SET—MANHATTAN RY.

lating material is cemented in place between the turns. The edges of the copper windings are exposed in order to facilitate the dissipation of the heat developed.

The exciting current of each alternator field is approximately 225 amperes at 200 volts and the excitation can be increased to provide for an overload of 50 per cent. These field windings are held upon the poles by copper wedges driven between the pole tips which serve to prevent the shifting of the magnetic lines of force and hence preserve constant the wave form generated. The armature consists of six castings bolted together to which a core is attached. The core is a built up ring of thin, soft steel plates with slots on the inner surface in which are placed insulated copper bars which, with their end connectors, constitute the armature coils. The plates of the armature core are separated at intervals by spaces in order to permit of thorough ventilation.

In order to produce a wave form free from irregularities at different loads a distributed winding with four armature slots per

phase per pole was adopted. This tends to avoid the production of harmonics which is of importance in view of the large capacity and self induction of an extensive system of cables and transmitting apparatus, especially where a large number of rotary converters are to be employed. Each slot contains three bars securely fastened to the end connectors. Any of these bars may be removed without disturbing the others and without moving the frame of the machine. The armature conductors are built to withstand a puncture test of 25,000 volts alternating current for 30 minutes.

Special freight cars were required for hauling the parts of these generators to New York where they were assembled for the first time. The weight of the completed machine is 900,000 lb. and its height 42 ft.

The exciting current is supplied by a battery of four 250-kw. exciters of the engine type, the armature and commutator of each machine being bolted together upon a ventilated cast iron sleeve pressed upon the engine shaft. The current generated at the central station is to be distributed over the entire system of the Manhattan Ry., consisting of 37 miles of road in the boroughs of Manhattan and the Bronx. It is distributed to eight sub-stations along the road where transforming apparatus is installed to reduce the voltage to the proper pressure for use in connection with rotary converters. The sub-stations are all built upon a uniform plan

kw. and a maximum of 2,250 kw., or 3,000 h. p. Each converter is a self-contained unit, the two bearings and the lower half of the field frame being mounted upon a common base. The field frame is divided in a horizontal plane. The machine has 12 poles and if

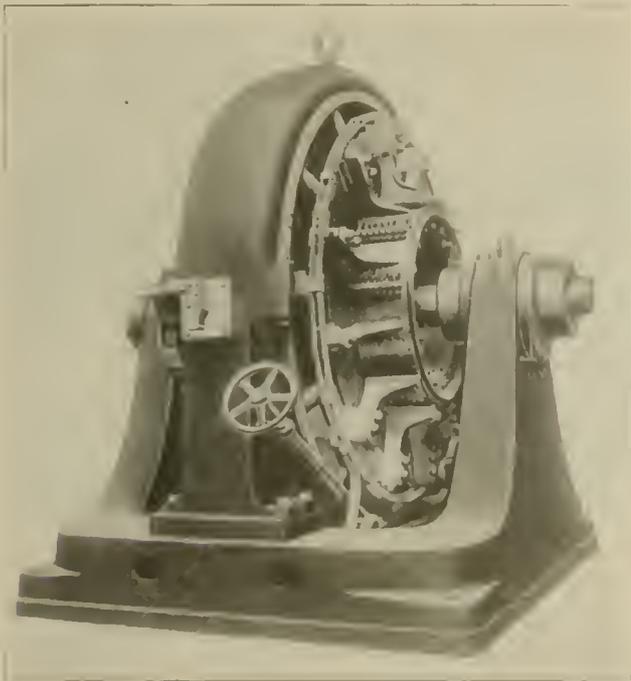


FIG. 2 ROTARY CONVERTER MANHATTAN RY.

and the general arrangement of the apparatus in all of them is similar, so that an operator familiar with one station can go on duty at any other one if required, without any special training. The rotary converters are arranged in two parallel rows and the transformers are located in groups of three upon galleries along the sides of the building. There are 26 rotaries and 78 transformers in the eight sub-stations, each rotary receiving current from a group of three 550 kw. step down transformers connected in delta, at a potential of about 390 volts.

The sub-stations are located at unequal distances from the power stations and, as they are all to be supplied with power from alternators operated in parallel, the potentials delivered by the high pressures distributing cables to the several sub-stations will differ. In order that the potential of the direct current delivered by the rotary converters should be equal, provision for changing the ratio of transformation of the step down transformers is made by means of loops brought out from the primary windings. The transformers are of the air-cooled, Westinghouse type, and motor-driven blowers are installed in each sub-station for supplying the necessary air. The guaranteed efficiency of these transformers at full load is 97 1/2 per cent. The rotary converters have a nominal capacity of 1,500

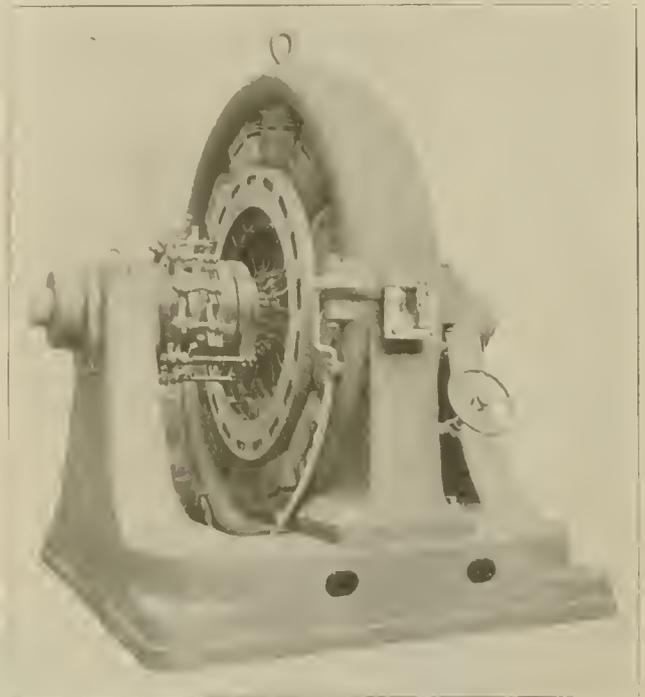


FIG. 3 ROTARY CONVERTER MANHATTAN RY.

supplied with alternating current of 25 cycles per second will operate at a speed of 250 r. p. m. The output of the converter has a normal pressure of 725 volts and the efficiency of the machine at full load is 95 3/4 per cent. The direct current and alternating current sides of this machine are shown in Figs. 2 and 3 respectively.

The converters occupy a floor space of 10x13 ft., are 13 1/2 ft. in height and weigh about 5,000 lb. each. The converters are started by means of a motor generating set one of which is installed in each sub-station and which is illustrated in Fig. 4. The method of starting by direct current derived from these starting sets rather than direct current taken from the main bus-bars at the sub-stations

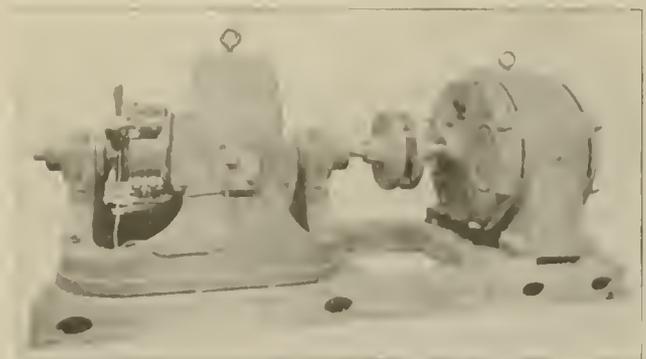


FIG. 4 MOTOR GENERATOR MANHATTAN RY.

was determined upon to avoid undue magnetic and electrical strains in the converters which may easily result from a slight mistake of the operator, such for example, as closing the synchronizing switches when the machine are not exactly in step.

The equipment of this immense plant has been accomplished without the least drawback or mishap, and the generators, which were the first of their size ever built, were assembled for the first time in New York and put into commercial service immediately, without

the slightest hitch. The installation of these large units for the Manhattan Ry. has been followed by the adoption of 5,000 kw. Westinghouse alternators for the New York subway and for Mr. Yerkes' London underground lines.

STEAM TURBINE PLANT FOR LONDON UNDERGROUND LINES.

The largest steam turbine plant ever erected is designed for the use of the Metropolitan District Railway Co.'s station at Chelsea. These machines, which will be of the Westinghouse-Parsons type, will be of 7,000 h.p. each, and as 10 of them are to be installed, the station will have a maximum output of 70,000 h.p. Owing to the large size of these machines the very high speeds usually associated with turbines will not be required. The speed of these machines will be but 750 r.p.m. Three-phase generators of 5,000 kw. capacity each will be mounted on the turbine shafts, and these dynamos will be much smaller than would be possible if slow speed reciprocating engines were employed. They will require to have but four poles each and will be about 9 ft. in diameter.

Recent tests of steam turbines of large size show a great economy in steam consumption over engines of the reciprocating type. The economy of space, absence of vibration and absence of oil from the exhaust steam are very important advantages of these ma-

ST. LOUIS WATER WORKS RAILWAY.

A unique electric railway, for the use of its employes only, has just been built by the St. Louis Water Works. It is a little over four miles in length and runs from Baden to the Cham of Rocks pumping station. The road is of single track construction. It is practically level, its maximum grade being but seven tenths of one per cent and about three hundred twenty five feet long. The track is laid with 60-lb. T-rails, on oak ties 18 in. between centers. The joints are of the ordinary fish-plate type. The road bed is formed of macadam and the track is ballasted with cinders. There is no pavement, and the rails are bonded with "Protected" rail bonds.

The power house is constructed of hard brick with granite and sandstone trimmings, the inside dimensions being 30 x 50 ft. The floor is laid with hexagonal silver gray encaustic tiling. This power house supplies current for the general lighting system of the three water works stations and for the machine tools in the machine shop and the cranes in the Baden pumping station as well as for the electric railway. A general view of the engine room is shown in the accompanying illustration.

The engine room contains three steam engines and one Pelton water wheel. One of the engines is a 150-h. p. single cylinder Straight Line engine made by the Straight Line Engine Co., Syracuse, N. Y., and is direct connected to a 100-kw. direct current Westinghouse generator; this is used entirely for operating the



POWER STATION AND CAR OF ST. LOUIS WATER WORKS RY.

chines, but a point of the highest importance is that with the use of three-phase currents and rotary converters at sub-stations there should be as little variation as possible in the angular velocity of the engine throughout each revolution. The phases are disturbed when this occurs, as it must to a certain extent with reciprocating engines, however carefully balanced and however heavy the fly wheels. With the turbine the shaft is turned continuously with an even force of steam acting upon its numerous blades, and for this reason variation in angular velocity is practically non-existent. The benefit of this is particularly noticeable when running alternators in parallel.

It is claimed that the speed regulation of these turbines with a fluctuating load is governed very accurately. The admission of steam is governed by a fly-ball governor in connection with a set of levers, and when running light the steam is admitted in separate puffs at distinct intervals, while under full load the steam is admitted in an almost continuous stream. It is also possible to maintain the vacuum much higher than with the reciprocating engine so that the steam works down to the extreme limit of expansion.

If the turbine should prove a success for large units a considerable change may be expected in the design of alternators, as at higher speeds the number of poles and the diameter of the machines will be greatly diminished.

The Lake Shore Electric Railway Co. will run special cars to Toledo and Cleveland to accommodate theater parties from intermediate towns. A trial of this plan has been made with satisfactory results, four special cars from Clyde, Bellevue, Fremont and Gibsonburg in one evening carrying 250 people to Toledo theaters.

electric railway. The other two engines are made by the A. L. Ide & Sons Co., of Springfield, Ill. One of these engines is a 150-h. p. tandem compound direct connected to a 100-kw. alternator. This generator is used entirely for carrying the lighting load at night, lighting all the pumping stations and water towers. The other engine is a 35-h. p. single cylinder engine direct connected to a 25-kw. direct current General Electric generator. This generator supplies current for the machine shop and the electric travelling cranes at the Baden pumping station. Direct current is generated at 575 volts and 110 volts and alternating current at 1,150 volts. The Pelton water wheel is connected directly to a 20-kw. Westinghouse alternator which supplies current for the day lighting load, which is comparatively small to the night load, as there are only a few lights used in the pump pits, basements, etc. The engines are operated condensing. They exhaust into a 12-in. vacuum oil separator, which is connected to the condenser. Each engine is supplied with a Sweet's Steam separator made by the Direct Separator Co., of Syracuse, N. Y., which company is represented in St. Louis by the Laufketter & Bendit M. E. Co.

In addition to the generators installed at Baden station, each of the other water works pumping stations are provided with an engine and generator for furnishing current for their electric travelling cranes and machine shops, and these generators are connected to the secondary wires of the lighting system and therefore can be used in case of necessity to light their respective stations and act as a relay for the main station at Baden.

The converters used are of the Westinghouse make and consist of two 15-kw. oil filled transformers, one 7.5-kw. oil filled transformer, one 5-kw. oil filled transformer and four 1-kw. and one 5-kw. dry transformers.

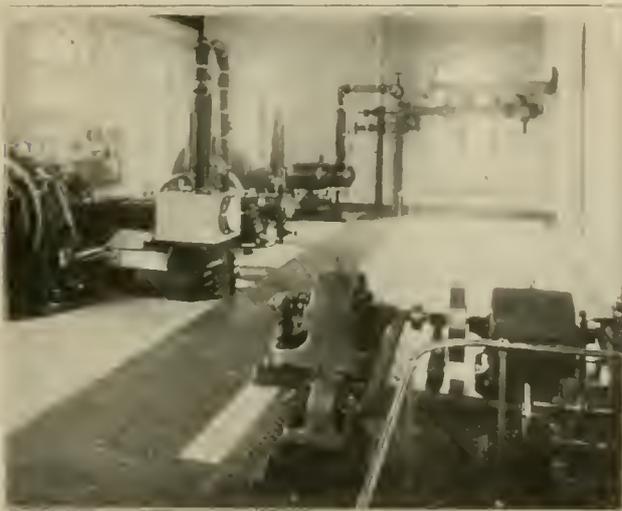
The steam for the engine in the generator house at Baden is supplied from the boiler house of the Baden pumping station. This boiler room is 60 x 167 ft., and contains eight boilers aggregating 2,400 h. p. These boilers are operated at 140 lb.

One passenger car, made by the St. Louis Car Co., is operated. The car is 43 ft. over all; inside it is 32 ft. 8 in. by 9 ft. 3½ in. and 8 ft. 2 in. high. It is mounted on the St. Louis No. 23 trucks and has M. C. B. couplers. The car has two G. E. 57 motors, Johns electric heaters, Johns and Christensen air brakes.

One conductor and two motormen are employed and are paid \$90 per month. The car travels an average distance of 42½ miles per day, and its maximum speed is 25 miles per hour. It is provided with an arc headlight, air whistles and a locomotive pilot, and has a seating capacity for forty-eight passengers. At present no persons except those connected with the water department are allowed to ride on this car without a special permit from the water commissioner, who, however, hopes to obtain authority ere long to operate the road for the benefit of the general public and to charge fares for all passengers except water works employes.

The district traversed by the road is very much in need of transportation facilities.

The car operates on a regular schedule beginning at 7 a. m., and makes five trips every day in each direction. On the two morning



INTERIOR OF ENGINE ROOM.

trip the car leaves Baden at 7.00 and 7.30, and in the afternoon at 1.45 and 4.40 and on the evening trip it leaves Baden at 9.45.

As the plant is operated in connection with the water works station, it is impossible to give any data as to the cost of operation. As no additional firemen or engineers are required, the expenses are correspondingly reduced. No repair shop is maintained exclusively for the electric railway, as the pumping station is provided with a regular machine shop where all repairing will be done.

There is one car house, which is a temporary wooden building, in which, however, no men are especially employed, as the motorman and conductor have charge of the general cleaning and care of the car.

The entire water works system of the city of St. Louis to which this road belongs is in charge of Mr. Edward Flad, water commissioner. The construction department, under supervision of which the line work of the railway was done and the engines, piping, etc. installed is in charge of Mr. Nils Johnson, mechanical engineer, Mr. S. B. Russell, in charge of the water works extension department, attended to the design and construction of the station building.

The Bona Delavan Lake & Janeville Electric Railway Co. has completed a bridge across the Rock River at Janeville. A similar bridge is in course of erection at Beloit; the grading for the electric line between Janeville and Rockford is finished and it is expected to have the road open for traffic by April 1st.

MERIT SYSTEM IN DETROIT.

Jan. 1, 1902, the merit system of disciplining trainmen was put in force on the Detroit United Ry.; this is what is well known, by name at least, to the majority of our readers as the Brown system. The object is to avoid so far as possible suspensions with consequent loss of pay, which so often work a severe hardship to well-meaning employes, in administering discipline, and substitute marks of merit and demerit which will stimulate and encourage the employes in the faithful and intelligent performance of their duties, while the record shows the company how each individual is doing.

The Detroit United Ry. is, we believe, the first street railway to adopt this system, though it is in force on some of the large steam railroads. Naturally the time is too short for the Detroit company to pass definitely on the value of this system, but the general superintendent, Mr. A. H. Stanley, informs us that so far it has exceeded his best expectations. Almost without exception the men started at the first of the year with the determination to try to keep a perfect record and it is believed that a large per cent of them will succeed in doing so.

The general idea of the system is to give merit marks to the men for rewards and demerit marks by way of punishment. One of these marks offsets the other, as for example, a man receiving one or more demerit marks for some infraction of the company's rules can clear up his score by good conduct which entitles him to an equal number of merit marks. A special record of all conductors and motormen is kept and all discipline imposed is shown thereon and credit given for excellent conduct, deeds of heroism, loyalty, etc., and these credits are given full consideration in connection with charges entered against any conductor or motorman. This record is a private one and is not open to any one except the man concerned.

For every 12 consecutive months of service free from demerit marks or free from the necessity of imposing a reprimand 10 marks will be deducted from any that may have previously been entered against an employe's record. When 60 marks are entered against the record of any employe his services will be dispensed with. On January 1st of each year the names of each conductor and motorman who has gone through the previous year with a perfect record will be posted at each of the car houses. Each employe will be afforded an opportunity for appealing against the decision regarding the number of demerit marks imposed, but such appeal must be made to his division superintendent within 10 days after receipt of notice. These notices are sent out on a printed blank addressed to the conductor or motorman stating the number of merit or demerit marks which have been entered against him and the reason therefor. The notice is signed by the general superintendent, and each one contains a serial number. At the bottom of this form is a perforated strip on which the recipient of the latter acknowledges the receipt of the notice and then forwards it to the company. These notices insure that each employe is kept correctly informed of the condition of his record.

Record bulletins are issued weekly, and are posted at all of the car houses on special bulletin boards, giving a brief account of each case which has resulted in discipline or commendation, giving the number of marks assigned but omitting all reference which would identify the person in question. These bulletins are educational in effect as they point out the acts of the employe which the company either censure or blame. The following items are taken from bulletins issued during January and serve to illustrate the manner in which the merit system is carried out.

"A motorman on the Jefferson division has been given 10 merit marks for excellent work in bringing his car to a stop to avoid colliding with a wagon which was carelessly driven on the track directly in front of him."

"A motorman on the Michigan division has been given 10 merit marks for turning into the office a \$10 bill which a passenger dropped in the vestibule of his car."

"A motorman on the Sherman division has had 5 demerit marks taken from his record which were given him for sliding onto a street railway crossing. He made a satisfactory explanation."

"A motorman on the Jefferson division has been given 20 demerit marks for colliding with a Jefferson car at the water works. He came to a stop at the switch, closed the same and started up at a good speed, paying no attention to a Jefferson car which was just

crossing the tracks ahead of him. He collided with the car, badly damaging both."

"A conductor on the cross town division has been given three demerit marks for neglecting to get a supply of transfers and borrowing some from another conductor."

"A motorman on the Brush division has been given five demerit marks for not coming to a stop before running over a street railway crossing."

The items quoted herewith serve to show the employes what actions and line of conduct will be approved by the company and also what they should avoid. These bulletins teach the men how, by a little judgment and forethought, immeasurable benefit results to the service. The system also teaches the men that their positions depend entirely upon themselves, as every one is given an opportunity to redeem himself any time he gets into trouble through negligence. By this system the man is either kept continuously in service or dropped entirely and it prevents what has sometimes been the case in the past, namely, a good man developing into a roustabout by hanging around saloons during a period of suspension varying from 30 to 60 days.

ANNUAL MEETING AND DINNER OF NEW ENGLAND STREET RAILWAY CLUB.

The second annual banquet of the New England Street Railway Club, held at Hotel Brunswick, Boston, Thursday evening, Jan. 23, 1902, was attended by nearly 300 guests and members, including railroad commissioners of several states, the governor of Rhode Island, the lieutenant-governor of Massachusetts, senators and statesmen, electrical engineers, and street railway men in the foremost rank of electric transportation affairs in New York and New England.

The gathering began at 6 o'clock in the parlors of the hotel, where an informal and very delightful reception was held until 7:15. The members and guests then started for the banquet hall, where the 20 or more invited guests were escorted to the head table and enthusiastically cheered by the long rows of members lined up along the several tables.

When the excellent menu had been thoroughly discussed and approved the chairs were pushed back, and while the cigars were going around President H. E. Bradford called for order and opened the business meeting. Reports of the secretary and treasurer showing the affairs of the club to be in excellent condition were accepted and approved; 19 new members were voted to membership; and the annual election of officers was then held, resulting as follows:

President, Edward C. Spring, superintendent Newton & Boston and Wellesley & Boston Street Rys., Newtonville

Vice-president, E. E. Potter, general superintendent Union Street Railway Co., New Bedford.

Vice-presidents for states—C. A. Bodwell, Sanford & Cape Porpoise Railway Co., Sanford, Me.; H. A. Albin, superintendent Concord Street Railway Co., Concord, N. H.; A. J. Crosby, superintendent Springfield Electric Railway Co., Springfield, Vt.; W. D. Wright, superintendent of equipment, Union Railroad Co., Providence; J. S. Thornton, superintendent People's Tramway Co., Putnam, Ct.

Secretary and treasurer, J. H. Neal, chief of department accounts, Boston Elevated Ry.

Executive committee—E. C. Spring, Newtonville; E. E. Potter, New Bedford; H. O. Farrington, master mechanic, Boston & Northern Street Ry., Chelsea; E. J. Rauch, master mechanic, Old Colony Street Ry., Brockton; A. J. Purinton, manager Springfield & Eastern R. R., Palmer; W. F. Ellis, civil engineer, Boston; J. F. Stone, manager Boston office Electric Storage Battery Co., Boston

Finance committee—J. F. Wattle, secretary, Rand Avery Supply Company, Boston; William Pestell, superintendent motive power, Worcester Consolidated Street Ry.; Paul Winsor, Boston Elevated.

The officers elect thanked the members for the honors conferred and Mr. E. E. Potter, of New Bedford, Mass., was introduced as toastmaster for the evening. Governor Kimball, of Rhode Island, the first speaker, put the club in good humor with a witty speech in which he took occasion to criticize in a friendly way some of the practices of street railway managers. Senator Blodgett, of Leominster, followed and said he believed the street railway interests

have done more to develop the resources of the state of Massachusetts than any other one interest. Mr. Henry M. Putney, of Manchester, N. H., Railroad Commissioner E. L. Freeman, of Rhode Island, and others, told some good anecdotes, and the toastmaster then called upon several of the street railway men present for remarks. Among the speakers were Col. N. H. Heft, H. H. Vreeland, of New York, A. D. Claffin, G. W. Bishop, C. Tracey Rogers, of Binghamton, N. Y.; Daniel Brady, and others.

The Hyde Park Glee Club, composed of 24 singers, and an orchestra rendered catchy and popular selections between the speeches.

Mr. Edward C. Spring, the new president of the club, is superintendent of the Newton & Boston Street Ry. and Wellesley & Boston Street Ry., and has held similar positions with the Norfolk Suburban, Norfolk Western, and Medfield & Medway street railways. His experience in electric work, extending over 15 years, starting with the Thompson-Houston Company, has brought him in close contact with the electric fraternity in the East. Mr



J. H. NEAL.

Spring has developed a successful scheme for rewarding faithful employes, which was outlined in the "Review" for Dec. 15, 1901, page 901.

Mr. James H. Neal, who has been re-elected secretary and treasurer of the club, has been associated with the transportation system of Boston since 1888. He is the inventor of the Neal headlight and the Neal brake and is also an expert accountant, having given special study to the problems arising in street railway accounting work.

BRIDGE FALLS AT INDIANAPOLIS.

January 16th the center span of the iron bridge over White River on Washington St., Indianapolis, gave way, and a street car, filled with employes of the road, and four two-horse gravel wagons were precipitated into the river 30 ft. below the level of the bridge. The car fell in about 5 ft. of water on one of its sides and the men inside broke out the window lights and crawled to a position of safety on top of the car. Two of the horses were drowned and two of the others so badly hurt that they had to be killed. Fortunately none of the passengers or drivers was seriously injured.

The bridge was pronounced unsafe about a month previous to the accident and the city commenced repairs. It was opened for traffic on the day of the accident at which time the city engineer examined it and stated that it would last for 10 years. Three hours after this the center span collapsed.

NEW COMPANY TO OPERATE NEW YORK SUBWAY.

A new company has just been organized to operate the New York Rapid Transit subway now under construction, and the organization of the company has been completed with the exception of filing the corporation papers. Its capital stock will be \$25,000,000. It is necessary to obtain the consent of the legislature to permit Mr. John D. McDonald to transfer his contract to operate the tunnel to the new corporation. Mr. August Belmont, who has been prominent in financing the subway, will be at the head of the new corporation.

FIRE AT PATTERSON, N. J.

In the early hours of Sunday, February 9th, the city of Paterson, N. J., was visited by fire which swept over 20 city blocks in the heart of the business and residential districts, destroying six bank buildings, six churches, many public buildings, including the city hall, the public library and several schools, nearly a dozen important office buildings, the two largest department stores in the place, the car barns of the Jersey City, Hoboken & Paterson Street Ry., and over 500 private residences and smaller buildings. Conservative estimates made two days after the disaster place the total loss at approximately eight million dollars; a large percentage of which is covered by insurance.

As is frequently the case in widespread conflagrations of this kind, the exact cause of the fire is not definitely known. The flames were discovered shortly after midnight of Saturday, and, according to all newspaper accounts, originated in the car barns of the Jersey City, Hoboken & Paterson Street Railway Co. on Broadway, which are used for storing cars and making light repairs. President David Young, of the street railway company, strongly doubts the truth of this, and on last Monday made the following statement: "From the investigations I have made I understand that the fire did not start in the car sheds. In the first place, there is no wiring of any kind in the sheds and no cars

panying half-tone is from a photograph taken the morning after the fire and shows all that was left of the car house.

January 15th, fire destroyed the power house and car barns of the City Electric Railway Co., of La Salle, Ill., together with 12 of the company's cars. The loss approximated \$60,000.

The car house of the Indianapolis Street Railway Co. and 10 cars were destroyed by fire, February 4th, entailing a loss of \$30,000.

MARINETTE AND MENOMINEE LINES CONSOLIDATE.

The consolidation of the Marinette and Menominee street railways was effected early this month by the purchase of the majority interest of the Marinette lines by parties already controlling the Menominee road. Mr. Edwin Daniell, general manager of the Menominee company, will be made general manager of the consolidated companies. It is probable that two months will elapse before cars will run from one city into the other, as some new track will have to be laid, but a one fare rate will go into effect at once on the two street railway lines and transfers will be used at the bridge connecting the two cities. The new company expects to spend



RUINS OF CAR BARNS—PATERSON, N. J.

are run into the sheds with fires going. The fires are always dumped before they are run into the sheds. Besides, the place where the fire was first seen in the car sheds was occupied by cars that have been there for several weeks awaiting repairs. The attention of our night dispatcher was called to the blaze first, and it came at that time from a building adjoining the car sheds."

Before the dispatcher could send the alarm the south end of the building was all aflame. Seven double truck cars and two sweepers were destroyed, but the men at the barns succeeded in saving part of the rolling stock. The fire at first did not seem to be a serious one and was confined to the car barn property, but a high wind which increased in intensity toward daylight carried sparks and firebrands in different directions and soon a dozen fires had broken out within a radius of two or three blocks. The city fire department found itself unable to make any headway with the flames, and fire companies and apparatus were summoned from Jersey City, Newark, Passaic, Rutherford, Hoboken and other nearby cities, but before the flames were finally subdued a tract of land nearly a mile long and two blocks wide had been devastated.

A somewhat remarkable feature of the catastrophe is that it was singularly free from loss of life. No one perished in the flames and comparatively slight injuries and burns to firemen were the only casualties reported.

The Jersey City, Hoboken & Paterson Street Railway Co., in addition to its car house and rolling stock mentioned, lost a quantity of feed and trolley wire and most of its line poles in the district burned. It was able to maintain its service on parallel lines, however, and a line crew was at work erecting new poles before the ruins on either side of the street had ceased to smoke. The company's total loss is estimated at about \$60,000. The accom-

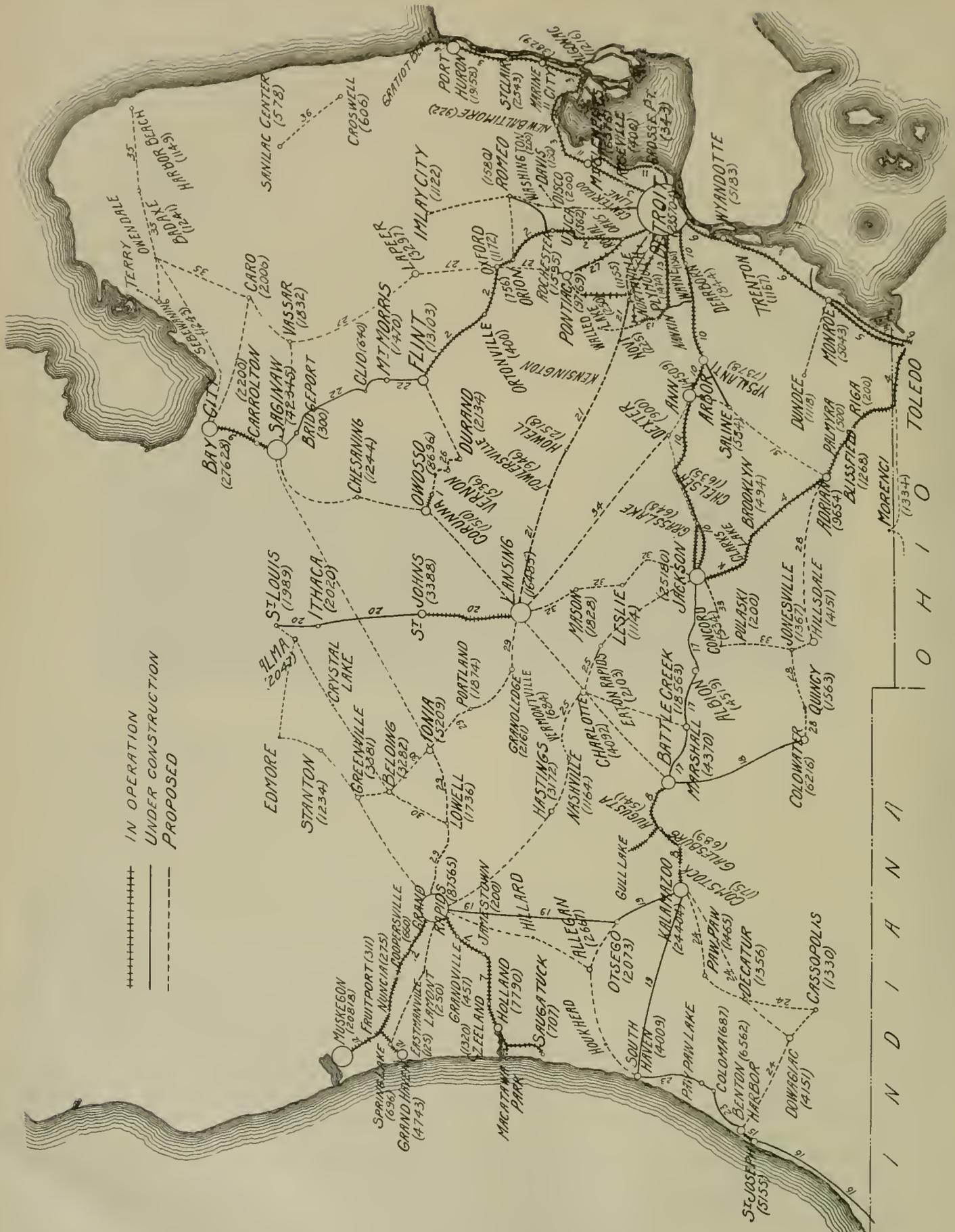
panying half-tone is from a photograph taken the morning after the fire and shows all that was left of the car house.

about \$100,000 in improvements this year. New track will be laid and new cars added to the systems, and ultimately both lines will be run by water power from Chappie Rapids. Work will be commenced this spring on construction of a belt line around the two cities.

WORN NICKELS HELD TO BE GOOD.

A passenger on the St. Louis Transit Co.'s line was ejected from a car, arrested and locked up over night because he tendered a worn coin in payment of his fare. He subsequently brought suit against the company for damages and was awarded \$2,000. Judge Ryan in the circuit court in reviewing this case stated that there was no such thing as assumed by the defendant as a nickel of less than full face value. A gold coin might be worth less than its face value because of abrasion and loss of weight, but this is not true of the nickel. It is better that the conductor, if in doubt, should receive the coin than to establish a rule which would permit him to eject the passenger who tenders a good coin and then plead as an excuse that he thought it was bad. In this case the plea does not go so far, as the conductor only rejected the coin because it was smooth. His act is considered merely capricious, and the amount of the verdict was not considered excessive in view of the hard treatment of the plaintiff.

The Michigan West Shore Traction Co. has obtained an extension of its franchise through South Haven until July 1, 1902, by which date the road is expected to be completed to Benton Harbor and St. Joseph.



ELECTRIC RAILWAYS OF SOUTHERN MICHIGAN.

INTERURBAN ROADS IN SOUTHERN MICHIGAN.

The remarkable growth of electric railways in the southern part of the state of Michigan is illustrated in the accompanying map, which shows the lines already in operation, those under construction and those which are proposed and for which franchises have been secured. The various roads on the map may be identified by their respective numbers, and the populations of the cities through which they pass are also shown on the map. The towns are shown by circles, the area of which is proportionate to the population. The following suburban roads are in operation:

1. Owosso & Corunna Electric Ry. This road goes to the cities named and an extension is proposed to Flint via Vernon and Durand.
2. Detroit, Rochester, Romeo & Lake Orion. (Detroit United Ry., Everett-Moore.)
3. Rapid Railway Co. (Detroit United Ry.)
4. Toledo, Adrian & Jackson Ry.
5. Toledo & Monroe Ry. (Everett-Moore.)
6. Detroit & Toledo Shore Line Ry. (Everett-Moore.)
7. Grand Rapids, Holland & Lake Michigan Electric Ry.
8. Michigan Traction Co. (From Kalamazoo to Battle Creek.)
9. Saginaw and Bay City Interurban. (Saginaw Valley Traction Co.)
10. Detroit, Ypsilanti, Ann Arbor & Jackson Ry. (Hawks-Angus.)
11. Detroit, Mt. Clemens & Marine City. (Detroit United Ry.)
12. Grand Rapids, Grand Haven & Muskegon Ry.
13. Detroit, Plymouth & Northville Ry. (Detroit United Ry.)
14. Port Huron, Gratiot Beach & Electric Ry. (Detroit United Ry.)
15. St. Joseph & Benton Harbor Electric Street Ry.

ROADS UNDER CONSTRUCTION.

16. Indiana Railway Co., South Bend, Ind. (From South Bend, Ind., to St. Joseph, Mich.)
17. Calhoun County Ry. (From Battle Creek to Jackson.)
18. Battle Creek & Coldwater.
19. Grand Rapids, Kalamazoo & South Haven Traction Co.
20. Lansing, St. John & St. Louis Electric Ry. This road is now operated by steam power temporarily between Lansing and St. Johns.
21. Detroit, Howell & Lansing Ry.
22. Saginaw Suburban Ry. (To run between Saginaw and Flint.)
23. Michigan West Shore Traction Co. This road extends from Benton Harbor to South Haven.

PROPOSED SUBURBAN ROADS.

24. Kalamazoo Traction Co. To run from St. Joseph to Benton Harbor and Kalamazoo
25. Central Michigan Traction Co. To run from Vermontville to Charlotte and Eaton Rapids.
26. Corunna & Durand This is an extension of the present line between Owosso and Durand.
27. Detroit, Pontiac, Lapeer & Northern Ry
28. Adrian & Coldwater Ry.
29. Lansing & Grand Rapids Ry.
30. Grand Rapids to Belding, Lowell and Ionia
31. Detroit, Ann Arbor & Adrian.
32. Jackson & Lansing
33. Jackson to Coldwater
34. Dexter to Lansing.
35. Caro to Lake Huron.
36. Detroit, Le Roy & Samlar Center

CHASE-SHAWMUT CO.

We are very glad to be able to announce that while the recent fire in the factory of the Chase Shawmut Co., 390 Atlantic Ave., Boston, was a serious one, the company is rapidly getting affairs into shape again and is filling orders for Shawmut face and flexible road bonds. The branch of the business was not greatly interfered with and bond orders can be filled at short notice.

FINANCIAL.

METROPOLITAN STREET RAILWAY CO.

It is announced that a new company with which Messrs. Whitney, Widener and Elkins are prominently identified has been formed to lease the Metropolitan Street Railway Co., of New York. The new organization will be incorporated so as to permit it to hold the stock of any corporation. Its capital will be \$30,000,000, which may be increased as required. According to current reports it is not the purpose of the company to attempt to effect a consolidation of the other New York systems, such as the Manhattan and the Brooklyn Rapid Transit, but such a merger is hoped for ultimately. The money raised will be used to convert 100 miles of horse railway lines to the interurban trolley system to conform to the construction of the greater part of the city's lines. An annual dividend of 7 per cent on the Metropolitan stock will be guaranteed by the new company and the present Metropolitan stockholders will have a right to subscribe \$20,000,000 of the new capital at par to the extent of 45 per cent of their present holdings. It appears, therefore, that the object of the new company is to lease the Metropolitan so as to enable the present interests to retain control of the property without making very heavy outlays on their part, as if new Metropolitan stock were issued for \$30,000,000 the controlling interests would have to take their share of it or stand in danger of losing their control. It is announced that the entire new issue of capital has been underwritten by Kuhn, Loeb & Co., of New York.

BROOKLYN RAPID TRANSIT CO.

The comparative statement of operation for the months of November and December, 1901 and 1900, given herewith, show an increase in operating expenses of the company which is said to be due to the policy of using net earnings to pay the cost of improvements on the road.

	Nov. 1901.	Nov. 1900.	Dec. 1901.	Dec. 1900.
Gross receipts.	\$907,812.74	\$642,018.06	\$9,534,045.05	\$6,137,956.45
Expenses	730,839.79	627,959.44	4,515,871.12	3,902,051.76
Net receipts	266,972.95	314,058.62	2,018,173.93	2,235,904.69

The gross receipts are increasing at a satisfactory rate and while the policy of the company has disappointed those who were expecting dividends it will inspire confidence in the ultimate value of stock as an investment providing that the gross earnings continue to show a gain. The annual meeting of the company was held January 31st, but was entirely uneventful. The retiring board of directors was re-elected.

The Brooklyn Heights Railroad Co., of which Mr. C. D. Meneely is secretary and treasurer, requests us to make the following announcement:

Beginning with the month of February, 1902, the Brooklyn Heights Railroad Co. until further notice will guarantee Brooklyn Union Elevated 4 and 5 per cent bonds and Kings County Elevated 4 per cent bonds on three days in each month.

Bonds will be guaranteed on the following dates: February 24, 1902; March 7, 17 and 28, 1902; April 4, 14 and 25, 1902; May 2, 12 and 23, 1902; June 3, 13 and 23, 1902; July 1, 11 and 21, 1902.

THE TWIN CITY RAPID TRANSIT CO.

The annual report of the Twin City Rapid Transit Co. for 1901 was issued January 17th last, and shows the company to be in a most prosperous condition. The physical condition of the property has been greatly improved as evidenced by an increase of 41 per cent in the cost of maintenance of way and 2 per cent in the cost of equipment. The gross earnings for the fiscal year ending Dec. 31, 1901, were \$3,173,975, an increase of 11.79 per cent and the net earnings were \$1,758,524, or an increase of 14.59 per cent over the year 1900. The operating ratio for 1901 was 48.35 per cent of the gross earnings as compared with 49.16 per cent for the preceding year. This covers all charges, including taxes, except interest. On May 1, 1901, the company cancelled \$20,000 of the \$270,000 7 per cent first mortgage bonds of the Minneapolis Street Railway Co. by the issue and sale of \$20,000 5 per cent consolidated bonds of the same company.

The company has expended during the year \$646,746 for various improvements. It has built forty 44-ft. cars each equipped with four motors. It has also increased the equipment on forty other 44-ft. cars and has expended \$185,322 in paving streets in connection with its tracks in both Minneapolis and St. Paul. The following table shows the statement by months of the gross earnings of the company.

	Passenger Earnings.	Miscellaneous Earnings.	Total Earnings.
January	\$234,445.95	\$1,828.65	\$236,274.60
February	213,883.95	1,695.68	215,579.63
March	240,637.35	1,576.27	242,213.62
April	230,454.00	1,789.87	232,243.87
May	249,862.80	2,082.71	251,945.51
June	276,614.35	2,661.76	279,276.11
July	288,336.00	2,312.72	290,648.72
August	281,224.05	2,364.98	283,589.03
September	306,469.70	1,923.80	308,393.50
October	269,193.35	1,759.60	270,952.95
November	266,800.05	1,717.00	268,517.05
December	292,576.30	1,764.06	294,341.26

Total .. \$3,150,497.85 \$23,478.00 \$3,173,975.85

The tabulated statement of receipts and expenditures for the year 1901 are as follows:

Passenger earnings	\$1,150,497.85
Miscellaneous	23,478.00
Total earnings	3,173,975.85
Total operating expenses	1,415,451.70
Net earnings from operation	1,758,524.15
Interest on debt and taxes	666,537.75
Surplus applicable to dividends	1,091,986.58
Total dividends	810,400.00
Transferred to surplus	281,486.58
Operating ratio	44.60
Operating ratio (including taxes)	48.35

NORTHWESTERN ELEVATED RAILROAD CO.

The annual report of the Northwestern Elevated, Chicago, as published February 17th, shows the road to be in excellent financial condition. The earnings applicable to stock amount to \$159,287, or 3.18 per cent on the preferred stock. The increase in taxes amounting to \$50,000 over the previous year and the expenditure on the property reduced the net earnings considerably. The income account is as follows:

Passenger earnings	\$1,016,186
Other earnings, including loop net earnings for 4 months	84,676
Total earnings	\$1,100,863

Operating Expenses.

Maintenance of way and structure	\$*26,747
Maintenance of equipment	28,993
Conducting transportation	267,578
General expenses	52,820
	376,140

Total net earnings .. \$ 724,723

Charges.

Loop account	\$101,635
Taxes	78,580
Interest on bonds	385,220
	565,435

Surplus for year.....\$ 159,287

Ratio of operating expenses to earnings, including maintenance reserve36.26 per cent

Ratio of operating expenses, maintenance reserve, loop account, and taxes to earnings.....53.64 per cent

President Buckingham in his report to the trustees stated that the management has been engaged in planning for the proposed extensions to Ravenswood and Evanston. Negotiations have been

*Includes \$15,000 which has been set aside in monthly installments, in cash, for betterments and maintenance of structure.

under way for some time with the St. Paul road for its Evanston branch but no basis for final settlement has been reached as yet. Regarding the Ravenswood branch the management has made estimates of the cost and has gone over the ground thoroughly. From some figures which have been given out recently it appears that to improve the St. Paul's Evanston branch on the elaborate scale proposed some time ago would involve an expense of at least \$3,500,000. While final statements are still lacking, it appears improbable that the management will undertake so great an increase in the road's capital investment at this time, particularly in view of the fact that elevated railroad property will be taxed pretty heavily in the future. Instead of operating an elevated track for this extension it seems much more probable that when this Evanston branch is secured that an incline to the present elevated structure will be built similar to that on the Lake Street road at a comparatively moderate outlay.

SOUTH SIDE ELEVATED RAILROAD.

The annual report of the South Side Elevated, of Chicago, for the year ending 1901 shows the net earnings were somewhat less than the previous year owing to the larger taxes due, to the settlement of an accumulation of damage cases and the cost of maintenance of storage batteries. The policy of the company has been to keep the structure, roadway and cars in the best state of repairs. A mile of new rails was laid during the year, nearly three miles of guard rails have been renewed and a large number of ties replaced. About one-third of the structure was painted. The company desires to extend its lines into the southern wards of the city and the first and essential step towards this development is the third track on the north half of the road, without which the cars employed on the new lines could not be handled satisfactorily. Progress has been made toward obtaining authority to construct this track.

The comparative statements of earnings and expenses for the years 1901 and 1900 are as follows:

Total operating earnings	\$1,362,231
Less operating expenses	844,960

Net earnings\$ 517,271

Deduct interest on bonds	\$ 33,750
Deduct dividends on capital stock	357,955
	391,705

Surplus for year 1901.....\$ 125,566

Earnings.

	1901.	1900.
Passengers	\$1,316,000	\$1,249,543
Other earnings	45,646	35,560
Miscellaneous	576	1,524
	\$1,362,231	\$1,286,638

Expenses.

Maintenance of way and structure	\$ 74,498	\$ 44,844
Maintenance of equipment	105,279	106,684
Conducting transportation	361,619	333,113
General expenses	141,201	100,188
Loop rental and expenses	162,360	163,571
	\$ 844,960	\$ 748,402

LAKE STREET ELEVATED RAILROAD.

The annual report of the Lake Street Elevated R. R., Chicago, for the year 1901 was presented at the annual meeting of the stockholders held January 14th and showed a gain of \$28,508, or about 4 per cent in the gross earnings of \$18,370 or nearly 5 per cent in net earnings. The charges, however, were somewhat increased so that the surplus over all was only \$6,204. A number of valuable improvements in the property were made during the year, but the cost of these improvements, of course, increased the indebtedness of the road, which is not in a satisfactory condition. Its first mortgage and debenture bonds draw 5 per cent interest, while the other Chicago elevated roads have put their funded debt on a 4 per cent basis, leaving the Lake Street at a disadvantage in this respect.

The comparative statement of earnings for several years is shown in the following table:

Year ending Dec. 31.	1901.	1900.	1899.	1898.
Whole number passengers..	15,304,038	14,017,343	.....	.....
Daily average	42,175	40,048	37,206	33,948
Earnings:				
Passenger	\$707,796	\$742,594	\$684,217	\$618,326
Miscellaneous	18,666	15,360	13,296	15,077
Gross	\$786,462	\$757,954	\$697,513	\$633,403
Operating expenses	388,790	378,661	331,553	324,947
Net	\$397,663	\$379,293	\$365,960	\$308,456
Charges:				
Taxes	14,857	13,650	13,744	13,849
Interest first mort. bonds..	17,202	22,115	22,050	23,370
Interest debentures	218,355	201,955	201,605	198,307
Interest floating debt.....	56,248	37,756	37,745	37,667
Loop rental	76,970			
Suburban rental	6,000	97,887	87,177	61,954
Mileage tax reserve.....	1,767	1,178	.....	.....
Total	\$391,459	\$374,541	\$362,321	\$335,147
Surplus for year.....	6,204	4,752	3,639	*26,691
Per cent op. to gross.....	49.43	49.25	47.53	51.30

*Deficit.

CONSOLIDATED TRACTION CO.

The report of the Consolidated Traction Co., of Pittsburg, to the stockholders for the month of December, 1901, has been issued and will be the last report of this kind, as the road and properties of this company were leased and transferred December 31, 1901, to the Pittsburg Railways Co. The comparative statement is as follows:

	1901.	1900.
Gross earnings from operation.....	\$275,628.64	\$249,444.51
Operating expenses	140,041.11	109,068.90
Net earnings from operation.....	134,687.53	140,375.61
Total net earnings and other income.....	163,727.68	168,370.13
Total deductions	65,486.62	63,331.38
Total income	98,231.06	105,038.75
Fixed charges	86,061.74	86,475.84
Net income	12,179.32	18,562.91

MONTREAL STREET RAILWAY CO.

The following comparative statement of earnings and expenses for the months of December, 1901, and 1900, is issued by the Montreal Street Railway Co.:

	1901.	1900.	Increase.
Passenger earnings	\$156,711.05	\$147,977.66	\$8,733.39
Miscellaneous earnings	2,484.60	658.91	825.78
Total earnings	158,195.74	148,636.57	9,559.17
Operating expenses	105,006.85	90,735.60	8,871.25
Net earnings	52,588.89	51,000.97	687.92
Fixed charges and int. on loans..	15,185.13	9,220.45	5,964.68
Surplus	37,403.76	41,680.52	*5,276.76
Expense per cent of car earnings)	67.39	65.37	2.02

*Decrease.

TORONTO RAILWAY CO

The annual meeting of the stockholders of the Toronto Railway Co. was held on January 15th and the financial statement for the year was considered highly satisfactory. The report shows that the gross earnings amount to \$1,661,017 as compared with \$1,501,001 of the previous year, making an increase of \$160,016. The statement shows net profits of \$510,726, out of which two quarterly dividends of 1 per cent each for the first half and two quarterly dividends of 1 1/4 per cent each for the last half of the year were declared, aggregating \$270,000, thus leaving a surplus of \$172,726

after deducting pavement charges paid to the city. The comparative statement of earnings of 1900 and 1901 is as follows:

	1901.	1900.	Increase.
Gross earnings	\$1,661,017.50	\$1,501,001.28	\$160,016.22
Operating expenses	857,612.10	775,980.82	81,631.28
Net earnings	803,405.40	725,020.46	78,384.94
Passengers carried	39,848,087	36,061,867	3,786,220
Transfers	13,750,938	12,579,704	1,179,334
Operating ratio	51.6 per cent	51 per cent	0.6 per cent

WOODSTOCK, INGERSOLL & THAMES VALLEY ELECTRIC RY.

The board of directors of this road held a meeting January 18th, after 6 months' operation of the road to Ingersoll, and the treasurer's report of operation during this time shows that the road has been successful beyond the expectation of its promoters. After setting aside the money to pay interest on the bonds for the 6 months out of the net earnings from operation, the directors declared a dividend of 2 1/2 per cent on the \$100,000 of preferred stock for the past 6 months. A considerable balance out of the net earnings still remains in the treasury and the showing is considered remarkable, as no special efforts to attract traffic were made. The company is looking forward to a very successful summer season, as the best attractions are to be offered at its summer park at Beachville, and it is expected that the receipts will be very materially increased. The officers of the company are: J. G. Wallace, president; W. H. Armstrong, secretary and treasurer, and Mr. Ickes, general manager.

WAUPACA ELECTRIC LIGHT & RAILWAY CO.

In accordance with the requirements of law upon which the taxation of property in Wisconsin is based, Mr. Irving P. Lord, general manager of the Waupaca Electric Light & Railway Co., has filed sworn statements of the gross receipts of the company for 12 months immediately preceding Dec. 1, 1901. The total gross receipts of the company amount to \$15,778 as against \$12,756 for the year preceding, making an increase for the past year of \$3,022. The gross receipts for the railway department for 1901 were \$8,416 and for the year 1900, \$6,115. It is stated that the operating expenses have been decreased about 10 per cent during the past year.

SCHUYLKILL TRACTION CO.

The annual meeting of the Schuylkill Traction Co. and its underlying street railway companies were held January 13th, at which its first detailed annual report was presented. The report was as follows:

Cash January 1, 1901.....	\$ 5,012.00
Gross income from operations.....	140,006.93
And from all other sources.....	63,147.95
	\$208,257.87

Total expenditures:	
Operating expenses, including interest on loans, etc.	\$ 60,748.84
Maintenance and repairs.....	13,724.27
Betterments and new equipment.....	56,398.80
Interest on bonds.....	32,286.50
Reduction of loans.....	18,129.30
Reorganization expenses and payment of tax arrears....	12,773.77
Cash balance December 31, 1901.....	5,196.30
	\$208,257.87

The net income from operation after payment of operating expenses and maintenance of property was \$56,623, leaving net, after the payment of all interest, \$623,337. These are the largest gross receipts in the history of the company, while at the same time they are the largest expenditures for improvements and the largest net earnings heretofore made.

Mr. E. W. Farnham, president and general manager of the Rapid Traction Construction Co., Marquette Bldg., Chicago, has recently returned from New York, and reports that he is negotiating for the equipment of some 800 miles of track with the Farnham third rail system.

HALF FARES.

Nineteen cars on the interurban line between Muskegon, Mich., and Fruitport have been equipped with Westinghouse air brakes.

The Union Traction Co. of Indiana is erecting a bridge between Jonesboro and Gas City. The structure will rest on the abutments of the bridge that was burned some time ago.

The Des Moines (Ia.) City Railway Co. has installed a new Allis-Corliss 2,400 h. p. engine at its power house and has completed a number of improvements of its property at a total cost of \$270,000.

Mr. S. W. Owen, of Norwalk, O., is interested in organizing a company to build the long contemplated electric line between Norwalk and Tiffin. Arrangements for financing the project have been effected.

T. M. Solomon, an American citizen, and J. Santos Ramirez, of Nicaragua, have been granted by the government of Nicaragua a concession for installing electric lighting systems at Managua, Masaya, Granada and Leon.

The case of the Mechanics' Saving Bank of Providence, R. I., against the Lincoln (Neb.) Traction Co. to restrain it from selling six street car tickets for 25 cents, will come up for trial in the Federal Court within 90 days.

Work will be begun, March 1st, on the Cincinnati Traction Co.'s, 14-story office building which will be one of the handsomest and most modern in Ohio. It is expected to be completed by January next at a cost of \$700,000.

The Colorado Springs Rapid Transit Railway Co. has completed a number of extensions of its system in Colorado Springs, and begun the erection of a new station at the Dixon Park terminus of the line to North canon.

The Schenectady Railway Co. is building a new iron bridge across the Mohawk River in order to run its cars to Sciota. The old bridge has been moved four ft. four inches to make room on its abutments for the new structure.

The Connellsville (Pa.) Suburban Street Railway Co. has sold its buildings to the Pittsburg, McKeesport & Connellsville Railway Co., the purchase including a three-mile line, a power house and lighting plant and a pleasure park.

The electric railways of El Paso and Juarez were opened to the public on Saturday, January 11th, with an appropriate celebration. Cards of invitation were issued by the company and a large number of guests made the initial trip in special cars.

A plan for equipping Chicago street cars with firebox keys in order that the conductor, motorman or any passenger may in an emergency turn in a fire alarm with all possible dispatch, is under consideration and meets the approval of the fire marshal.

The Houghton County Street Railway Co. of Hancock, Mich., has experimented satisfactorily with the construction of portable fences along its right of way for the purpose of keeping the snow from the track. The fences proved particularly serviceable in the cities.

The Oakland (Cal.) Transit Co. has reduced the fare between Oakland and San Leandro from 15 cents for a single trip or 25 cents for a round trip to a 10-cent fare in each direction. Important changes have also been made in the system of commutation fares.

There was a bad accident on the line of the Lake Shore Electric Ry., near Fremont, O., on January 22d. One of the freight and baggage cars on this line was closely following an east-bound passenger car. The latter stopped to permit a passenger

to alight and the freight car coming behind it at a rapid rate crashed into the passenger car, badly injuring the conductor and motorman of the former. None of the passengers were fatally injured.

Grading is under way for the new electric line between Herkimer and Little Falls and foundations are being laid for a power house at Small's gull. The current will be received from Trenton Falls at a voltage of 22,000 and will be reduced to 500 for use on the line.

The Natchez (Miss.) Electric Street Railway Co. opened its new lines to the public on February 5th. Four cars have been received from St. Louis and 3½ miles of track completed. E. H. Ratcliff is president, and E. H. Jackson, general manager, of the company.

The Galveston (Tex.) City Railway Co. voluntarily increased the wages of its motormen and conductors, on January 1st. The employees' union appointed a committee to draft suitable resolutions of thanks to Major Baer, president and manager of the company, for his action.

An overheated stove in one of the cars of the Chicago Union Traction Co., on January 4th caused the second fire which has threatened the company's equipment within the last few weeks. In the second instance the damage did not exceed \$1,000 and is covered by insurance.

It is again reported without confirmation that the Northwestern Elevated Railroad Co., of Chicago, is about to acquire by lease the Evanston branch of the Chicago, Milwaukee & St. Paul Ry. It was expected that the L road would begin operations on the surface line north of Wilson Ave. on February 1st.

The Worcester (Mass.) Consolidated Street Railway Co. has notified its conductors and motormen whose homes are in Marlboro, Northboro and other suburban towns, that they will be expected to remove to Worcester for the sake of convenience, as all the company's cars are to be quartered in that city.

Members of the American Society of Civil Engineers who held their 49th annual meeting in New York City last month listened to a lecture by Mr. William Barclay Parsons, chief engineer of the Rapid Transit Commission, of New York, on the progress of the work of excavating the rapid transit subway. The lecture was illustrated by stereopticon views and following this, the party under escort of Mr. Parsons was taken through several portions of the tunnel. One of the points visited was at Broadway and 57th Sts. The under-ground work here was well lighted, especially the station at 50th St., directly underneath the Columbus monument.

SALE OF CANTON-AKRON LINE.

We are advised that the original owners of the Canton-Akron Ry., which was acquired by the Everett-Moore syndicate a few months ago, have repurchased the property and also taken over the Canton-Massillon Electric Ry. which the Everett-Moore syndicate had a contract to buy. Messrs. P. L. Saltonstall, of Boston, and L. E. Myers, of Chicago, were principally interested in the Canton-Akron line, and we understand that these interests contemplate extensive additions.

NEW MANAGER AT LOS ANGELES.

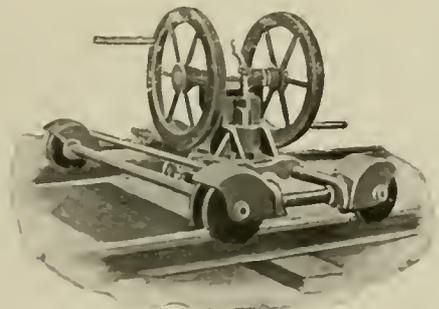
President Huntington, of the Los Angeles Railway Co., on February 7th published the following order: The conflicting interests of the Los Angeles Railway Co. and the Pacific Electric Railway Co. render necessary separate managements of these properties. Effective February 15th, Mr. J. A. Muir is appointed general manager of the Los Angeles Railway Co., vice Mr. Epes Randolph, retiring for other service.

PROVIDENCE-WORCESTER INTERURBAN.

The preliminary work of organizing an electric railway to run between Worcester and Providence is being pushed very actively by the promoters of the plan. The road is to be called the Worcester & Providence Street Ry., and the right of way is being rapidly acquired. According to the present plans the new road will connect at Providence at the terminus of the Branch avenue line of the Union Railroad Co., and from this point will run through the towns of North Smithfield, North Providence, Smithfield and Burdville. At the state line it will join with the tracks of a company incorporated under the laws of the State of Massachusetts, which will carry the road into the city of Worcester. The length of the proposed road is estimated at 135 miles, and the fare is said to have been set at 45 cents. As the present fare is \$1.10, it is expected that the road will handle a large part of the traffic between these two cities. It is proposed to run both freight and passenger cars. The capital stock of the company will be \$750,000, and it is stated that as soon as the charter has been obtained work will begin on the road and will, it is expected, be completed during the present year.

GORE TRACK DRILL.

The accompanying illustration represents the Gore track drill mounted on a carriage designed for it by the Ludlow Supply Co., of Cleveland, O., which is the agent for this drill in the central states. This is specially adaptable to construction work, and is said to be one of the most efficient hand drills on the market. It has been in use for about two years, and has proved itself to be a thoroughly reliable machine. It is possible to drill a 7/8-in. hole through the web of a 70-lb. T-rail in from 40 to 45 seconds. With this drill,



GORE TRACK DRILL ON CARRIAGE.

when mounted as shown in the illustration, from 40 to 50 holes per hour can be drilled. When once adjusted it remains in the right position for work, and can be moved rapidly along the track. It is easily operated, and can be readily taken from the track if necessary.

The Ludlow Supply Co. has also secured the agency of the Simplex Electrical Co., Cambridgeport, Mass., which manufacture enamel and coil spring car heaters under the patents of the American Electric Heating Corporation.

COMPENSATION FOR FRANCHISES.

An important suit has been settled in Toledo, O., in which Judge Barber, in his exhaustive opinion handed down January 30th, held that the city has a right to exact compensation for its franchises. The case was a suit in equity brought by the city against the Toledo Traction Co. for the receipt of the Robinson lines, as an ordinance gave the city one per cent per annum of the gross receipts, which has never been paid. The argument was made that the city cannot lawfully speculate in the use of its franchise, nor in the dispositions of the use of its public streets can it derive private advantage to itself. Counsel agreed that the only question before the court, however, was the right of the city to sell its franchise. The court held, however, that the statute provides that the council has power to

fix the conditions upon which street railways may be constructed and operated, and hence this confers ample power to exact one per cent unless the contract is immoral and against public policy.

MISUSE OF SCHOOL TICKETS.

The pupils of the public schools of Lowell, Mass., have been abusing the privilege of the school tickets which were issued to them by the street railway company in books and which were sold at half price. Recently the street railway company found that the children were selling tickets from their books and charging 5 cents each for them, thus making 100 per cent on the transaction. The books did not last as long as they were supposed to and an investigation which was undertaken brought these facts to light. The street railway company has now called in all the special ticket books which were issued and is substituting therefor slip tickets on which are ten fares which are just the number required for the pupil for a week. These slips will be issued to the pupils each week and the new arrangement will not permit of any speculation.

TROLLEY EXCURSION TO FLINT, MICH.

January 6th, by courtesy of the Detroit United Ry., the city officials of Pontiac, Mich., and a large party of guests were invited for a trolley ride to Flint. The party was escorted by Mr. A. H. Stanley, general superintendent of the company, James Bullon, division superintendent, G. W. Parker, general passenger and freight agent, A. Eastman, assistant general passenger and freight agent, and John Kerwin, superintendent of tracks. A pleasant trip was made to Flint via Royal Oak, about three hours being consumed on the trip. A committee of the business men's organization of Flint escorted the party to the Elk's club rooms where refreshments were served, addresses of welcome made and toasts responded to.

A number of the leading manufacturing establishments of Flint were visited by the party and at four o'clock, by invitation, the guests were driven to Oak Grove sanitarium where they were handsomely entertained. The party returned to Pontiac about 10 o'clock in the evening after having made a most enjoyable trip.

A COLLISION IN CHICAGO.

A collision between a Kedzie Ave. electric car and the Pioneer limited train of the Chicago, Milwaukee & St. Paul Ry. at Chicago Ave. on the evening of January 27th, resulted in injuries to 12 passengers in the electric car. The responsibility for the accident proved a difficult matter to determine from the evidence available. None of the injuries resulted fatally, and though the motor car was demolished and its trailer badly damaged, parts of the wreck being afterwards found at a distance of 200 ft. from the scene of the accident, the majority of the passengers escaped unharmed.

The Louisville (Ky.) Anchorage & Power Valley Electric R. R., which has been in operation only about three months, is paying running expenses and making more than enough to meet the interest on its bonds. The road's bonds are already in demand.

A bill has been introduced in the Ohio Legislature providing that all companies operating interurban lines running for more than five miles out of any municipality shall equip their cars with toilet rooms before Jan. 1, 1903.

The Dayton & Xenia Traction Co. carried 38,000 passengers into Dayton during the month of December.

The Phoenix (Ariz.) Railway Co. has constructed a short loop which affords easier access to the pleasure park at the end of one of its branches. The loop gives the company a total of 11 miles of track. An artificial lake will be an additional feature next season to the park's attractions.

LANSING, ST. JOHNS & ST. LOUIS RAILWAY.

The informal opening of the part of this road between Lansing & St. Johns which took place recently, marks the beginning of interurban transit in the central part of the state of Michigan, and this road will eventually form a division of a vast net work of lines which are either proposed or under construction throughout the central and southern part of the state. The contract for building and equipping the road complete was awarded to the Arnold Electric Power Station Co., of Chicago, which has handled all the engineering details.

The 20 miles of road between Lansing and St. Johns is about one-third of the ultimate length of the line which is to extend to Alma and St. Louis, a distance of 60 miles. The towns of DeWitt and Maple Rapids, as well as a number of smaller places, will be included in its route. None of these towns has direct communication with each other nor any convenient way of reaching Lansing, the capital city.

The road is being built in a very substantial manner and a number of engineering difficulties were encountered upon the route. Two miles from DeWitt the road passes over what is called Clayton's cut. This is the largest cut on the line, being 2,000 ft. long

to greatly simplify the method of electrical distribution. The system in this case does away with rotary converter sub-stations and uses the alternating current system throughout from the station generators to the motors under the cars, static transformers being placed on the cars. As this plan involves several entirely new features the operation of the road, which will commence regularly within a short time, will be watched with the greatest interest by electrical engineers throughout the world.

AUDIT COMPANY OF ILLINOIS.

The importance of auditor's reports as a basis of credit for partnership and individuals as well as for large corporations is becoming more widely recognized in this country, and there are now a number of companies making a specialty of accounting and auditing. Among these is the Audit Company of Illinois, which extends its operations to the examinations of all legitimate enterprises, auditing the accounts, examining the financial standing of clients and the physical condition of their properties, due regard being had to the confidential nature of the work.

The equipment of this company for handling accounts and reporting on the financial and physical condition of railway, gas and



BRIDGE OVER LOOKING-GLASS RIVER—LANSING, ST. JOHNS & ST. LOUIS RY.

and 13 ft. deep. The excavation was made in heavy yellow clay, which was removed with great difficulty. Three miles north of DeWitt the road passes over a sink hole which also caused trouble for the engineers. An eighth of a mile from the right of way lies a small shallow lake. The field through which the right of way passes was found to be a comparatively thin layer of soil covering the concealed extension of this lake. A temporary track was laid around this place and the process of filling in was begun. After many car loads of earth were put down rails were laid across this spot, but in a short time the ground broke away and the road bed was found to be practically afloat. A steam shovel was then put to work and 3,500 carloads of sand and gravel were used in filling up the hole.

The new road will handle passengers, mail and freight in the same manner as steam roads except that it will make much more frequent stops and thus come into close touch with all classes of its patrons. The road bed is well ballasted and solid, the bridges have been very substantially built, the marshes occurring at frequent points have been converted into substantial ground and the right of way is enclosed by a wire fence.

The unique feature of the Lansing, St. Johns & St. Louis Ry. is the electric system which has been adopted for operating the road. The system was worked out by Mr. Bion J. Arnold, and is intended

electric lighting companies is unusually strong and effective. Expert accountants and engineers experienced in the construction and operation of similar properties enable such work to be handled in the most satisfactory manner.

The headquarters of the Audit Company of Illinois are in the New York Life Bldg., No. 171 La Salle St., Chicago. The officers are: President, L. A. Walton; vice-president, F. W. Little; secretary and treasurer, C. D. Organ; manager, H. J. D. Wodrich

WASHINGTON TRACTION LINES COMBINE.

Deeds have been placed on record conveying to the Washington Railway & Light Co., formerly the Washington & Great Falls Co., the entire properties of the Metropolitan and the Columbia Street Railway Cos., of Washington. The new company has also absorbed the suburban lines of the Washington Traction Co. The movement is in accordance with an act of the last congress giving authority for the consolidation of the street railway properties operated by the Washington Traction Companies.

A boiler in the power house of the Ithaca (N. Y.) Street Railway Co. exploded, January 23d, injuring three employees.

CANADIAN NOTES.

W. B. Rankine, vice-president of the Canadian Niagara Power Co., announces that work on the plant of the company in the Queen Victoria Falls Park will be prosecuted with dispatch. The construction of the Canadian works will take two years. The company has now awarded contracts aggregating one and three-quarters millions of dollars, including the tunnel which A. C. Douglas is constructing, 2,200 ft. through solid rock, and the circular coffer dam nearly completed along the shore line of the river, by James Barry of Niagara Falls, Ont. The proposed power transmission line from Niagara Falls to Toronto can be ready to supply power for operation by October next, getting the electric current from the power plant of the Niagara Power Co. on the American side until the Canadian works are completed. A bank of eleven transformers has been ordered from the Canadian General Electric Co. A contract just awarded to Dawson & Reilly is an important one. It provides for a wheel pit 175 ft. long, parallel to the river, 160 ft. deep, and 20 ft. wide. The intake canal will be 600 ft. wide where it comes from the river, and 14 ft. deep. The first installation provides for three 10,000-h. p. turbines and dynamos.

The Canadian Court of Appeals has recently decided the snow case of the city of Montreal against the Montreal Street Railway Co., which the city had appealed from the Superior Court. The decision sustained the company's contentions as to its duties and privileges, holding (a) that the company is bound to keep its tracks clear from ice and snow, but not to remove or cause to be removed from the streets and convey elsewhere the snow so cleared from its tracks; (b) that the company, without the permission of the city council, may use, for the purpose of clearing snow or ice from its tracks, electric sweepers, rotary brushes or other similar apparatus, which sweeps snow or ice from its tracks into the street. The city had the right to remove all the snow from curb to curb, including what was shoveled from the sidewalks or fell from the roofs of houses, and charge half the cost to the company.

Although the Montreal Terminal Railway Co. has gained an entrance to the city for its electric cars, there is little probability that any transfers will be issued or accepted by the Montreal Street Ry. lines, this being optional with the latter.

The total earnings of the Hamilton (Ont.) Street Ry. for the year 1901 were \$152,519.

The excellent natural water power at Lachute (Que.) is attracting the close attention of American capitalists, as well as those of Shawinigan, and Lachute was recently inspected by Messrs. A. E. Doucet, of Quebec; E. V. Kane, Robert C. Cookman, H. E. Mitchell, of Philadelphia; H. E. Gill, of New York; H. H. Melville, of Boston; H. Kingbolt and F. D. Enick, of New York.

The Ottawa council proposes to water the streets of the city by means of sprinkling cars operated by the electric street railway, as well as in Toronto.

The International Rapid Transit Co., composed largely of New York financiers identified with the International Traction Co. of Buffalo, is endeavoring to secure a controlling interest in the Hamilton, Grimsby & Beamsville Electric Railway Co. Individual shareholders in the latter company have been offered \$200 for their stock, on the understanding that the Hamilton, Grimsby & Beamsville Ry. shall liquidate every liability. It is understood that the International Rapid Transit Co. is negotiating for the Niagara, St. Catharines & Toronto Electric Ry., which controls the Niagara Falls, Wesley Park & Tramway Co., the Port Dalhousie, St. Catharines & Thorold Electric Ry., and the charter for the built electric railway from Queenstown opposite Lewiston, N. Y., so that it would only have to build a twelve mile extension of the Hamilton, Grimsby & Beamsville Railway from Beamsville to St. Catharines to have a continuous electric railway from Hamilton to Niagara Falls, where the Niagara, St. Catharines & Toronto Railway connects with the various electric railways under the control of the International Traction Co.

Application has been made for the incorporation of the London (Ont.) Railway Co. to build an electric railway from Ingersoll to London. F. G. Rumball and J. H. Purdom, of London, are among the promoters, and T. H. Inseombe is solicitor for the company.

The citizens from Notre Dame de Grace and Montreal West have forwarded a petition to the Montreal Street Railway Co., asking for a new line from Westmont to Rockfield.

A meeting of the executive committee of the Canadian Electric Association was held on January 10th for the purpose of arranging the preliminary program of the annual convention, which will take place next June in Quebec. It was announced that Mr. Fred Nicholls, manager of the Canadian General Electric Co., had offered \$500 to the association for the purpose of stimulating study and research. This sum will probably be disbursed in the form of prizes for papers on electric subjects.

A syndicate headed by Major J. K. Leslie has, it is stated, bought the charter for an electric railway from Hamilton, through Ancaster, to Brantford. The charter was held by Jacob Shaver, J. Henderson and E. Kendrick, and J. V. Teetzel, solicitor for the Toronto syndicate, is authority for the statement that application would be made at once to the Legislature to amend the charter, and that the work of construction would be started early in the spring.

Notice has been given that at the next session of the Quebec provincial Parliament application will be made for an act to incorporate the Shawinigan Terminal Railway Co. with power and authority to lay out, construct and operate an electric railroad of standard gage over the existing electric railway and tramway lines in the present village of Shawinigan Falls and in the parish of St. Boniface, and from a point in or near the said village of Shawinigan Falls, to any points in the neighboring counties of St. Maurice and Champlain.

Westmont has, it is reported, extended the franchise of the Montreal Street Railway for 50 years. In view of the new franchise being granted for 50 years, instead of 10 years, as in the original proposition, the town will make one payment of \$4,500, in place of \$2,000 per annum, for 10 years. The route will extend from the Guy St. line, Cote des Neiges, to the boulevard and western limit of Westmont, with connections later with the center of the town.

The Velvet Mines of Rossland, B. C., intend applying at the next session of the House of Commons for a charter to build and operate a railroad with either steam or electric motive power, between Rossland and the Red Mountain railroad. The line, if put through, will be about 30 miles long.

Montreal has experienced one of the worst snowstorms known here in years. Seventeen electric sweepers were kept busy on the lines of the Montreal Street Railway Co. for nearly three days, and nearly all the lines were kept open. It is now the city's turn, and thousands of men and as many teams as can be hired will be necessary to remove the snow from the sides of the street, where it is piled up to the height of many feet.

CHANGES IN WESTINGHOUSE COMPANY.

At a meeting of the directors of the Westinghouse Electric & Manufacturing Co., held in New York, January 23d, the resignation of Mr. B. H. Warren, second vice-president, was accepted. Mr. Warren still retains his connection with the company as a director. The retirement of Mr. Warren brought about the following changes in the officers of the company.

Mr. Frank H. Taylor, until recently fourth vice-president, has been advanced to the position of second vice-president and will be in charge of the sales of the company and have a general supervision over its affairs.

Mr. L. A. Osborne, manager of works, has been made fourth vice-president, in which capacity he will have charge of the engineering and producing operations of the company.

Mr. Arthur Hartwell has been advanced to the position of sales manager in charge of the sales organization. Mr. Hartwell was formerly manager of the Chicago office of the company.

Mr. Philip A. Lange, formerly general superintendent, was made manager of works, in which position he will have charge of the manufacturing departments of the company. The officers in other respects remain as heretofore.

An order has been introduced in the Chicago council appointing the mayor, corporation counsel and commissioner of public works as a special committee to open negotiations with the officials of the Union loop in regard to the extension of the loop as far south as Polk St., the removal of all unused stairways and the eventual installation of elevators in place of stairways at all loop stations on the elevated lines.

THE CONCORD, MAYNARD & HUDSON STREET RAILWAY.

The completion of the Concord, Maynard & Hudson Street Ry. forms an important connecting link between a number of heretofore isolated systems and opens up a wide extent of rich farming and manufacturing districts in eastern Massachusetts. This road joins the Lexington & Boston Street Ry. at Concord, with the Clinton, Leominster & Fitchburg and Worcester & Marlboro electric lines at Hudson. The system presents an example of a medium-size, up-to-date, modernly equipped interurban electric railway. Considerable revenue will be derived by transporting the employes of several large factories along the way. At Hudson are large



MAP OF CONCORD, MAYNARD & HUDSON SYSTEM.
Proposed Extensions in Broken Lines.

rubber works and boot and shoe factories. At Maynard is the extensive plant of the American Woolen Co., to which additions are at present being built. The line passes other important shoe and leather plants, rubber factories, and at Acton runs past a large powder mill.

The road as now completed is 14 miles long, single track with turnouts. The roadbed is well constructed with 60-lb. T-rails on chestnut ties spaced 24 in. c. to c. The joints are bonded with 9-in. American Steel & Wire bonds. Extensions are to be built to South Acton, Saxonville and Northborough.

The power and car houses located at Maynard are simple and solid in construction and well adapted to the purposes for which they are designed. The power house is 48 ft. x 120 ft. 4 in., built of brick with iron trusses and gravel roof. The engine room which is 42 ft. 8 in. x 45 ft. 4 in., contains two 350-h. p. cross com-

room and well equipped machine shop. The office is fitted up with every convenience necessary to the quick transaction of the work of the company. The room for the motormen and conductors is 20 x 40 ft. and contains 20 lockers for clothes, lavatory, set bowls, pool table, card and writing tables; also a large graphophone with over a hundred records. The room is well lighted and heated and it is found the men spend most of their leisure time here instead of on the streets or in saloons.

The grounds about the buildings have been greatly improved, and where once were only an ugly and unsightly ledge and rocks will soon be a well kept lawn and artistic flower gardens.

The equipment consists of six closed motor cars built by the Laconia Car Co. Works, and eight open cars built by the Wason company, all mounted on Bemis double trucks. The cars are fitted with Christensen air brakes and Gold electric heaters.

The officers of the company are: President, W. R. Dame; secretary, M. J. Buckley; treasurer, W. S. Reed; superintendent, John W. Ogden; general contractors, Marcus A. Coolidge, of Fitchburg, Mass.

Mr. John W. Ogden, superintendent of the Concord, Maynard & Hudson Street Ry., was born in Fitchburg, Mass., 45 years ago. He was educated in the public school, entering the high school at 12 years of age, but was obliged to leave in two years on account of the death of his father. He then took up the printing business and afterwards began the study of medicine at the College of Physicians and Surgeons in Boston. For several years he was in business in Fitchburg. He held a city position for two years and for twenty-two years was constable. He was appointed a justice of the peace by Governor Grenhedge and later by Governor Crane. He was identified for about 15 years with steam railroads, in the meantime taking up the subject of electric roads and working up through the several departments to the position of superintendent. He opened the Worcester & Clinton road December 10, 1898, and the Clinton & Hudson road Apr. 18, 1900, both of which he successfully handled as superintendent until their consolidation with the Worcester Consolidated Street Railway Co., when he was appointed assistant superintendent of the third division from Worcester to Fitchburg, which position he resigned to accept the present one. He is a Knight Templar and 32d degree Mason, as well as a Shriner, and is identified with several other societies.

SUIT FOR ALLEGED FALSE ARREST.

The Brooklyn Rapid Transit Co. has been made defendant in a suit brought by one Francis Keegan, a former employe of the company, to recover \$10,000 for alleged false imprisonment at the time



POWER HOUSE AND CAR BARN AT MAYNARD, MASS.

pound condensing engines made by the Slater Engine Co., of Warren, Mass. These engines have cylinders 14 and 28 x 36 in. Each engine is direct connected to a 250-kw. Westinghouse generator. The boiler room contains two 264-h. p. B. & W. type boilers. All valves are of the Crane make.

The car house is built of brick and is 51 ft. x 204 ft. with annex 35 x 100 ft. It contains four tracks, office, large stock room, men's

of the big street railway strike in Brooklyn in July, 1899. While the strike was at its height the railway company received information of a plot to blow up a section of the elevated with dynamite, and upon advice caused the arrest of Keegan and 20 other employes. Keegan was subsequently discharged for lack of evidence and now brings suit, claiming that his reputation was injured and his prospects in life seriously affected by his arrest and imprisonment.

KEYSTONE CAR WHEEL CO.

The accompanying illustration gives a general view of the factory of the Keystone Car Wheel Co., of Pittsburg, which is located at West Homestead, Pa., a short distance outside the city limits. Mr. Charles V. Slocum is president of the company and previous to its organization was manager and treasurer of the Penn Car Wheel Co. and before that he was secretary of the New York Car Wheel Works, thus having had an extensive experience in this business.

The Pressed Steel Car Co. bought out the Penn Car Wheel Co. and had use for the entire product of the foundry; this left an opening for a new car wheel foundry which Mr. Slocum at once recognized. With his accustomed energy and ability he at once organized a new company which, though but one year old, already occupies a prominent position among car wheel works.

The new shop was at first built for a capacity of 300 wheels per day, but the business of the Keystone company soon outgrew this output and last October the factory was enlarged to produce 500 wheels per day.

The company's shops are very favorably located on three lines of railroads, the Pennsylvania, Baltimore & Ohio and the Pittsburg, Bessemer & Lake Erie, being the only factory in the Pittsburg district with such extensive shipping facilities. The company makes a specialty of wheels for electric railway service and

adverse conditions, the motorman being able to bring it to a full stop on any portion of the grade in less than a car's length, notwithstanding that the track was muddy and slippery because of the falling snow. The car was gotten under full headway and stopped short repeatedly, the brakes fulfilling every requirement. They were accorded the highest praise by the company's engineers as well as the laymen who watched the test. It is hoped that the exhibition will restore the confidence of the street railway patrons in the safety of the car service.

NOTES FROM KANSAS CITY.

The Metropolitan Street Railway Co. of Kansas City has about completed the installation of machinery at the new Olive Street station from which power will be generated for the operation of lines in the south part of the city. The equipment comprises two G. E. 750-kw. rotary converters which will be used as direct current generators until the new high tension power house is completed. The machines are driven by a 2,000-h. p. engine, rope transmission being used.

The Metropolitan's moderate investment in equipping a three-acre pond on its Northeast division with accommodations for skaters has resulted on many days in increasing the receipts by



WORKS OF THE KEYSTONE CAR WHEEL CO.

has met with gratifying success in this line of work. Large orders have been recently received from the street railways in Baltimore, Cleveland, Pittsburg and other prominent cities.

The secretary of the company is Mr. John Howard Yardley who maintains headquarters for the company in Philadelphia. Mr. Yardley was formerly connected with the New York Car Wheel Works and also with the Penn Car Wheel Co., and is widely known in the street railway field.

MAGNETIC BRAKES FOR AMSTERDAM.

A serious accident, involving the wrecking of two electric cars on the Market St. line of the Amsterdam Street Railway Co. recently, led the management to make a careful examination of the brake systems now employed for street railway service. As a result of this investigation the magnetic brake of the Standard Traction Brake Co. was selected, and, after thorough tests under the most difficult conditions and in the most exacting service, it was finally adopted for the entire system. Car No. 15, one of those which was in the wreck, was entirely rebuilt and fitted with Standard magnetic brake equipment. The first public demonstration was given recently when a trial trip was made over the line with officers of the road and guests. The car was taken up Market St. hill, and allowed to descend, the operation being watched with considerable interest by many pedestrians as well as those on board. The magnetic system proved all that was claimed for it under the most

65 per cent. Five arc lamps were placed around the pond and a comfortable shelter erected.

The council recently passed an ordinance requiring the company to put flagmen at all its railroad crossings, but the company contends that fewer accidents have occurred since the flagmen were dispensed with, and will, if necessary, contest the case in the higher courts.

An ordinance has also been introduced in the council requiring that the gates on electric cars be removed, on the ground that the gates prevent passengers from getting out of a car quickly when a collision is imminent.

February 1st a strike was inaugurated by the employes on the Kansas City, Leavenworth Electric Ry., who demanded the reinstatement of a number of men who had been discharged for neglect of duty. Superintendent DeCoursey and his assistant procured a sufficient number of substitutes during the first day of the strike to man most of the cars on all the company's divisions, and the service has not been crippled to any extent by the demonstrations of the strikers, although, on several evenings, it was thought prudent not to run cars after dark. The strikers' attempt to operate a bus line in opposition to the cars has resulted in signal failure, and Manager Wolcott of the company reports that he has had many more applications for work than vacancies.

The Northern Ohio Traction Co. has declined to accede to the demand of the Akron, O., council for a 3 cent fare in that city.

PERSONAL.

MR. H. A. EVERETT has been re-elected president of the Cleveland Electric Railway Co.

MR. ANTON G. HODENPYL, of King, Hodenpyl & Co., of Chicago, has been elected a director of the Rochester (N. Y.) Railway Co.

MR. JAMES DAWSON CALLERY, the recently elected president of the Pittsburg Railways Co., controlling all the lines in that city, Allegheny and vicinity, has the distinction of having been the president of the pioneer electric line in Pittsburg. Mr. Callery's first experience in street railway work was in connection with the Second Avenue Co., operating a local horse car line.



J. D. CALLERY.

He so well demonstrated his ability in a subordinate capacity in this company that he was elected president. Directly after this, in 1889, Mr. Callery converted the road for electric operation, the first in Pittsburg to be put on a paying basis and established permanently. Extensions were made in all directions; theretofore inaccessible tracts of land were connected with the city and developed as residential suburbs. By connecting many towns along the Monongahela River between Pittsburg and McKeesport, Mr. Callery soon made the Second Avenue system one of the largest in the country at that time. In 1897 he effected the organization of the United Traction Co., which brought about the consolidation of the Pleasant Valley and Manchester systems in Allegheny City with the Second Avenue lines in Pittsburg. Mr. Callery was made president of the United company. Two years later the West End system in Pittsburg, in which Mr. Callery was also interested, was purchased by the Southern Traction Co., and he was elected president. The Pittsburg Railways Co. was formed last December to take over all the Pittsburg and Allegheny lines, including the United, the Southern, the Consolidated, the Monongahela, the Birmingham, the Suburban and other systems. Mr. Callery's accession to the presidency of all these roads is but the logical event. Mr. Callery was born in Allegheny City 40 years ago. He is the son of James Callery, a prominent business man of Pittsburg, now deceased, who was best known as being the organizer of the Pittsburg & Western R. R., running from Allegheny to Akron and now operated as an important division of the Baltimore & Ohio system. His son is an officer or prominent stockholder in a score of Pittsburg's leading business institutions, and is vice-president of the Philadelphia Co., which controls the gas and electric companies in Pittsburg.

MR. GEORGE M. SARGENT, president of the Sargent Co., Chicago, and his wife, left February 8th for an extended trip in the Mediterranean.

MAJOR EVANS, of Lorain Steel fame, was at the dinner of the New England Street Railway Club. The major has as many friends in the business as any other one man in the trade.

MR. C. E. DONNATIN has been appointed superintendent of the mechanical department of the Los Angeles Railway Co. In this position he will have charge of the company's rolling stock, car and machine shops and store room.

MR. JOHN HARRIS, superintendent of the Cincinnati Traction Co., on February 14th, completed the 35th year of his service with the street railways of Cincinnati. Mr. Harris was born in Lancaster, O., in 1841, and went to Cincinnati, taking horses for the market there; he commenced business, caring for horses, on the site of the present federal building and within 200 ft. of

the office now occupied by him. During the last 40 years Mr. Harris has been kept away from his office but a single day by sickness.

MR. L. J. WOLF has been elected president of the Aurora, Elgin & Chicago Railway Co., succeeding Mr. B. Mahler; and Mr. Myron H. Wilson has been elected vice-president, succeeding Mr. Wolf in that capacity.

MR. JOHN A. GRANGER, whose name is familiar to old-time railway men, has accepted an important position with the Burnet Co., of 121 Maiden Lane, New York City, a new firm organized to deal in railway and electrical supplies.

MR. I. A. SWEIGARD, of Philadelphia, has been elected president of the Ambler & Jenkintown, the Montgomery, Doylestown & New Hope, and the Center & Clearfield Street Rys. The three companies elected Mr. T. F. Durham, secretary and treasurer.

MR. JOHN G. WEBB has been elected vice-president, and Mr. F. J. Green, secretary, of the Columbus, London & Springfield Railway Co. Mr. Webb and Mr. Green formerly occupied the positions of treasurer and vice-president, respectively, of the company.

MR. FRANK L. BROWN has been appointed agent of the J. G. Brill Co. for the Pacific Coast territory, succeeding Mr. F. A. Lawson, who resigned January 1st. Mr. Brown's office will be in San Francisco. Mr. Brown formerly represented the Shelby Steel Tubing Co.

MR. JOHN MURPHY, general superintendent of the Pittsburg Railways Co. under Mr. Callery, is a native of Ireland and 40 years of age. Mr. Murphy came to America in his early youth and devoted himself diligently to obtaining a thorough education. His home was in central Pennsylvania. After leaving school he obtained employment as an engineer on a steam railroad, and in this connection improved his opportunity to study the mechanical construction of the road and locomotive, all of which prepared him for his subsequent success in the economical construction and management of electric lines. When the Second Ave. horse car line in Pittsburg was converted into an electric system, he was chosen superintendent. In 1898 he was made general superintendent of the United Traction Co. Since his recent appointment as general superintendent of all the trolley lines in Pittsburg and Allegheny he has actively engaged in effecting practical improvements of the system which include the changing of routes and building of short loops to relieve the congestion of cars in Fifth and Sixth Aves. During his busy and practical career Mr. Murphy has found time to study electrical engineering as a science. He is, as well, an inventor of ability, being the inventor and patentee of the Murphy car wheel truing machine.



JOHN MURPHY.

MR. A. H. RUTHERFORD has been elected vice-president of the Knoxville (Tenn.) Traction Co. in the place of Mr. C. C. Howell, who has resigned on account of ill-health. Mr. E. C. Hathaway, general manager of the Railways & Light Company of America, will succeed Mr. Howell as general manager of the Knoxville Traction Co.

COL. C. C. HOWELL, formerly vice-president and general manager of the Knoxville (Tenn.) Traction Co., received many tokens of esteem from his friends on retiring from his dual capacity with the company on January 24th. The employes of the road presented him with a gold-headed cane. In the afternoon of the

same day, a hundred of his friends came to his house with valuable gifts for Col. and Mrs. Howell. At a meeting of the hospital board that evening he was presented with a silver dish by the gentlemen members, and a loving cup by the ladies of the board.

MR. HAROLD W. CLAPP, manager of the Brisbane Tramways of Brisbane, Australia, is in this country and attended the New England Street Railway Club dinner last month. His father has been associated with the Brisbane Tramway & Omnibus Co. for many years. Mr. Clapp is about to take a course at the shops of the General Electric Co.

MR. S. LA RUE TONE will be associated with Mr. Callery in the management of the Pittsburg Railways Co., in the capacity of assistant to the president. Mr. Tone was born in Cincinnati in 1864. He graduated from the Rensselaer Polytechnic Institute,



S. LA RUE TONE.

in Troy, as a civil engineer, and entered the service of the Pennsylvania R. R. He resigned to accept a better position with the Philadelphia Traction Co., controlled by the Widener-Elkins syndicate, and when the latter bought the old Pittsburg, Oakland & East Liberty Passenger Ry., in 1887, Mr. Tone was employed to effect its conversion into a cable system, a work which was successfully accomplished in the winter of 1888. The name of the company was changed to the Pittsburg Traction Co., and Mr. Tone remained with it for two years. Later, he became identified with the Duquesne Traction Co., and in 1892, entered the service of the West End Traction Co., as chief engineer. Mr. Tone has acted as chief engineer in charge of the construction of lines in Connellsville, Kittanning and Rochester, Pa., and Steubenville, O. When the United Traction Co. was organized he was made chief engineer of all the lines it controlled, a position which he retained until the recent merger, when he was appointed President Callery's assistant.

MR. ROBERT A. DUNLAP, assistant treasurer of the Cincinnati Traction Co. has resigned that position, and retired for the present from active service on January 16th. Mr. Dunlap has been in the street railway field for more than 40 years, and was associated with the promoters of the first system in Cincinnati. In accepting his resignation the company voted him a life pension of \$100 per month.

MR. CHARLES FITZGERALD, formerly general superintendent of the Consolidated Traction Co., Pittsburg, and Mr. W. C. Smith, formerly superintendent of transportation of the company, were presented with handsome gifts by the employes of the railway, on retiring from office. The presentation was made in the Empire Theater, January 11th, and was followed by a cheerful demonstration of good will.

MR. A. K. DETWILER, formerly president of the Toledo & Maumee Valley Railroad Co., Mr. C. A. Denman, the former manager of the company, and Mrs. Phelan, the latter's assistant, on retiring from office, were presented with especially handsome gifts by the employes of the road as a testimonial of the regard which the employes bear to the officers with whom they have been associated for more than six years.

MR. BION J. ARNOLD, president of the Arnold Electric Power Station Co., of New York and Chicago, has been appointed consulting electrical engineer of the New York Central & Hudson River R. R. In connection with his new position Mr. Arnold is developing a project for the construction of an underground loop for the tracks entering the Grand Central station in New York and converting the service on these lines from steam to electric traction.

MR. WILLIAM C. WHITNEY, the veteran financier, capitalist, horse-lover and street railway man, has announced his intention to retire from all the many business interests with which his name has been associated, and devote the remainder of his life to travel, recreation and his racing interests. It is stated that with the possible exception of one other, Mr. Whitney has more money invested in racehorses and homes for them than any man in the United States. Speaking of his connection with the Metropolitan Street Ry., of New York, the New York Sun quotes a prominent New Yorker as follows: "It is not generally known just how intimately William C. Whitney has been connected with the development of the Metropolitan Street Railway system. Many persons think that Mr. Vreeland is responsible for it. That is not so. Vreeland has perfected in a superb way Whitney's plans. But Whitney planned to control the street railway business of New York so long ago as when Jacob Sharp was laying the rails of the Broadway road. And from his brain the system has developed. As an illustration of the details which he looks after, I may tell you that the entire system of transfers now used on all the lines was thought out, improved and perfected by Mr. Whitney."

MR. TRUMAN P. GAYLORD has been appointed manager of the Chicago office of the Westinghouse Electric & Manufacturing Co., of Pittsburg, succeeding Mr. Arthur Hartwell, who has been advanced to the position of sales manager at the Pittsburg office. Mr. Gaylord is 31 years of age and was born in Shelby, Mich. He entered the University of Michigan with the class of '93, on a course of electrical engineering, but in 1892 removed to Chicago, where he was engaged as engineer of subways and underground construction for the World's Fair, under Frederick Sargent and later under R. H. Pierce. In October, 1893, Mr. Gaylord became associate professor of electrical engineering at the Armour Institute of Technology and in accepting this position was prevented from returning to complete his course at the University of Michigan. In recognition of his services in building up the electrical engineering department of the Armour Institute, the trustees awarded Prof. Gaylord the degree of electrical engineer. In 1898 he severed this connection to accept a position with the Chicago Edison Co., in which latter he remained a year, organizing, during that time, the testing department, which was at once recognized by the company as a most important innovation. Mr. Gaylord entered the Chicago office of the Westinghouse company in July, 1899, in the capacity of engineer, from which position he was soon promoted to that of general salesman.

MR. W. ELWELL GOLDSBOROUGH, director of the School of Electrical Engineering of Purdue University, has been appointed chief of the Department of Electricity of the Louisiana Purchase Exposition. Mr. Goldsborough's career in the electrical field has been a conspicuously active one since his graduation from Cornell University with the degree of M. E., in 1892. He was for a year professor of electrical engineering at Arkansas University, Fayetteville, Ark., and resigned this position to become associate professor of electrical engineering at Purdue University. In 1897 he was elected director of the School, a position which he still retains. Prof. Goldsborough came prominently before the public in connection with a series of tests at the Plant St. Station of the Edison Electrical Illuminating Co., of Baltimore, his ideas being embodied in the reconstruction of the plant and his report published in the transactions of the American Institute of Electrical Engineers. The scope, conduct and results of the tests were reported as ideal in their proportions by the committee which passed upon that paper. Prof. Goldsborough has been a frequent contributor to technical literature. He is a member of numerous engineering and scientific societies, among them, the American Institute of Electrical Engineers, the Institution of Electrical Engineers of England, the Franklin Institute, the American Association for the Advancement of Science, and the Society for the Promotion of Engineering Education. Prof. Goldsborough had made a special study of electrical features at expositions. He was a member of the international electrical congress at Chicago, and attended similar gatherings at the Omaha and Buffalo expositions, serving as a juror of awards at the latter. He was appointed as

a delegate of the American Institute of Electrical Engineers to the Paris Exposition and now holds the office of manager in the Institute.

OBITUARY.

MR. MICHAEL MURPHY, president of the Van Brunt St. & Erie Basin Railroad Co., of Brooklyn, N. Y., died of pneumonia, on January 21st, at his home in Brooklyn. He was born in Ireland about 60 years ago. Mr. Murphy was a well known hotel man. The Van Brunt St. & Erie Basin R. R., of which he was president, is a short independent electric line in South Brooklyn, about 2½ miles long, that has never been consolidated with the Brooklyn Rapid Transit system.

MR. SAMUEL ELMER, president of the Mountain Lake Electric Railroad Co., of Gloversville, N. Y., died suddenly on Sunday morning, January 26th. Mr. Elmer was a native of Ashfield, Mass., and was 53 years of age. Prior to 1890 he was a prominent business man of New Haven, Conn., but in that year removed to Gloversville, where he became the holder of large real estate interests and the promoter of the electric lines connecting Gloversville, Fonda and Mountain Lake.

Mr. FREDERICK G. FRESE, vice-president of the Richmond & Petersburg Electric Railway Co., died at his home in Richmond, Va., January 24, of pneumonia, after a three-weeks' illness. Mr. Frese was a native of Ohio, and 36 years old. For the greater part of his life he was a resident of Akron, from which city he removed to Richmond last June to accept the vice-presidency of the Richmond & Petersburg company and to become the local representative of the Cleveland Construction Co. Previously, he had been interested in the building of inter-urban electric railways and telephone lines in Ohio, and was at one time connected with the Western Union Telegraph Co., and later general manager of the Akron Telephone Exchange.

ELECTIONS.

THE TOLEDO & WESTERN RAILWAY CO. has elected the following officers: Luther Allen, president and treasurer; F. E. Seagraves, secretary, and C. E. French, auditor.

THE DETROIT UNITED RY. has elected the following officers: J. C. Hutchins, president and general manager; Henry A. Everett, vice-president, and George H. Russell, treasurer.

THE PHILADELPHIA, MORTON & SWARTHMORE STREET RAILWAY CO. has elected the following officers: Louis J. Levick, president, and E. J. Hasse, secretary and treasurer.

THE LAKE ERIE, BOWLING GREEN & NAPOLEON ELECTRIC RAILWAY CO. has elected the following officers: L. Black, president; W. M. Tuller, vice-president; E. M. Friess, secretary, and A. Froncy, treasurer.

THE MEDIA (PA.), MIDDLETOWN, ASTON & CHESTER ELECTRIC RAILROAD CO. has elected the following officers: F. W. Hammett, president; B. Griffith Jones, vice-president, and E. J. Hasse, secretary.

THE XENIA (O.), CEDARVILLE, JAMESTOWN & WILMINGTON ELECTRIC RAILWAY CO. has elected the following officers: J. E. Lawes, president; W. H. Manning, vice-president and manager, and R. R. Grieve, secretary and treasurer.

THE LANSING (MICH.), ST. JOHNS & ST. LOUIS RAILWAY CO. has elected the following officers: John Mills, of Port Huron, president; Isaac Hefett, of Maple Rapids, vice-president; M. W. Mills, of Port Huron, treasurer, and F. L. Dodge, of Lansing, secretary. The new directors elected to the board are: F. C. Norris and E. F. Percival, of Port Huron, and Stiles Kennedy, of St. Louis.

THE COLUMBIA (PA.) & MONTOUR ELECTRIC RAILWAY CO. has elected its president and directors as follows: B. F. Meyers, of Harrisburg, president; and Joseph Ratti and E. B. Tustin, of Bloomsburg; B. F. Crispin, of Berwick, and L. S. Hart, W. N. Myers and E. R. Sponsler, of Harrisburg, directors.

RAPID TRANSIT SUBWAY EXPLOSION IN NEW YORK CITY.

At noon on January 27th, by an explosion of a large quantity of dynamite intended for blasting purposes in the Rapid Transit subway at 41st St. and Park Ave., New York City, two hotels, a hospital, the Grand Central Station and other buildings in the immediate neighborhood were badly wrecked, five persons were killed and over a hundred men, women and children were so badly bruised and cut by flying glass and debris as to require the attention of ambulance surgeons and doctors. Terrible as the catastrophe was it is worthy of note that this is the first serious accident of any kind that has occurred in connection with the subway work, although thousands of pounds of explosives have been used in all parts of the city, and for a portion of the time half the streets in the borough of Manhattan have carried their normal vehicular, street car and pedestrian traffic with an open trench from 15 to 40



SCENE OF EXPLOSION IN PARK AVENUE, NEW YORK.

ft. deep, and from 15 to 30 ft. wide along one side of the street. We believe the record has never been duplicated on any undertaking of equal magnitude.

The explosive that caused the accident was stored in a shed or shanty located on the street near the corner of 41st St. and just in front of the Murray Hill Hotel—which will be remembered as the headquarters of the American Street Railway Association during the convention in New York last fall. The amount and exact nature of the explosive have not been officially determined and will be a subject for investigation before the February Grand Jury in General Sessions. The law permits the storage of but 62 lb. of dynamite at any one point within the city limits but also sanctions it is claimed, delivery of a sufficient quantity of explosives each morning for the work to be done during the day. Both John B. McDonald, general contractor for the subway, and Ira A. Shaler, sub-contractor for this section, deny that any violation of law existed.

The powder shanty stood at the opening of a small shaft running down to the level of the subway tunnel which at this point is 20 ft. below the Park Avenue tunnel of the Metropolitan Street Railway Co. Sectional drawings showing the relative positions of the tunnels or subways at this point will be found in our convention issue for last September, page 542. The shanty was just at the foot of the derrick shown in the accompanying engraving, which is reproduced from a photograph taken immediately after the explosion. The exact cause of the accident is still the subject of investigation but from reliable testimony thus far submitted it appears that the explosive, which was kept in cartridges in boxes,

was ignited through the falling of a lamp set on a shelf in the powder shed.

The greatest damage was to the Murray Hill Hotel. Every pane of glass in the structure was broken and on the side facing the tunnel the walls were badly injured. The cafe, the lobby and all the front rooms on the lower floors were absolutely wrecked by falling walls and ceiling. One guest occupying the corner suite on the first floor was killed in his room, and two employes of the hotel were killed in the lobby. The zone of broken glass extended for two blocks up and down Park Ave., the Grand Central Depot and the Grand Union Hotel on 42d St., suffering great damage in this respect.

In the Metropolitan tunnel immediately adjoining the scene of the explosion cars were delayed for about three hours by debris thrown on the tracks, but no serious damage occurred, although the escape of cars not 50 ft. from the powder shed seems miraculous.

Sub-contractor Ira A. Shaler, also the superintendent of the section on which the explosion occurred and the watchman of the dynamite house have been held responsible for the accident by the coroner's jury.

YORK COUNTY TRACTION CO.

The annual meeting of the York County Traction Co. was held last month and the following directors were chosen: George S. Billmeyer, Judge W. F. Bay Stewart, John W. Stacey, Grier Hersh, George P. Snysler and W. A. Himes. This board of directors serves for the York & Dallastown Street Railway Co., York & Dover Street Railway Co., York & Hanover Street Railway Co., Red Lion & Windsor Street Railway Co., York Haven Street Railway Co., Wrightsville & York Co., Colonial Street Railway Co. and Penn Park Street Railway Co.

Mr. W. H. Lanius, president of the company, stated that the York County Traction Co. had been organized chiefly for building suburban electric railways, and noted the addition to the company's property during the past year of the suburban lines operating from York to Dallastown and from York to Dover. Partial surveys have been made to Wrightsville, Hanover and York Haven, and the road to the former place will be built in the early spring and all of the contemplated roads in 1903. It was also stated that these lines will in the future be extended to connect with those at Baltimore.

The station of the Electric Light Co., which furnishes current for the railway company, has been greatly enlarged and improved during the past year by the addition of new machinery and a storage battery. A new car barn 50x232 ft. has been built and the present trackage of the company's barns is now 2,200 ft. A large repair shop has also been built.

The company contemplates extending its Dover line to Dillsburg, a distance of 12 miles. This line will include the towns of Wellsville and Franklintown. Additions and improvements have also been made in the electric light plant, including a 600-h. p. engine and two 300-h. p. dynamos for incandescent lighting. The plant has a boiler capacity of 2,000 h. p. and a 2,400 h. p. engine capacity. The York Haven Power & Water Co., which is now constructing a water power plant, will eventually furnish the current for these railway lines and the company's present plant will then be utilized as a storage plant, from which the current will be distributed.

USING INSULATING VARNISHES.

The Standard Varnish Co., of 29 Broadway, New York City, gives the following suggestions for securing the best results with insulating varnishes. Part of the recommendations applies to its own varnishes but much of the advice is good no matter what make of varnish is used.

It is important that the varnish be applied at the proper consistency. In many cases it may be used thinner than applied by the dealer, but in no instance should it be used heavier. It is not practical to furnish a dipping varnish of the exact consistency to meet all requirements, as the gravity of all varnishes is affected by changes of temperature. It is therefore suggested that for dipping purposes the varnish be kept at nearly 75 degrees F. as possible, and the gravity reduced by thinning with benzine to suit the

requirements of each case. When the proper consistency is secured, the gravity may be taken with a hydrometer and the exact degree of thinning thus established.

While the gravity of the varnish when exposed in the dipping tank becomes lower in hot weather, it is necessary to thin with benzine before each dipping, on account of undue evaporation of solvent. On the other hand, in cold weather the gravity becomes abnormally heavy in consequence of contraction, and the varnish should be kept in a warm place, so that the temperature is in the neighborhood of 75 degrees F. when used; otherwise it will be too heavy and consequently require considerable thinning with benzine.

It can be applied by dipping the work into the varnish or with a brush. When applied by dipping, the varnish should be frequently thinned with benzine to replace the solvent that has evaporated. The varnish should be kept in tightly closed vessels to prevent evaporation as much as possible.

For highest insulation, two applications of the varnish may be employed, receiving treatment as aforesaid. In thinning, benzine should be added to the varnish slowly and thoroughly stirred in. It is recommended that 63 degrees benzine be used for this purpose.

When varnish is applied by dipping, best results can be obtained by placing armature and field coils in an oven for two to four hours before immersing same in the varnish. After this preliminary baking, the coils should be taken from the oven and dipped at once in varnish, allowed to drip over the dipping tank and again placed in the oven and thoroughly baked. In following this method the first cost of treating coils is slightly increased. The value of this treatment, however, is apparent. The moisture is driven out, the air in the coil expanded, allowing proper penetration, and the coat of varnish given the coil immediately upon taking from the oven, effectually prevents further absorption of moisture. The life of apparatus thus treated is considerably lengthened.

The oven in which the work is baked should be ventilated at the top to permit the escape of gases which form while the varnish is in process of drying. Provision should also be made for the ingress of air at the bottom of the oven, thus permitting free circulation of fresh air with its accompanying oxygen over the work to be dried. In this manner more thorough and quick drying results can be obtained. Uniformity of heat throughout the oven is essential, and this is accomplished by placing the pipes which carry the heat near the floor and on all sides of the oven. Steam or electric heat is best suited for drying the varnish on account of the dry quality of same. Care should be exercised not to overbake the varnish, otherwise its elasticity will be destroyed.

It is recommended that a hydrometer and a thermometer be used, the former to determine the specific gravity of the varnish, and the latter as a precaution against overbaking.

CONSOLIDATION IN ATLANTA.

The Georgia Railway, Gas & Electric Co., which is a consolidation of the Georgia Electric Light Co., the Atlanta Railway & Power Co., and the Atlanta Rapid Transit Co., has been incorporated by H. M. Atkinson, P. S. Arkwright, R. E. Cullinane, S. J. Bradley, M. B. Lipscomb, F. M. Sisk, J. G. Rossman, J. R. Hunter, and W. B. Stovall, all of Atlanta.

The new company is to have a capital stock of \$3,000,000 of which \$300,000 is to be preferred. The length of track over which this company is to operate is about 140 miles.

The city council of Atlanta made a vigorous protest against the granting of this charter but the secretary of state was advised by the attorney general that under the law he could not refuse to issue a charter if it had been applied for in a legal manner and if it complied with the provisions of the general law. One of the particular objections urged against the charter was that the term of 101 years applied for is too long, but this term is permitted to all companies applying for a charter in that state.

A car containing 15 passengers, on the innerurban electric line between East Liverpool and Wellsville, O., on January 28th narrowly missed being demolished by an avalanche of boulders, trees and earth which buried the track to a depth of 50 ft. The car missed the full force of the land-slide by only a few feet.

PROPOSED TUNNELS FOR NEW YORK.

New York City has waited long and patiently for adequate transportation accommodations but now with the rapid transit subway well on toward completion, \$30,000,000 of new securities in sight for equipping the remaining 100 miles of horse railways for electric traction and the elevated roads in process of change to electric operation, it appears that the desired era is close at hand.

This is true not only of the carrying facilities within the city limits but also applies to the means of communication with other places outside the city.

Nearest in point of completion are the plans of the New York Central management for equipping electrically its tracks entering New York from Mott Haven to 42nd St., through the Park ave. tunnel. The unfortunate collision in the tunnel last month has hastened action on this matter and we are informed by Mr. B. J. Arnold, who has been retained by the New York Central as consulting electrical engineer, that complete plans have been prepared for operating at least the two outer tracks of the tunnel section by electricity. It is also stated that suggestions have been made and are under consideration for running and lighting the entire tunnel section, including the two inner as well as the outer tracks with electricity.

The New York Central management has authorized the following statement:

"The company now confirms the statements made from time to time in the public press that it has been preparing plans for the enlargement of the facilities of the Grand Central Station and changes in the methods of using the Park Ave. tunnel so as to meet the demands of a constantly increasing traffic, and provide for the convenience of the traveling public. The best method of improvement, and one which the company desires, would be the abolition of the tunnel and making in its place an open cut, similar to that south of 56th St., but this, on account of the opposition it has encountered, has been impossible of attainment up to the present time, and therefore, after a thorough investigation of the subject, it was determined that the most practicable plan for caring for the enormous passenger traffic concentrated in the Grand Central Station would be the construction of a loop station under the present terminal, so that the suburban trains could be operated by electricity through the existing side tunnels, to be equipped with the most modern appliances for underground traction, and to the accomplishment of this plan the efforts of the company have for some time past been directed. In this way the passenger facilities of the present station would be nearly doubled, and, with the suburban business thus provided for, the through passenger and mail business can be moved through the center tunnel with promptness and regularity, which is very important to the traveling public, the city and the railroad.

Before determining that electrical or some other power shall be substituted for steam on all trains entering the Grand Central Station, it must be demonstrated that the business can be safely and promptly handled in that way; therefore it is contemplated to make the experiments in the side tunnels and the underground station."

Of other schemes for connecting New York with New Jersey and Long Island, reference has been made in previous issues of the "Review."

The most important of these is the proposal of the Pennsylvania Railroad Co. to build a tunnel under the North and East Rivers New Jersey with a mammoth union station to be built in the heart of Manhattan Borough and also affording an entrance for the Long Island R. R., which is controlled by the Pennsylvania company, into Manhattan. In reference to this President Cassatt, of the Pennsylvania R. R., has said: "After years of exhaustive study the conclusion has been reached that a tunnel line, operated by electricity, is in every way the most practical, economical, and the best both for the railroad company and of the city. The line, as adopted, will traverse the city of New York from the Hudson River to the East River, and be underground throughout, and at such depth as not to interfere with the future construction of subways by the city on all its avenues, similar to the one now building along Fourth Avenue."

There is a well established rumor that the Pennsylvania's plans for subterranean railroading include a second tunnel under the East River from Long Island to the mainland north of Manhattan for the purpose of connecting the Long Island R. R. with the New York, New Haven & Hartford road, thus giving the Pennsylvania R. R. an outlet to New England. This scheme as yet lacks official confirmation.

Still another tunnel under the Hudson River, is promised within two years, this one to join the lines of the North Jersey Street Railway Co. at Jersey City, with the Metropolitan lines on Manhattan Island. Work on a tunnel of this nature was commenced in 1874 but was abandoned in 1892. The Metropolitan Street Railway Co. has purchased property near the Hudson River front at 13th and 14th Sts. and it is believed this purchase has been made for terminal purposes and that all the cars of lines in the northern counties of New Jersey Street Railway Co. will soon have entrance direct into New York.

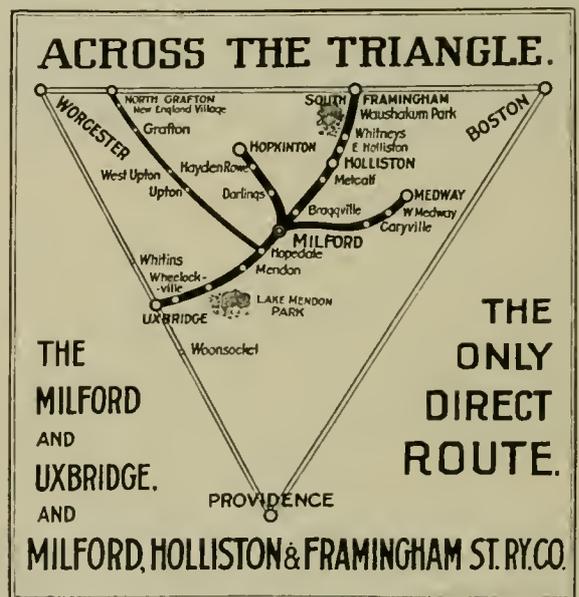
The Broadway extension of the New York Rapid Transit Subway which is to run from the Manhattan City Hall, under Broadway to the Battery, and under the East River to the Brooklyn City Hall, has received full legislative sanction and will be in operation, it is officially stated, by the time the main underground road is completed.

Apropos of this subject the new East River Bridge with its double set of electric railway tracks within two years or less should be carrying its share of the daily rush between Manhattan and Brooklyn.

And finally comes the statement of Bridge Commissioner Lindenthal that the old Brooklyn Bridge is to be practically rebuilt by constructing another deck of tracks over the existing roadways.

ATTRACTIVE TIME TABLE FROM MILFORD, MASS.

Following the example of many other electric roads, the Milford, Holliston & Framingham Street Railway Co. has issued a series of time tables closely resembling the form usually adopted by steam railroads. The names of stations, and arriving and leaving times



for all cars are given in vertical columns, together with the connections that can be made with intersecting steam roads and other electric lines for prominent near-by points. The folder contains two maps, one showing on small scale the territory covered, and the other on a larger scale and giving all the stations on the road with the principal connections.

The Brooklyn Rapid Transit Co. proposes to expend \$15,000 before May 1st in furnishing club rooms for its employes in the large depot building at Ridgewood.

BOSTON TRANSIT COMMISSION.

The seventh annual report of the Boston Transit Commission for the year ending August 15th, 1901, has just been issued. The work of this commission previous to the present year has been described in the "Review" for February, 1900, page 96, March, 1900, page 121, and February, 1901, page 113. The following summary gives a condensed statement of the expenditures of the commission from the beginning of the work to the close of the last fiscal year. The term of office of the commission will expire July 1, 1902, but the East Boston tunnel will not be completed at that time. June 15, 1903, is the date fixed by contract for the completion of the section under the harbor; other sections still remain to be contracted for.

The East Boston tunnel was begun in May, 1900, and about one-fifth of it is now substantially completed. The walls of this tun-

SUMMARY.

	From beginning of work to Aug. 15, 1900.	Aug. 15, 1900, to Aug. 15, 1901.	Total.
Subway. — Subway Commission	\$14,131 16		\$14,131 16
Part of General Expenses	117,307 29	\$149 04	117,456 33
Engineering and Miscellaneous	406,252 47	381 54	406,634 01
Section One	240,594 76	1 65	240,596 41
Two	364,173 20	718 85	364,892 05
Three	307,910 63	158 90	308,069 53
Three and one-half	9,479 39		9,479 39
Four	476,110 31	176 11	476,586 42
Five	387,438 54	70	387,439 24
Six	327,551 64	67 25	327,618 86
Seven	236,186 39	2 45	236,488 84
Eight	100,065 79	45 25	100,111 04
Eight and one-half	77,467 04		77,467 04
Nine	309,890 02	7 00	309,897 02
Ten	257,358 89	42 45	257,401 34
Eleven	269,231 43	78 47	269,309 90
Interest	258,575 60		258,575 60
Total	\$4,160,024 52	\$2,429 66	\$4,162,454 18
Alterations. — Part of General Expenses	\$22,272 87	\$6,160 08	\$28,432 95
Section Three	2,528 26	49 00	2,568 26
Four	163 42		163 42
Five	597 98	29,632 23	30,230 21
Seven	173,274 29	6,842 70	180,113 99
Nine	3 00		3 00
Ten	534 04		534 04
Interest	1,905 56		1,905 56
Total	\$201,276 42	\$42,675 01	\$243,951 43
East Boston Tunnel. — Part of General Expenses	\$34,632 75	\$35,237 97	\$69,870 72
Engineering Expenses	49,599 01	24,034 02	73,633 03
Section A	29,754 18	63,896 92	93,651 10
Section B	732 08	134,725 73	135,457 81
Interest		35,175 00	35,175 00
Total	\$114,718 02	\$293,069 61	\$407,787 66
Bridge. — Part of General Expenses	\$51,204 93	\$2,615 64	\$53,820 57
Engineering Expenses	1,492,979 11	96,636 75	1,498,715 86
Total	\$1,453,281 04	\$99,252 39	\$1,552,536 43
Grand Total	\$5,923,303 00	\$437,126 70	\$6,360,429 70

nel, including the upper arch and the invert, have been made of fresh concrete resulting in a monolithic structure. This is believed to be the first successful example of walls made of fresh concrete in connection with shield tunneling. The accompanying illustration shows a view in section A of the East Boston tunnel under Maverick Square. The shield used for boring this tunnel was brought to the work in two sections in such shape that they could be easily lowered into position and assembled on top of the finished side walls in the shaft. When the shield was assembled and riveted, 16 hydraulic jacks were placed in the openings prepared for them and connected with pumps which were placed in the shield. The latter rests on 16 iron rollers, 8 on each side, which in turn rest on steel plates placed on top of the side walls. These plates are

flanged to act as a guide to the shield when moving. The rollers are 8 in. in diameter and 16 in. long.

The shield was moved to the bulkhead, the latter was removed and the shield forced into the bank by the jacks thrusting against 12-in. square timbers arranged so that the pressure was transmitted directly to the arch of the completed section A. The shield was forced into the bank its full length, the interior earth being removed as the shield advanced. The excavation of the core is done at the same time the arch is being built. The invert is excavated and concreted in 10 ft. sections at a distance of about 20 to 30 ft. back of the shield. The side drifts and walls are kept uniformly about 100 ft. in advance of the shield. These methods of operation have been maintained with but little change from the beginning.

When the shield had been advanced about 230 ft., work was suspended for two weeks to put in three air locks. These are vestibules through which men and materials must pass in coming from the free air to the compressed air and in returning. One of the two doors of the lock must always be closed to prevent the escape of compressed air. During the operation of coming in, both doors are for a time tightly closed, and by means of valves the air within the chamber is gradually brought to the pressure of the compressed air when the inner door may be opened. In coming out the reverse process is followed. The time usually taken by the men in passing through the lock is about one minute. The air pressure used in this work at first was only 5 lb. per sq. in. above the atmosphere. This pressure was gradually increased each day until 18 lb. was reached, and a still greater pressure will doubtless be required later.

As was expected, the use of compressed air lessened the settlement of buildings and of the street. It also lessened very appre-



EAST BOSTON TUNNEL UNDER MAVERICK SQUARE.

ciably the stress on the drift timbers caused by the surrounding earth. As soon as compressed air was used the temperature inside advanced to 82 degrees at about which point it has since remained. Another feature intending to increase the warmth inside the tunnel is the heat produced by chemical action in the concrete. The rise in temperature in the middle of the walls two days after the concrete sets is 40 degrees above that of the air in the tunnel. About 12 days after setting the temperature recedes to that of the air.

At the time for which the report is issued (Aug. 15, 1901), 636 ft. of the masonry structure was completed. Some changes were made during the year in the subway near Pleasant St. As originally built, the southern end of the subway was an open four-track inclined bridge which permitted the street surface cars to descend to and into the subway and vice versa. The change in this locality was made for the purpose of enabling trains from the elevated railway to go under Pleasant St., and enter the subway. The change consisted in lowering the grade of the extreme easterly and westerly inverts so as to connect them with the lower end of the incline bridge leading from the elevated structure to the subway; and building an island platform for the use of the elevated roads between the two tracks. The use of the two inside tracks has been abandoned.

The Seattle Electric Co. has opened its new Fremont Ballard division for general traffic.

NILES CAR WORKS.

The Niles Car & Manufacturing Co. of Niles, O., now has its plant in operation and announces that it is prepared to bid upon and furnish all classes of rolling stock for electric and steam railways. Some interesting particulars concerning the company's plant, which has an aggregate floor space of seven acres, were given in our issue for June, 1901, page 305. The officers of the company are: President, George B. Robbins; vice-president, A. B. McCorkle; secretary, C. P. Souder; treasurer, William Herbert; general manager, W. C. Allison; assistant general manager and contracting agent, George E. Pratt; general superintendent of works, A. L. Jacobs.

The management has made a point of securing for assistant superintendents and foremen men who have had extensive experi-



NILES CAR WORKS.

ence in large car manufacturing plants. Thus, A. W. Scholl, assistant superintendent, was with Jackson & Sharp for 11 years and with the Pullman company for 11 years; Fred McBrien, mill foreman, has for years been with the Pullman and the American Car and Foundry companies; John Meek, foreman of the paint department, and W. F. Ray, foreman of the construction department, have both had long experience in such work.

Among the orders the company now has in hand are the following: Aurora, Elgin & Chicago, 30 motor cars; Western Ohio Ry., 20 motor cars and 4 work cars; Wisconsin Construction Co., 6; Alliance (O.) Electric Ry., 6; Toledo Railways and Light Co., 20; Detroit United Ry., 45; Louisville, Anchorage & Pewee Valley Electric Ry., 15 ten and twelve-bench open cars, for early spring delivery.

MOTORMEN ON LOUISVILLE RAILWAY CO.

The selection and training of motormen on the Louisville Railway Co., of Louisville, Ky., is carried on under a rigorous system in regard to which Mr. J. T. Funk, superintendent of the company, has furnished us with the following particulars. The rules governing the positions are stringent and competition for the places is so keen that only well qualified men have a chance. When a man presents himself for the position of motorman he is first interviewed by Mr. Funk, who judges from his personal appearance and intelligence whether the applicant will be considered or not. If his application is taken into consideration he first must furnish references. These must be good ones for steadiness of character, sobriety and honesty. The next step in his selection is an examination by the company's doctor to determine whether he is physically fitted for the duties of a motorman. The regulations in this respect are even stricter than in the army. The applicant must be at least 5 ft. 8 in. in height and not over 6 ft. His weight must be between 155 and 190 lbs., which limit is occasionally extended to 200 lb. in the case of a heavily built but well proportioned man. His sight and hearing are also subjects of special attention. The applicant must be over 21 and under 35 years of age, and his temperament is also taken into account. If he be excitable or nervous he will not be passed by the examiners.

After passing these requirements the applicant is taken to one of the car barns and started to work in the car pits. He is instructed by the inspector about the care of the cars and machinery, how to dismount and put the motors together, how to replace fuses, to operate switches and all of the practical work of managing the controllers and brakes. His apprenticeship in this work lasts from

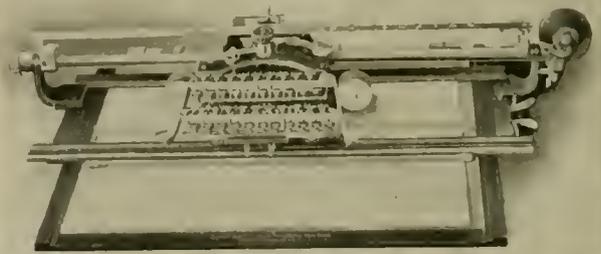
ten days to three weeks, according to his ability, and he is then put upon a car under the guidance of an experienced motorman, who stands beside him and teaches him exactly how to operate. When he is reported competent by his instructor on the car he makes a trip under the supervision of one of the head motormen or superintendents and if he shows proficiency in handling his car he is given a place on the extra list and his pay begins. There is always a long extra list at the car house, but this list is constantly changing, as when one of the regular men is, for example, two minutes late he is dropped from the regular list to the bottom of the extra list and is replaced by the man at the head of the extra list, so that a man starting on the extra list with a number ahead of him may, in the course of a few weeks, be assigned to regular duty on a car. He must always be on time but never ahead of time, for that means dismissal.

Under these stringent conditions it is readily seen that the fact that a man has obtained a position on the Louisville Railway Co. is a certificate as to his good references, sobriety, fair education, punctuality and honesty.

THE TYPEWRITER IN ELECTRIC RAILWAY WORK.

During recent years the increase in clerical work incident to all departments of the street railway business has developed a demand for more improved methods of preparing and handling pay rolls, mileage records, way and freight bills on roads that do a freight and express business, and the numerous other forms and statements incidental to railway requirements. For the purpose of filling these particular needs the Elliott & Hatch Book Typewriter Co., of 256 Broadway, New York, supplies a typewriting machine claimed to meet all the requirements of ordinary correspondence or commercial work and in addition having certain simple attachments which will reduce to a minimum the labor and time necessary to making tabulated statements, reports and records of almost any conceivable nature. It will accommodate a sheet of any width without the paper being folded and will write a line from 1 to 21 in. long. It will also write on the pages of a book as easily as it does on a detached sheet, and will accommodate any sort of blank or record book regardless of binding or size. This is accomplished by using a special self-adjusting table for the machine so that the book will always rest with the page to be written upon perfectly flat.

By a scheme for holding a roll of carbon paper manifold copies of all writing can be taken with minimum labor and 15 to 20 legible copies may be secured at one time. Ordinary letters in this way can be copied directly into a copy book at the time they are



BOOK TYPEWRITER.

written and all the work and annoyance of press copying letters, way bills or other records is entirely obviated. A dozen or more envelopes may be placed in the machine at one time, or cards of any dimensions or thickness may be written upon to the extreme top or extreme bottom.

Among the companies using the Elliott book typewriting machine are the following: United Traction Co., Pittsburg, Pa.; North Jersey Street Ry., Jersey City; North Hudson Ry., Hoboken; Pennsylvania Steel Co., Steelton; Consolidated Traction Co., Pittsburg; Union Traction Co., Philadelphia, Pa.; Manhattan Ry., New York City; American Steel & Wire Co., Chicago, Ill.; Westinghouse Companies, Pittsburg. The makers will send catalog on request.

OHIO NOTES.

One of the recent electric railway corporations is the Wooster & Mansfield Electric Railway Co., of Shreve, O. The capital stock is \$30,000.

In the case of the Mill Creek Valley Electric Railway Co., which has been seeking entrance into the city of Hamilton, and which company had bought a number of consents from property owners, the circuit court of that district holds that such consents when purchased are not legal and that the withdrawal of consents just before the passage of a franchise is legal. Both of these charges against the company have been sustained and the road can not get an entrance into the city at present.

The Columbus, New Albany & Johnstown Electric Railway Co. is now operating its cars out as far as Gahanna, about eight miles from the center of Columbus. It has also secured the contract for the delivery of the mail along the route and the intervening hamlets are now enabled to enjoy a mail service that is a great improvement over the old order of things.

The Columbus, Newark & Buckeye Lake Company has completed the laying of ties and rails. A good part of the wiring is also up. The authorities are now promising the completion of the road from Columbus to Newark by the middle of May. The Swick House at the Licking Reservoir has been leased and about \$15,000 in improvements will be expended on the building and other improvements will be made in order to make it a fine summer resort.

At a recent meeting in Cleveland of the directors of the three electric railways known as the Cleveland & Eastern, Cleveland & Chagrin Falls and Chagrin Falls & Eastern, it was decided to merge the properties into one company to be known as the Eastern Ohio Traction Co., capitalized at \$2,500,000.

The Toledo, Fostoria & Findlay Electric Railway Co. has made an application to the city council of Fostoria for a franchise for lighting the city and for the establishment of a steam heating plant.

The Columbus Street Railway Co. has just recently put in service the last five of the twenty new cars ordered for winter use. The company has ordered twenty new summer cars which are to be delivered by the middle of May; these will be the long pattern with vestibules and are made to seat 60 passengers. They will have double trucks.

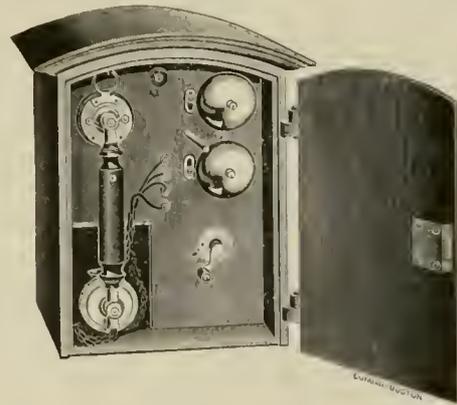
At the annual meeting of the stockholders of the Dayton, Springfield & Urbana Electric Railway Co., it was decided to double track the road between Dayton and Springfield in accordance with the plan to operate through cars between Columbus and Cincinnati. The directors of the road elected were F. J. Green, C. A. Alderman, Adolph Newsadt, John S. Harshman, John G. Webb and A. E. Appleyard. John S. Harshman was elected president; John G. Webb, vice-president; A. E. Appleyard, treasurer, and John G. Webb, secretary.

EXTENSION OF THE HAROLD P. BROWN FACTORY.

Harold P. Brown is building a large brick extension to his factory at Montclair, N. J., in order to keep pace with the increasing demand for the Edison Brown rail bonds. He is also putting in a new boiler and engine, which will increase the power capacity 100 h. p., and a lot of new machinery, which will permit the output to be doubled for the coming season. Mr. Brown advises us that the reports which have been made of the recent tests of the 7 $\frac{1}{2}$ -in. "Plastic Plug" bond upon the test bond track of the Baltimore & Ohio belt line, from Mt. Royal station, have been surprising. This is the portion of the track having the severest service, since it is up hill and around several curves, and hundreds of freight cars pass every day, and the return current varies from 1,200 to 2,800 amperes. The conductivity of the plastic plug bonds averaged more than half that of a 60 lb steel rail, and was more than five times that of the flexible copper bonds on the remainder of the track, which were 300,000 c. m. in section with two bonds per joint. In spite of the severe weather and heavy traffic, none of the plastic plug bonds has given trouble. This type of bond is being very largely used both for new work and for rebonding, and even at the present low price of copper it is cheaper than any other type of bond of even half the conductivity.

STREET RAILWAY TELEPHONES.

On suburban and interurban railways where many of the lines are single track the telephone has become almost indispensable. These are placed at each turnout or instrument are carried in each car which can be connected with the line parallel with the roadbed either by plug boxes located at intervals on the poles or by a jointed pole which connects with the overhead wires. In order that the telephone may be of value for street car work it is absolutely essential that the transmitters used for this purpose be entirely reliable. If a single instance occurs where the telephone fails to work



at a critical moment the whole telephone system is condemned by the entire force from the superintendent to the motorman.

The accompanying illustration represents a transmitter made by the Ericsson Telephone Co., of 296 Broadway, New York, which, it is claimed, will avoid any chance of failure. This transmitter is proof against moisture, dust, etc., and it is also one that will not pack when left undisturbed for a considerable space of time. The Ericsson telephone is used extensively on account of the latter quality and the company invites the investigation and inspection of this apparatus by all persons interested.

SILLS-EDDY MICA CO.

The mica products made and handled by the Sils-Eddy Mica Co., of 31 Broad St., New York City, have steadily gained in favor until now they are used exclusively by several hundred street railway companies and manufacturing houses. This company sells India and amber mica in practically every conceivable form, in cut and uncut sheets, thick and thin, stamped, powdered, for all purposes and in segments of all shapes and sizes.

Powdered mica will be found useful for making lubricants, foundry facings, linings, etc.

The Sils-Eddy company makes a specialty of selecting from sheet mica pieces that will cut specified or special sizes with the least waste, and sells solid mica rings, solid mica segments, mica washers, mica disks, etc.

It also handles insulation material in various forms as, commutator rings, washers and tubes, paper and cloth, and similar sundries used in the electrical trade. All its insulation is stamped with the name of "Micabeston," which name the company holds is a guarantee of strength, finish and adaptability.

The company in addition to its New York offices has offices and warehouses at 31 Clark St., Chicago, and factories in Newark, N. J., and Ottawa, Ont., Canada.

NEW YORK STATE BLIZZARD.

A blizzard which swept northern, western and central New York, Feb. 3d and 4th, resulted in tying up both steam and street railway traffic in many places. In Albany, trolley wires were torn down by the wind; in Ithaca, street cars were blocked for several hours and the whole city was in darkness, and in Utica, cars were operated at irregular intervals during the storm. The Dunkirk & Fredonia Railroad Co. abandoned its cars and used covered sleighs for the accommodation of passengers. The wind's maximum velocity was 52 miles an hour and it blew at an average rate of 40 miles for 30 hours.

INTERURBANS TO ENTER CINCINNATI.

A bill providing for common terminals for interurban roads within cities has been introduced in the Ohio legislature which has for its object the admission of interurban traction lines into Cincinnati. The bill authorizes the incorporation in any city of Ohio of a company for the purpose of building stations, switches, tracks, subways, elevated ways, power plants and other equipment upon the streets, alleys and public places of any such city, for the use of interurban roads. The company must make application to the governing power of the city for a franchise and such a franchise can only be granted after competitive bidding. The franchise must fix the terms upon which the interurban roads can use these tracks, and the revenue to the city. The bill also provides that the franchise shall limit the occupancy of streets and other public property so as to avoid interference as far as possible with the operation of any street railway in actual operation at the time of granting the permission. Companies organized under the bill shall have power to enter upon and appropriate rights of way over private lands in the same manner as this power is exercised by steam railroads. In almost all of the cities of the state except Cincinnati, the connecting interurban lines already have admission to the city. Cincinnati is peculiarly located and the situation there has been kept well in hand by the railroad interests at present in control. There are comparatively few entrances to the city on account of the hills, and all of the entrances available are pretty well covered by the local street railway lines.

One of the greatest difficulties that interurbans have in entering Cincinnati is the fact that the local lines are of the 5 ft. 2 in. gage while the outside lines are all standard gage. This precludes an entrance into the city over the existing lines. The only alternative under these conditions is to make arrangements by which transfers can be effected with the local lines at the city limits.

The interurban lines desiring an entrance into Cincinnati are united in their desire to have the bill passed. The roads that will be affected by the bill if it becomes a law are the Southern Ohio Traction Co., the Cincinnati & Eastern Electric Railway Co., the Suburban Traction Co., the Rapid Railway Co., the Cincinnati & Columbus Railway Co., the Cincinnati, Lawrenceburg & Aurora Electric Street Railway Co., and the Ft. Wayne, Dayton & Cincinnati Traction Co.

PENNSYLVANIA REPORT.

The annual report of the Bureau of Railways of the Pennsylvania Department of International Affairs for the year ending June 30, 1901, gives the following data on electric railways: Total length (single track) of lines in the state, 2,167 miles. Passengers carried during the year, 580,654,629. Cost of roads and equipment, \$94,616,246. Total earnings from operation and income from other sources, \$27,308,143; and total disbursements \$26,042,617. Number of cars owned by street railway companies, 6,618. Number of persons employed, nearly 16,000, receiving a compensation of \$8,745,024. The number of passengers killed was 33; injured, 1,050, and the number of employes killed, 14, and injured, 129. The roads carried 42,460,997 more passengers in 1901 than in 1900.

A PECULIAR ACCIDENT.

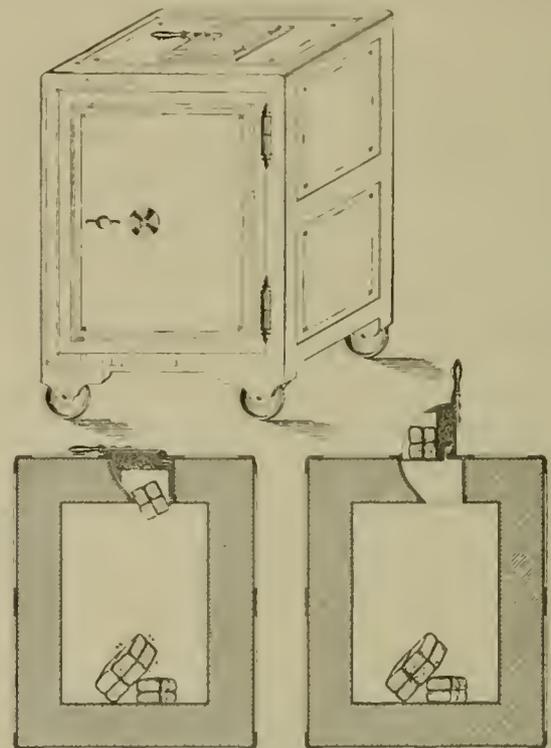
Two fatal accidents on electric cars happened within a few minutes of each other on the evening of January 29th between East McKeesport and Wilmerding, Pa. There is a hill a mile and a half in length between these places, and a car which became unmanageable on this grade ran down it at a high speed, jumped the track and crashed into the Wilmerding station of the Pennsylvania railroad. The platform of the station was torn up and the side of the building smashed. While the crowd was gathering about the wreck a second car, twelve minutes later, rushed down the same hill, beyond control, and crashed into the first car and the crowd surrounding it. Three people were killed and seven seriously injured, some of them being passengers and the others simply onlookers at the station. On its way down the hill the second car wrecked a carriage, fatally wounding the driver.

FIRE-PROOF CONDUCTORS' SAFE.

A strong fire and burglar-proof receiving safe for the daily receipts of a street railway company would seem to be an absolute necessity and it is somewhat surprising that this matter is so frequently neglected. An ordinary tin box with perhaps a small chain running to the cashier's window is all too often made to do duty as depository for the conductor's daily cash.

To meet the special needs of street railway companies in this direction the Morris-Ireland Safe Co., of 64 Sudbury St., Boston, has perfected a receiving safe having a device which readily opens to receive the cash, but which prevents the money from being withdrawn except by one who knows the unlocking combination.

The money, which is put into small bags and tied up by the conductors, is deposited through the top of the safe in a small box or compartment that is first lifted by means of a handle. When the handle is released the weight of the cash carries the box down, allowing the bag to drop through an opening in the bottom of the box to the bottom of the safe. The dimensions



CONDUCTORS' SAFE.

and arrangement of the receiving box are such that even if a bundle of the money were drawn to the top by means of a wire or other implement it could not be drawn through the opening.

The safe has all the recent improvements found on regulation office safes. It has combination lock, eight flanges, angle front and back, patent inside bolt-work, tongue and groove malleable hinge, and other appliances to make it fire and burglar-proof. It can be supplied in several sizes.

The company has furnished these safes to over one hundred city and interurban roads, including the United Traction Co., of Albany, the Boston Elevated, the Milwaukee Electric Railway & Light Co., the Metropolitan of New York, the Holyoke (Mass.) Street Ry., the Bridgeport (Conn.) Traction Co., the Springfield (Mass.) Street Ry., and other roads both large and small.

The Central Traction Co., which is building an electric line from Noblesville, Ind., to Indianapolis, has completed grading for a distance of 12 miles. Contracts for ties have been awarded and specifications are being prepared for the large power house to be erected at Noblesville.

SIGNAL DEVICE FOR SUBURBAN LINES.

An automatic signal device has just been built by the Michigan Electric Co. for Capt. C. P. Bass, of Portland, Ore., which has a number of commendable features. The device consists of electric switches which are worked automatically by the trolley and which are contained in two wooden boxes about 1 ft. long, 8 in. high and 6 in. thick. There is also a relay, or counting box as it is called, and a signal board containing six red incandescent globes and the necessary wiring.

If it is desired to operate the signals between two switches on a suburban line one of the boxes is placed near the trolley wire just beyond the junction of each switch. When the car passes the trolley strikes a small iron lever extending from the bottom of the box which is thrown upwards and throws the current on a pair of lamps attached to a pole near the next switch, which may be a long distance away. This is a warning to any car approaching in the opposite direction that another car is between the two switches. The motorman of the former car will stop on the siding until the second car passes which, striking a second box extinguishes the light. If a second car should come before the first car reaches the meeting place, another pair of lamps would be lighted and the motorman waiting on the switch would know that he had to wait for two cars. In the same way the approach of a third car would be announced.

A somewhat similar system but on a smaller scale, has been used in Portland, Ore., and other western cities for some time. The new system will be submitted to a test as soon as possible.

CONSOLIDATION IN KENTUCKY.

The Blue Grass Consolidated Traction Co., of Lexington, Ky., has been organized under the laws of Kentucky, with a capital stock of \$7,000,000, and to be bonded for \$7,000,000, \$4,000,000 for construction and \$3,000,000 for taking over plants already constructed and in operation. The company proposes to own and operate all of the electric roads in the "Blue Grass" country, connecting with Lexington by suburban roads, Frankfort, Versailles, Richmond, Nicholasville, Paris, Georgetown, Winchester and Mount Sterling. Also to light by electricity all of these towns, and all of the blue grass country, and to make the artificial ice and supply all of this territory. Also to make sterilized water and sell it in connection with ice, to have and own its own coal mines and transport its own coal. One central power house will be located in Lexington with sub-stations at the different towns. It is also expected to furnish power for manufacturing plants. The company has been organized, the state franchise fee paid, and the franchises secured, which are very liberal and give three years for building. Options have been secured on nearly all of the plants to be taken over, which consist of railways, electric lighting and ice plants. This company will serve some 200,000 people.

The officers are: Geo. B. Davis, president and general manager, 622 Hammond Bldg., Detroit, Mich.; M. C. Alford, vice-president, Lexington, Ky.; H. C. Beatty, secretary, Lexington, Ky.; Paul Sheldon, treasurer, 44 Wall St., New York.

LOUISVILLE RAILWAY RELIEF ASSOCIATION.

The Louisville Railway Relief Association, which has for its object the payments of sick and death benefits to its members, has issued its annual report for the year ending Dec. 31, 1901. This association has steadily grown both numerically and financially since its organization and the good that it has achieved during the past year will be appreciated when it is considered that more than \$1,300 have been paid in sick benefits and \$600 in funeral benefits. The perpetuity of the institution is now well assured and it has long since ceased to be regarded as an experiment. The cost to individual members has been but small, but at the same time the relief afforded has been very great. The total receipts of the association during the past year, including interest, amounted to \$2,788. The total disbursements for benefit, including general expenses, amounted to \$2,305, leaving a surplus of \$483. This, in addition to the surplus at the beginning of the year, \$1,040, leaves \$2,423; with which the association begins a new year.

NEW INTERURBAN AT NASHVILLE.

The Suburban Street Railway Co. which recently obtained a charter for electric railways through West Nashville, Tenn., and other suburban towns, has elected the following officers: T. J. Felder, president; D. C. Buntin, vice president, and Thomas Taylor, secretary and treasurer, and these, with John M. Gray, Jr., B. F. Wilson, L. K. Whitworth, S. J. Keith and A. H. Robinson, directors. The company is capitalized at \$50,000. Surveys for the proposed lines are under way and contracts will soon be awarded.

ROCHESTER-SYRACUSE ROAD PROGRESSING.

The Rochester, Syracuse & Eastern Railroad Co., which was incorporated November 7th last, was given a hearing before the railroad commissioners on February 6th and expects to proceed at once with the construction of its line for which preliminary surveys have been completed, and which will approximate 100 miles in length. The majority of the company's capital stock of \$3,500,000 is said to be owned by Syracuse business men, and it is stated that the management and headquarters of the company will be permanently located in Syracuse. The officers are as follows: Lyman C. Smith, president; Willis A. Holden, vice-president; Albert K. Hiscock, treasurer; Charles A. Lux, of Clyde, secretary, and C. D. Beebe, general manager. The route includes Fairport, Macedon, Newark, Palmyra, Lyons, Clyde and Savannah, and will open a rich agricultural territory of over 75 miles' extent which has had heretofore not even a promise of electric railway service. Exclusive of its terminal cities, the interurban will traverse a district with a population of 600,000 inhabitants. It is expected to have the road in operation for the entire distance between Rochester and Syracuse by the spring of 1903. Cars will be operated at the rate of 50 miles per hour.

JOLIET-LA SALLE INTERURBAN.

The Illinois Valley Traction Co. has been granted a charter to build electric railways connecting Joliet, Princeton, Ottawa, Streator and La Salle, and has filed petitions for franchises in La Salle and Bureau Counties. The company has a capital stock of \$500,000, of which all but \$5,000 is owned by T. G. Woods, who with W. B. McKinley recently purchased the two gas plants at La Salle and will consolidate them. Mr. McKinley, George T. and N. W. Duncan, W. B. Brinton and E. Woodman are principally interested in promoting the Illinois Valley company and have announced that they expect to have the road in operation within six months. General offices will be located for the present in La Salle.

DAVENPORT-MUSCATINE INTERURBAN.

A new interurban railroad company has been organized to build an electric line between Davenport and Muscatine, Ia., a distance of 29 miles. The new road will also include a local line in the city of Davenport. The company has a capital of \$500,000 which has been subscribed by local capitalists and is now busy securing its franchises. Private rights of way in the country are also being purchased. The line has already been surveyed and the steepest grade on the route is 5½ per cent.

The officers of the company are: President, Edward Doherty; vice president, C. G. Whipple; general manager, D. A. McGugin; treasurer, August Steffen; secretary, A. Afterhaddy. Mr. McGugin is an experienced contractor and railroad man and has been connected with the building of a number of electric roads in Michigan and elsewhere.

TROLLEY BRINGS CROWDS.

The application of the Nyack (N. J.) Electric Railroad Co. for rights to build an electric line from Nyack to Sparkill has been indefinitely held up. The district is settled by wealthy families, and many people appeared at the hearing to oppose the application because they fear it would bring too many excursionists to the place in the summer.

KITTANNING & COWANSHANNOCK VALLEY STREET RAILWAY CO.

This company has been incorporated in Pennsylvania to build and operate an electric railway connecting Forge City, Kittanning, Greendale, Yatesboro, Rural Valley, Meredith and Plumville, Pa., three of which places are towns of considerable size. The lines will be 14 miles in length, of which two miles will be city track and 12 miles interurban line.

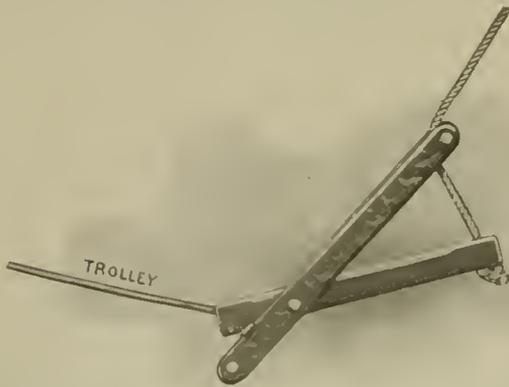
The officers of the company are as follows: President, Charles Dunbar, Allegheny, Pa.; vice-president, Henry Schill, Rural Valley, Pa.; secretary and general manager, George S. Caruthers, Standard Building, Pittsburg, Pa.; treasurer, Charles Colwell, Kittanning, Pa. The capital stock is \$75,000, issued in shares of \$50 each. There will probably be a bond issue of \$225,000. The contract for the new road is to be let about March 15th. The company proposes to operate four closed and four open cars, which will be from 40 to 50 ft. combination freight and passenger cars, and the line will be operated from one power house, the location of which has not been decided.

It is also proposed to establish an up-to-date park for picnic and summer amusement purposes and if possible, traffic rates will be secured from the Pennsylvania R. R. for picnic parties and for transfer of freight.

The project is being backed chiefly by local parties and the stock will be subscribed and paid up by residents along the proposed road. The road opens up a new territory hitherto shut off from railroad service and will serve a large population without competing with the steam roads in its neighborhood. It is expected that the road will be completed and in operation within the present year.

THE "G.-D." TROLLEY PICK-UP.

The accompanying illustration shows a new device recently put upon the market by the Garton-Daniels Co., of Keokuk, Ia., for temporarily suspending trolley wires in case of a break on the line. As will be seen from the illustration, the device forms a pair of wooden tongs by which the end of the trolley wire may be grasped, and by means of the cord attached to the other end of the tongs the



wire may be elevated with the broken ends suspended in the air, thus opening the circuit and permitting the operation of cars. The method by which the wire is grasped by the tongs is clearly shown in the illustration. The rope is fastened securely to one handle and passed through a loop in the other handle, and by throwing the rope around a pole or over a guard wire and pulling the broken wire taut the handles of the tongs are pulled together, securely grasping the wire in the jaws at the opposite ends, which are notched to receive it. The device folds up, measuring but 18 in. in length and 4 in. in diameter when folded. Its weight is but 3½ lbs., so that one or more may readily be placed under the car seats or elsewhere on a car out of the way.

All the horse car lines in Vienna, Austria, have been converted into electric railways. The change was completed January 28th.

The San Diego (Cal.) Electric Railway Co. has repaired its tracks and completed a number of improvements of the system. A new car, made by the American Car Co., of St. Louis, has been put in commission on the San Diego lines.

STREET RAILWAY PATENTS.

This list of patents is furnished by T. Reed Clift, patent attorney, Washington, D. C., from whom copies of patents can be obtained.

No. 600,421, January 7, Edwin B. Green, Whiting, Ind. Railway switch.

No. 600,630, January 7, Fred P. Crockett and Osro P. Johnson, Kalamazoo, Mich. Trolley-harp.

No. 600,674, January 7, John H. Surtin, St. Louis, Mo. Car fender.

No. 600,742, January 7, George Kovacs, Trenton, N. J. Snow melter for railroad switches.

No. 600,757, January 7, Morris M. Nash, Lowell, Mass. Sleet cleaning device for trolley arms.

No. 600,760, January 7, Stephen H. Pocock, Hamilton, Canada. Car-brake.

No. 600,818, January 7, Andrew Ambuhl, Decatur, Ill. Ice cutter for trolley wires.

No. 600,922, January 14, Wm. F. Bossert, Utica, N. Y. Three-way railway switch.

No. 601,008, January 14, Wm. E. Schilling, Laporte, Ind., and Orville M. Ridgway, Kansas City, Mo. Device for operating street railroad switches.

No. 601,010, January 14, Carl Schwarz, Hancock, Mich. Automatic railway switch.

No. 601,086, January 14, John N. Valley, Jersey City, N. J. Elevated railroad.

No. 601,201, January 14, Henry S. Stier, St. Louis, Mo. Car brake.

No. 601,263, January 7, Albert W. Ham, Lausenburg, N. Y. Trolley tender.

No. 601,275, January 14, Washington H. Kilbourn, Greenfield, Mass. Trolley pole controlling device for cars.

No. 601,315, January 14, Edmond W. Jeter, Atlanta, Ga. Car fender.

No. 601,351, January 21, John A. Brill, Philadelphia, Pa. Convertible car.

No. 601,358, January 21, John L. Creveling, New York, N. Y. Means for driving dynamos from car axles.

No. 601,359, same.

No. 601,381, January 21, Appolinaris Hrebicek, Bingerbruck, Germany. Subterranean current transmission for electric railways or tramways.

No. 601,473, January 21, Claude M. J. Limb, Lyons, France. Electric traction system.

No. 601,625, January 21, Eugene Haywood, Chicago, Ill. Means for propelling cars.

No. 601,781, January 28, Charles J. Kintner, New York, N. Y. Means for automatically operating switches.

No. 601,808, January 28, Wm. B. Potter, Schenectady, N. Y. Collector for surface contact railways.

No. 601,820, January 28, Wm. F. Weiss, Camden, N. J. Car fender.

No. 601,848, January 21, Jas. D. Edwards, St. Louis, Mo. Brake.

No. 601,895, January 21, Arthur D. Coon, Ballston Spa, N. Y. Folding car step.

No. 602,046, January 28, Richard Bischoff, New York City, N. Y. Brake for street cars.

No. 602,050, January 28, Wm. A. N. Dorland, Philadelphia, Pa. Automatic switch controller.

No. 602,118, January 28, Arthur S. Clift, East Orange, N. J. Reversing device for overhead carriers.

No. 602,136, January 28, H. M. Harding, Englewood, N. J. Means for regulating speed of cars on overhead electric railways.

No. 602,137, January 28, H. M. Harding, Englewood, N. J. Support for controller or brake wires.

No. 602,187, January 28, Robert Smith and Henry W. Leonhard, St. Louis, Mo. Fender.

The Electric Railways Corporation, capitalized at \$100,000, has been incorporated in New Jersey, by Louis S. Phillips and Horace B. Hord, of 52 Broadway, New York City, and Suydam F. Wheeler, Commercial Trust Building, Jersey City, to examine and report on questions arising in connection with the organization, location, character, construction, traffic, etc., of electric railways.



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NO. 3

The "Review" is on record in regard to the question of forming an association of the street railway manufacturers and supplymen who exhibit at the annual conventions of the American Street Railway Association, but in view of the action taken by the executive committee of the A. S. R. A., in disapproving a plan for an exhibitors' association recently laid before it the time is opportune for further discussion of the subject. The A. S. R. A. executive committee at its meeting in Detroit last month voted to make no change in the manner of handling exhibits and we understand that this vote was intended as a rejection of a proposal made to it. We do not know on whose behalf the plan was brought before the committee for action, but we understand that the scheme was in substance, as follows: That the entire matter of the exhibits and convention entertainments, aside from the banquet, be turned over to the supplymen, who acting through an association or a committee, would provide an exhibit hall at their own expense and also bear the cost of the various excursions and other entertainments, as is done by the supplymen at the annual conventions of the two steam railroad associations—the Master Car Builders' and the Master Mechanics'.

We are of the opinion that both the American Street Railway Association and the exhibitors will heartily approve of the action taken by the executive committee in regard to this proposal. This plan would have deprived the A. S. R. A. of an important source of revenue, that derived from the rental of space for exhibits, which is needed by the association and being a nominal charge, is not a burden on the exhibitors. The supplymen would also have the additional responsibility because of the general entertainments when the demand upon their time because of individual entertaining are already large. There is a difference in the conditions which should be borne in mind when drawing analogies between the methods of handling exhibits at the street railway and the steam railroad conventions. At the latter, usually held at summer resorts, Saratoga or Old Point Comfort, the hotels which are chosen as the convention headquarters, have halls suitable for the exhibits

or a sufficient shelter can be improvised with some lumber and canvas. On the other hand the street railway conventions are in large cities where finding an exhibition hall with the requisite space is more difficult and more expensive. Probably no body of street railway supplymen, as informally organized as such an association would naturally be or so few in number as its executive committee, would care to assume the financial responsibility of engaging the Coliseum in Chicago or Madison Square Garden in New York, for a week.

As was pointed out when the "Review" in the "Daily Edition" for Oct. 20, 1900, urged the advantages of a supplymen's association the function of the organization would be the handling of the details in connection with the exhibition, which until last year have always been put in charge of an official of the street railway company acting as convention host. This cannot but be recognized an imposition for we all know that street railway men have plenty to do without undertaking such additional work.

Everyone who attended the New York convention last October certainly appreciated the fact that the general arrangement at the hall and for the handling of exhibits were never before so satisfactory to all concerned. It was an object lesson as to what could be done by securing the services of an experienced man as director of exhibits, and one result was that the exhibitors at that meeting appointed a committee comprising representatives of a number of leading manufacturers and large exhibitors, to formulate a plan for a "Street Railway Manufacturers' Association." This committee has recently addressed a circular letter to the persons interested and will, we believe, be entirely successful in effecting a permanent organization at the Detroit convention.

To quote the committee: "The working committee of this association could confer with the executive committee of the American Street Railway Association, also with the committee in charge of the exhibits at the convention city. It is believed that arrangements could be made whereby a committee of this association could have full charge of installing exhibits, handling freight, decorating the hall, and all other matters pertaining to the exhibits. An experienced man could be engaged to go to the convention city some time in advance of the convention and make all necessary contracts and arrangements for the exhibits, engage carpenters, attend to the building of booths, put up signs, handle freight, etc. This manager would also remain after the convention to see that all goods were reshipped, and close up all matters pertaining to the exhibits." It is proposed to leave the matter of apportioning the expense for settlement at a meeting to be held in Detroit in October next.

Stress should be laid on the fact that this plan for a Manufacturers' Association does not contemplate any change from the present method of assigning space to exhibitors nor is it proposed to divert the revenue received for exhibit space from the treasury of the A. S. R. A. Space in the hall would be paid for as heretofore, the new association merely assuming the work of the director of exhibits.

Therefore we can see no reason why the Manufacturers' Association should conflict in the slightest degree with the A. S. R. A.; on the contrary the latter and the railways of the convention city would be relieved a great lot of detail work.

Elsewhere in this issue will be found part two of an article by Mr. W. E. Partridge on "California and Combination Cars." This article contains a very complete sketch of the various styles of cars containing both open and closed compartments, and shows that the use of this type is gradually spreading from California, where it was first put into operation, through the eastern part of this country, as well as to a number of places in foreign countries. The desirability of a car equally adapted to summer and winter use is entirely obvious from the standpoint of the railway company, but the discussion on the most desirable form of car for city service, following the paper on that subject by Mr. Chamberlain, read at the A. S. R. A. convention last October, emphasizes the fact that it is extremely difficult to establish any single standard type of car which is equally suited to all climates and all the dissimilar conditions and tastes throughout the different parts of the country.

The use of the convertible or combination car means a saving in the work of changing trucks and equipments from one style of car to another or of maintaining a double supply of equipments. Fewer

cars would suffice for the road, and the storage capacity of the barns could be considerably decreased. All these advantages would effect considerable economy in the original outlay for rolling stock as well as the labor account, and are therefore, much to be desired from the standpoint of the railway manager. But the ordinary style of open car with running boards along the sides is probably one of the most popular cars with the public during hot weather which has ever been produced, and it is questionable if any other style of combination or convertible car will ever attain the same degree of popularity for city service where only ordinary speeds are permissible. For high speed interurban work, however, the partially closed car has been found preferable, as the velocity and sweep of the wind in the open country makes a certain amount of shelter desirable, even in the hottest of weather.

The metric system is once more exciting considerable comment in this country. Bills are now before Congress providing that after a certain date the use of the metric system of weights and measures shall be compulsory in all departments of the Government and in all matters connected with construction or commercial operations other than those relating to public lands and surveying, and one of these bills provides that the metric system shall be "the" legal system of weights and measures recognized in the United States. The word "the" in this connection can only be considered as meaning "the only legal," inasmuch as the metric system was legalized in 1866 by act of Congress, and were the pending bills to become laws the present standard would become illegal. The bills in question have, we believe, received the approval of a committee of the Franklin Institute; on the other hand they have been strongly condemned by a committee of the American Society of Mechanical Engineers who say the measure involves "changes that will inconvenience and hinder trade and manufacturing, and require an expenditure of time and money that cannot be expressed in figures, sweeping away as it does the advantages accruing from the numerous established standards now recognized and universally adopted throughout the country." For our part we are heartily in accord with the view expressed by the Mechanical Engineers' Committee.

We recommend that those of our readers who are interested in the metric system consult the paper by Mr. George W. Colles, read before the American Society of Mechanical Engineers in 1896 and printed in the Society's "Proceedings," vol. xviii, p. 492 et seq. This paper is far too long to abstract and to give even the briefly stated conclusions would require over a page of the "Review," but it is well worth the reading for one who wishes to familiarize himself with the futile efforts which for over a century have been made to impose the metric system upon the world in general.

In 1821 John Quincy Adams, to whom in 1817 as Secretary of State had been delegated the work of investigating the metric system, made an elaborate report to Congress. One paragraph from this report is as follows:

"From the verdict of experience, therefore, it is doubtful whether the advantage to be obtained by any attempt to apply decimal arithmetic to weights and measures, would ever compensate for the increase in diversity which is the unavoidable consequence of change. Decimal arithmetic is a contrivance of man for computing numbers; and not a property of time, space, or matter. Nature has no partialities for the number ten; and the attempt to shackle her freedom with them will forever prove abortive."

On another page will be found an article entitled "Operating Notes on High Speed Electric Railways" in which are discussed several points in regard to high speed electric roads that are in a number of ways different from the ordinary street car system as well as from the main line railroads. There is a certain type of electric railroad now being put in operation for which no distinctive appellation exists. As pointed out by the writer, the name "interurban railway", as generally understood, is hardly applicable to the steam road which has discarded steam locomotives and adopted electricity as a motive power. A number of so called interurban systems which now cover 150 or more miles of roadway are in fact, similar in almost every respect the motive power to main line railroads. The construction of these roadbeds is of the best, and we may add parenthetically that we believe the time has come to abandon the expression "equal to the best steam railroad practice" in describing electric railways. Undoubtedly there have been electric roads constructed which were "built to sell", but

there are now in operation enough well-built electric lines to render "the best interurban practice" a sufficiently high standard of excellence.

Insofar as steam railroad organizations and methods are applicable to electric roads they have been very largely adopted by the latter. The present tendency is towards a more extensive organization such for example as has recently been introduced by the Buffalo company, where there are superintendents of transportation, of rolling stock and buildings, and of construction and maintenance of way; the motive power being under another superintendent who has the title of electrical engineer.

Some method of train dispatching is now used on all interurban electric roads and the experience gained by the steam roads in this respect has proved useful to electric railways although the system on the two classes of road cannot be carried out in exactly the same manner. The telephone is largely replacing the telegraph in this department and in this respect we believe some of the steam railroads of the country will follow the example of electric railroads. The telephone seems far better adapted to the purpose of dispatching where the number of train units is large. With the telephone the dispatcher speaks directly to the motorman, who can take down his instructions in duplicate, keeping one copy for himself and giving one to his conductor the message can also be repeated back so that no excuse whatever can exist for a mistake in orders. The telegraph is not at all suitable for single track electric interurbans where it is desirable that the train men report at every passing point. The protection of trains by signals is a subject to which the managers of electric interurbans are keenly alive, and steady progress is being made in this direction, although the block system is seriously handicapped because the rails being utilized for the power return circuit are not available for the signal circuits.

Two serious criticisms of present interurban practice are made by the author of the "Notes." One is that the sub-stations are too often located only with regard to the electrical engineering features of the system, when with only slight disadvantage electrically they could be placed at sidings and the sub-station attendants would then be available as signalmen. The second criticism is that too much is expected of sub-station men, the stress under which they must work not being appreciated; and the writer states that as the result of his experience he believes that where the man in charge of the apparatus at a rotary converter sub-station is expected to act as ticket agent and agent for the dispatcher also, an eight-hour relief is absolutely necessary to secure satisfactory service. Where men have attempted to fill such positions and stand a 12-hour shift seven days per week they have broken down under the work; this being the case, the sooner managers recognize the conditions, the better will be the result for all concerned.

The question of whence the trainmen for the high speed electric interurbans are to be drawn is also discussed by the author, who says the management may take steam railroad men who are trained to obey dispatcher's orders but do not know how to handle the electrical equipment of their cars, or it may take street railway men who know all about the electrical apparatus but are not sufficiently imbued with the importance of strictly obeying train orders. This it appears to us is purely a matter of expediency. Both steam and electrical roads have to break in new trainmen, and the high-speed interurban must expect to do likewise, save that if it takes employes from one of the other class of roads the work of teaching them is already partly done. If recognition of the importance of train orders is more to be desired than familiarity with electric cars choose the steam road man and teach him the other part of the work.

It is perhaps true that the discipline on street railways is inferior to that on steam roads, but as for the men themselves we believe that the character of these employes at the present time compares very favorably with that of any similar body on steam roads. The discipline on any road depends entirely upon its management, and the difficulty of obtaining men suitably discipline for this work which existed a few years ago is now rapidly disappearing owing to the more stringent rules under which most of the electric railways are now operated. The lack of experience in operating under steam road conditions is undoubtedly a serious disadvantage when a "street" railway employe enters the service of a high speed interurban line, and it is this inexperience that has caused some of the accidents to which reference has been made. But as stated in the preceding paragraph the manager may choose either one of two classes of men and supply the deficiency.

The Grand Rapids, Holland & Lake Michigan Rapid Ry.

From a paper read before the Chicago Electrical Association, March 7, 1902, by George A. Damon* and William D. Ray.†

The Grand Rapids, Holland & Lake Michigan Rapid Railway Co. was incorporated Feb. 24, 1900, to construct and operate an interurban electric railway from Grand Rapids, Mich., the second city of the state, to Holland, and there connect with the Holland & Lake Michigan Railway and the Saugatuck, Douglas & Lake Shore Railway.

Grand Rapids has long been known as the "Furniture City," the majority of its factories being engaged in furniture manufacturing. The city, including the suburbs, has a population of nearly 100,000, and the last census shows a growth in the past ten years of 45 per cent. Besides being the greatest furniture manufacturing city in the country, Grand Rapids has other industries of importance and its factories are busy the year round and employ thousands of people. An interurban road, nowadays, to promise success, must have a large city as a terminal, to which the people can be carried from many small towns, which it serves. Grand Rapids

numbers that hotels could hardly be built fast enough to accommodate them. The boats of the Graham & Morton Transportation Co. come twice each day to Holland, with excursionists, who usually take the local Holland road for Macatawa Park. The new management has arranged for cars to meet the boats at the wharf. The lake trip is short from Chicago and quite attractive in many ways. The interurban railway company does not expect large profits from this transient population but depends upon Grand Rapids' patronage, that city heretofore having had no electric line running to nearby summer resorts. The Holland, Saugatuck & Douglas line passes through a rich fruit belt and terminates in Saugatuck, which has for the most part a summer population, with but few winter residents. The Saugatuck and Douglas resorts have not been frequented as much as Macatawa, but as their beauty becomes better known patronage will increase each year.

The summer business on the interurban line, it is expected, will



VIEW OF LINE SHOWING CROSSING SIGN AND SHELTER.

was wisely chosen. The Grand Rapids, Holland & Lake Michigan Rapid Railway was the first interurban line to be admitted to the city. From Grand Rapids, the eastern terminus, the road passes through the towns of Grandville, Jenison, Hanley, Jamestown, Vriesland and Zeeland; all these long settled villages are thrifty and their merchants prosperous.

A good farming country, an old and thickly settled rural community, peopled by industrious Dutch and Germans and given over to cultivation of acreages and fruit culture almost entirely, lies between Grand Rapids and the lake. There are several small towns and trading places, located from one to three miles distant from the company's tracks, which are tributary to the road. Holland, which is practically the western terminus of this new double track interurban road, has trebled its population in ten years, as shown by the last census, and now has 10,000 inhabitants.

The Holland & Lake Michigan Railway and the Saugatuck, Douglas & Lake Shore Railway were lines constructed for summer excursion business. The eastern shore of Lake Michigan has for years been a favorite with residents of Chicago who have visited Macatawa, Ottawa Beach, South Haven and other points in such

be enormous. The Pere Marquette Railroad runs excursion trains during the summer to Ottawa Beach, opposite Macatawa Park, which is the terminal of the electric road, and carries a large number of passengers, trains of 16 cars frequently being loaded to the platforms. The advantages that will accrue to the pleasure riding public of Grand Rapids, from the improved service offered by the electric road, are apparent, and it is safe to conjecture that this pleasure riding public will furnish the greater portion of the summer traffic. The amount of traveling throughout the winter months, as shown by the daily receipts, is gratifying.

The fruit business on the west side of Michigan is also very large, and Grand Rapids is the acknowledged center of the fruit belt, from which immense shipments are made each summer.

Holland is the junction point of the Pere Marquette and the Chicago & West Michigan railroads. The Holland & Lake Michigan and the Saugatuck & Douglas electric lines operate over private rights of way for a distance of 16 miles, except for three miles through villages. The aggregate length of track of the combined roads is 71 miles. The total distance covered is 45 miles, 19 miles of this comprising the two roads running from Holland to the lake, acquired by the company. Twenty six miles of double track road have been laid by the new company, to reach Grand Rapids from

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†Consulting electrical and mechanical engineer, Detroit, Mich.

these lake resorts. Cars are operated on a headway of one hour and require at the present time one hour and thirty minutes for the trip from Grand Rapids to Holland, or three hours for the round trip. This time is to be reduced as the roadbed is bettered, and later, during the summer months, a maximum speed of 45 miles per hour will be realized, with an average speed of 26 miles per hour, including stops.

The running time between Holland and Macatawa Park is about 30 minutes. The interurban cars, run on Grandville Ave. in Grand Rapids to the down town loop. While for some distance double track is used, single track with turn outs prevails. This spring a

sinkhole encountered just at the limits of Holland. After bringing the surface to grade with gravel the tracks were laid, but it was only a short time until track and fill dropped out of sight and only a pond remained in their place. It was then realized that a sink hole, nearly 700 ft. in length, had developed; an attempt was made to fill it with sand and gravel, but the bottom seemingly could not be reached and this method was abandoned. On the surface there was a firm crust covering some 40 ft. of muck. By drilling test holes a stratum of gravel about 10 ft. thick was penetrated and below this was found another layer of muck. After the top crust had given way as mentioned, the track was relaid temporarily on



SINK HOLE NEAR HOLLAND.

double track road from the terminal of the electric line to the loop down town is to be constructed.

The population served by this road is shown by the following table:

Grand Rapids	90,000
South Grand Rapids	500
Grandville	1,200
Jenison	200
Jamestown	150
Vreesland	200
Zeeland	2,000
Holland	10,000
Saugatuck	800
Douglas (opposite Saugatuck)	700

Total population of villages.....	15,750
Townships outside of villages, 3 miles on each side of line, and all tributary to line, estimated from reported population of entire townships	15,000

Total estimated winter population outside of Grand Rapids	30,750
Summer population 3 to 4 months (from outside of this district) at Macatawa Park and Ottawa Beach.	3,000
Ditto at Saugatuck and Douglas	1,000

Additional summer population	4,000
Total outside of Grand Rapids	34,750

The general character of the territory between terminals is rolling, with some steep hills. Several wooden bridges for spanning creeks, were required, the longest being that over the Lake Shore railroad near Grand Rapids, which is 750 ft. in length, and 24 ft. in height at the apex, with grades 1:59 and 3 per cent.

The road was prohibited from crossing through tracks of steam railroads at grade, and bridges and subways were consequently built. Grade crossings, however, were permitted over switch tracks, spurs and sidings, when protected with derauling devices, inserted in the interurban tracks. The private right of way is four rods wide and fenced in; it is protected by cattle guards and danger boards at all highway crossings.

An unexpected expense in building the roadbed resulted from a

long timbers placed side by side while a permanent track was built on a foundation of piles driven end on end till the gravel stratum had been penetrated to a depth of 4 ft. This construction was expensive and more work on the sink hole will be necessary from time to time.

Fills are made with a slope of 1 vertical to 1½ horizontal; cuts have a slope of 1 to 1. On the double track portions of the lines the width is 28 ft. at sub grade on fills and 30 ft. in cuts.

Near Jenison is to be found the biggest fill; this is 500 ft. long,



ROUTE OF GRAND RAPIDS, HOLLAND & LAKE MICHIGAN RAPIDRY.

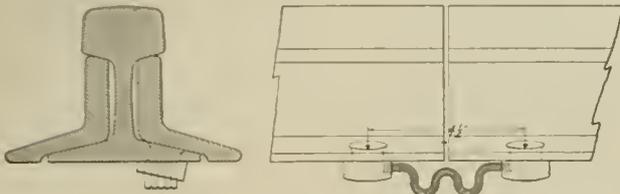
154 ft. wide at the base and some 42 ft. in depth, requiring 35,000 cu. yd. of fill, and costing over \$5,000.

It is exceptional to find double tracks provided for in the original construction plans of an electric interurban. In this case such provision was wise forethought, rather than compulsory afterthought. The company's single track steam railroad competitor, the Pere Marquette, parallels the double track interurban, from Grand Rapids to Holland. While trains on the former road may be seen

waiting on a siding for a passing train, the cars of the interurban go whizzing past, giving an interrupted service by virtue of the double track feature.

By glancing at the map it will be seen that the two roads are nominally parallel; their greatest distance apart is in the vicinity of Jamestown; at other points there is only a few rods between them. A desire to reach the centers of populous districts and communities and to build the road where the least expense for cuts and fills would be necessary is responsible for the divergence from an air line; however, no sharp curves exist and the grades are few and light.

The two subways in Holland, comprising three separate railroad crossings, are of steel and concrete construction. The trestles and bridges on the road are all of oak. The ties are spaced 2 ft.



RAIL BOND AS ATTACHED TO FLANGE.

between centers and are of hewn cedar, 8 ft. x 6 in. x 8 in. except on switches where oak ties 8 ft. x 8 in. x 8 in. are used. The track is of standard gage and laid with 30 ft., 65 and 67-lb. rails of the A. S. C. E. standard T-section; the ballast consists of 10 in. of coarse gravel tamped 4 in. under the ties, and where required is well drained with vitrified tiling 12 in. to 36 in. in diameter.

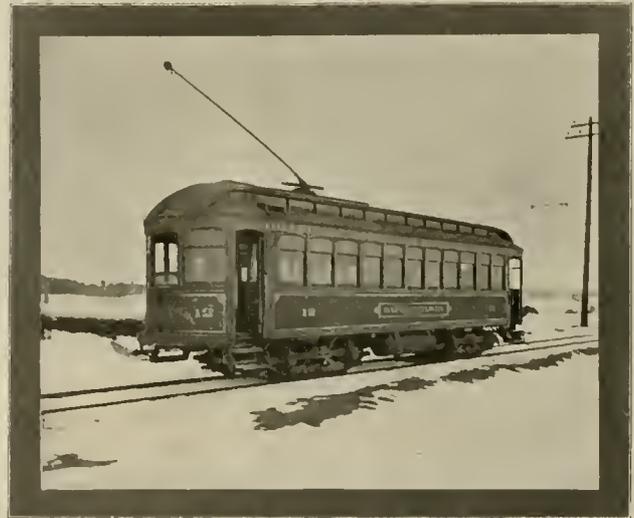
The sharpest curve is 6 degrees and the maximum virtual grade 3 per cent, except at the subway in Holland which is 5.56 per cent.

The bonding of the rail joints was done very thoroughly. Two types of bonds were installed,—a foot bond on relaying rail where angle bars did not permit the usual web bond, and on all new rail a web bond. These bonds were No. 0000, 6 in. long and crimped to 5 in. between centers, of the "Protected" type furnished by the J. M. Atkinson Co. The drilling of rails, for receiving bonds was done by a special machine which consists of a gasoline engine, tank and batteries, transmission and speed regulating devices, mounted on a special car equipped with drill stocks. This outfit paid for itself, many times over, in

all switches and frogs were well bonded and cross connected. Where the tracks crossed a creek, the rail circuit was grounded by sinking a metal plate into the flowing water below.

Loops are placed at all terminals and Y's are installed at the two car barns and at Zeeland sub-station. All switches are protected with indicating switch stands and signal lamps. All the special work was supplied by the Paige Iron Works and the Cleveland Frog & Crossing Co.

Substantial depots for the small villages and shelters at highway



STANDARD CAR.

crossings, have been placed where warranted and are greatly appreciated by the patrons.

The sub-station buildings at Zeeland and Macatawa are combined with a waiting room and freight office. The attendant for the electrical machinery looks after the selling of tickets, handling of freight, etc. The sub-stations are of white brick and stone construction, with high elevation.

Power Plant Building.

The selection of the exact location of the power plant was the result of a desire to have the plant in or near the village of Jenison, and at the same time upon a site convenient to railroad facilities, and to a supply of water for condensing purposes. It was also desirable to secure a site upon an elevation with a grade line sufficiently above high water mark to insure a dry basement during the spring of the year, without losing sight of the necessity of a firm sub-soil to support the machinery foundations. After some investigation a satisfactory site was selected at no great distance from the right of way of the electric road. The relative location of the power plant property with respect to the Pere Marquette R. R. tracks, and the fact that provision for extending the station was to be made on that side of the plant farthest from the electric car line, determined the relative position of the boiler and engine room.

In the power plant building itself, and, in fact, in the general design and selection of the entire equipment, an effort has been made to follow the best engineering practice and yet accomplish the result at minimum cost. The plant as completed, therefore, is thought to be a good example of a station thoroughly in keeping with the commercial character of the enterprise which it serves. There is in the plant no waste space, but at the same time crowding has been avoided. There is nothing about the equipment which may be termed a "frill," and yet everything which would pay an interest on the investment, either by reason of more convenient operation or of fuel economy, has been included in the plans. It will be interesting, therefore, to examine the plant with a view to learning the various considerations which entered into the selection and arrangement of its equipment.

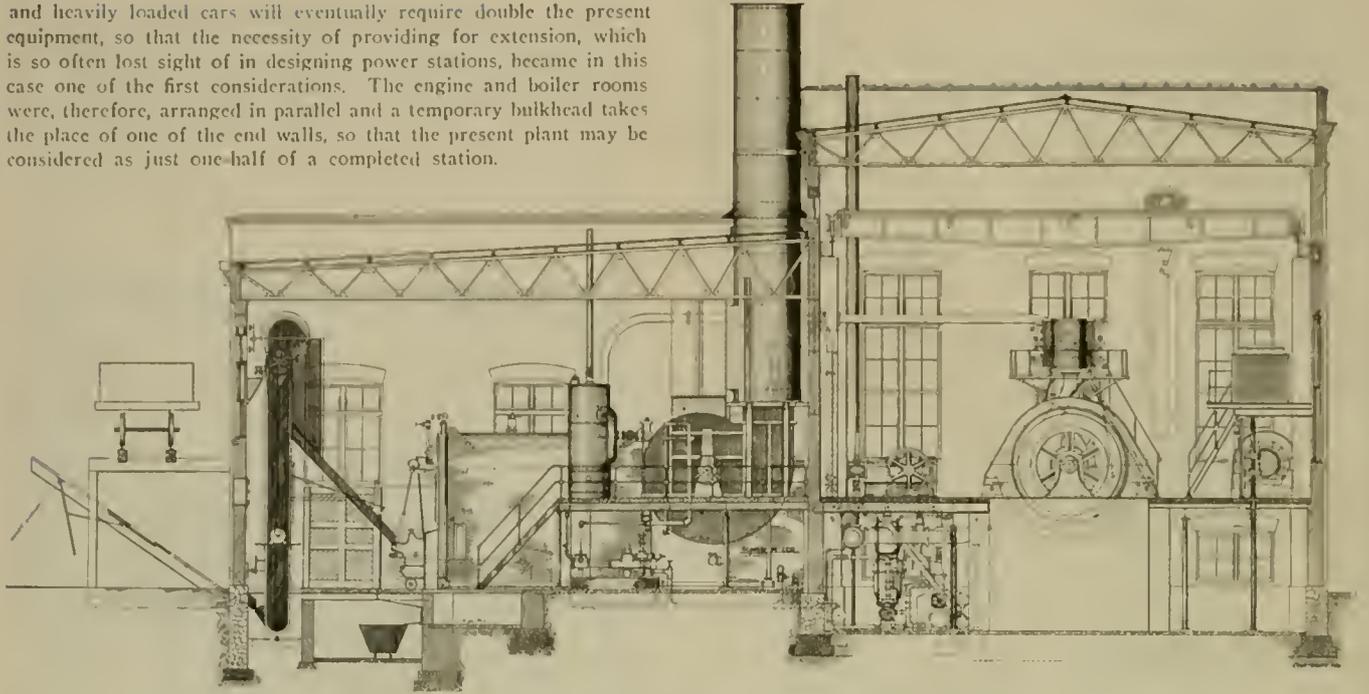
The general arrangement is shown in section and plan. The plant at present contains but two generating units. To furnish power for the operation of the road up to its full capacity with frequent



INTERIOR OF SUB-STATION.

the saving effected. The engine gave but little trouble and the outfit worked otherwise satisfactorily, requiring only one mechanic for both engine and drills. A combination drill was used, which not only drilled the foot of the rail, but also countersunk the hole. A screw compressor, operated by two men, was used in compressing bonds. The rail circuit was cross connected every twelfth pole, by a No. 0 tinned copper wire, and connected with a good ground;

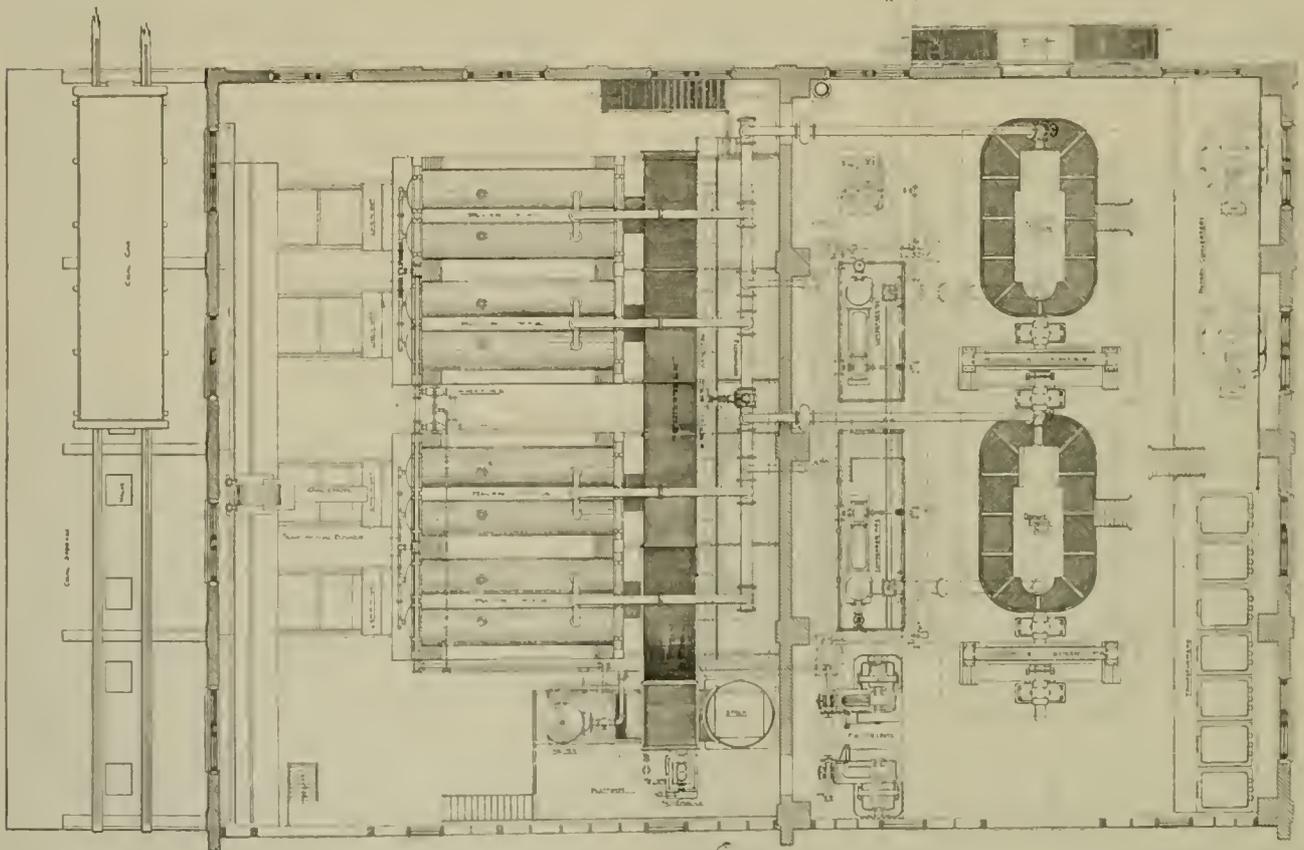
and heavily loaded cars will eventually require double the present equipment, so that the necessity of providing for extension, which is so often lost sight of in designing power stations, became in this case one of the first considerations. The engine and boiler rooms were, therefore, arranged in parallel and a temporary bulkhead takes the place of one of the end walls, so that the present plant may be considered as just one-half of a completed station.



CROSS SECTION OF POWER STATION.

The engine room is 32 ft. high from floor line to the lower chord of the roof truss. It is 47 ft. wide inside and at present 72 ft. long. The engine room floor is 9 ft. above the natural grade of the ground, while the boiler room floor is at grade. The engine room has a basement 12 ft. high for the accommodation of the condensers, and much of the steam piping; this basement is 4 ft. below the boiler room level. The boiler room is 54 ft. wide, 28 ft. high and

the same length as the engine room. There are four openings in the fire wall which divides the two rooms, two for doors between the engine and boiler room and two to provide access to the condenser basement from the boiler room floor. These openings are closed by means of metal covered sliding doors. The condensers can be reached from the engine room floor directly by means of a stairway landing midway between the steam connections to the two con-



PLAN OF POWER HOUSE.

densers. These stairs, as well as all other stairways about the plant, are made of iron with diamond tops and convenient railings. The main entrance to the engine room from the exterior is gained by means of a double stairway leading to a large door in the middle of the permanent end wall of the engine room. The location of this stairway on the outside of the structure saves considerable valuable space inside the building without detracting from its external appearance.

The building itself is made of cream colored local brick, and has large windows giving plenty of light and ample ventilation. The roof trusses are designed to secure a comparatively flat roof having a dip of $\frac{5}{8}$ in. to the foot. The trusses are tied together by channel iron purlins to which are bolted nailing strips for the matched roof boards which are covered with a four-ply gravel composition. The down-spouts are on the outside of the building. Neither the engine room nor the boiler room roofs have monitors, but instead 36 in. galvanized iron ventilators of the "Star" pattern are provided to allow the escape of heated air, and the results are satisfactory.

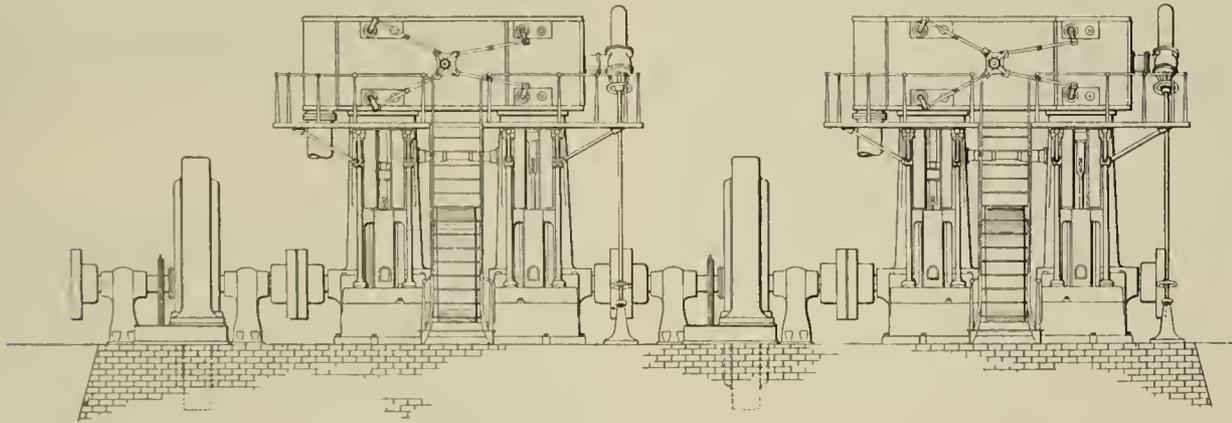
The floors of the boiler room and of the engine room basement are of concrete with a cement top. The engine room floor is supported by an iron structure and is independent of the main engine and generator foundations. This floor is made up of corrugated sheet steel plates, made by the Berger Manufacturing Co. The corrugations in the plate used are $2\frac{1}{2}$ in. high, and the vertical sides are separated by three small half-circle arches. The upper portion of the manifolds are filled with concrete which extends above the

The condenser outfit fits in nicely between the engines and boilers while the switchboard and high tension apparatus is located on the floor and gallery on that side of the engine room from which the distribution and transmission wires can conveniently leave the building. The travel of raw material and finished product is thus reduced to a minimum.

Coal Handling Apparatus.

The fuel is slack coal which is received from cars delivered upon a trestle alongside of the boiler room by the railroad company; so that the first movement of the coal is secured by gravity. The next operation is to transfer it from the coal pockets to the boiler furnaces. The plant was not large enough to justify an investment in an elaborate system of coal and ash handling apparatus and storage bins and yet the fact that the station was to operate nearly 20 hours each day for every day in the year made it desirable to adopt some method of doing away with hand firing. The coal handling device indicated on the cross section of the power house was selected as combining the advantage of small first investment with the ability to reduce the coal handling cost. This apparatus has not yet been installed but the fact that at present the coal and ashes are each handled at least twice only emphasizes the importance of an investment in this part of the plant.

The apparatus shown consists of a traveling bin carried upon an elevator leg which rests directly upon and travels along a track parallel to the boiler room wall. At frequent intervals along this wall



ELEVATION OF GENERATOR UNITS.

plate a sufficient distance to hold the 2x4 in. nailing strips for the hard wood floor.

All of the foundations are made of concrete with Portland cement and gravel from a pit near the power plant site. The foundations are faced with a layer of gypsum and present a neat and finished appearance. The main engine and generator foundation is a monolith.

The building is divided into bents with trusses spaced on 18 ft. centers. At each division point a pilaster 3 ft. wide, extending 2 ft. into the engine room, is carried 23 ft. above the floor to support the beams for the crane runway. The distance between these rails is 45 ft., and the lifting capacity of the crane is 15 tons. This crane has been a great convenience in the erection of the engine room equipment. The crane is operated by pendant chains, the transverse motion being secured by means of a chain hanging directly in front of the gallery which extends the entire length of the plant. There are two hoisting speeds, a slow speed for heavy loads, and a fast speed for overhauling the empty hook and for light loads, and each speed has a separate chain.

Attention should be directed to the effort which has been made in this plant to secure the simplest and the most efficient arrangement of the equipment. A power plant is a large factory in which the raw material is fuel and the finished product is electrical energy, and the problem is to transform the raw material into the finished output with the minimum amount of loss, labor and investment consistent with reliability.

It will be noticed that the plant is built up of a series of units. The two boilers of capacity equal to the demands of one engine are of about the same width as one engine and its contiguous generator.

cast iron pockets with sliding gates are placed ready to deliver the coal from the bunkers directly into the bottom of the elevator the bucket system of which is operated by an electric motor, allowing the bin to be filled from any point of the coal storage. The coal hopper can be moved along by this same motor until it is brought directly before the furnace to be supplied with coal which is delivered through an extended spout by gravity. The hopper of each furnace holds a supply sufficient for an hour's run, so that the operation of the boiler room becomes a "one man" job, and it would be hard to reduce the labor item below this point.

Stokers.

From the furnace hopper the coal drops on to a Green chain-grate, made by the Green Engineering Co. of Chicago. The links forming the grate can be inspected as the grate makes each cycle and each link is removable in case repairs are necessary. Each boiler is fitted with a grate having an area of 53 sq. ft., which is at the ratio of five boiler horse power per square foot of grate area, and as the boilers are rated at ten square feet of heating surface per horse power the ratio of grate surface to boiler heating surface is one to fifty. The grates are guaranteed to handle successfully from 30 to 50 lb. of coal per sq. ft. per hour. The regulating devices include an adjustable gate to fix the thickness of the fuel upon the furnace,—a speed adjusting mechanism to determine the rate of the grate movement, and a system of dampers, both to vary the amount of air through the grate itself, and to shut off the upflow of air back of the grate in front of the bridge wall. The ashes are delivered by the moving grate to a pit beneath the boilers, which in this case is

designed to hold the amount produced by a day's run at full load, and it is therefore necessary to take out the ashes only once in 24 hours.

Boilers and Draft.

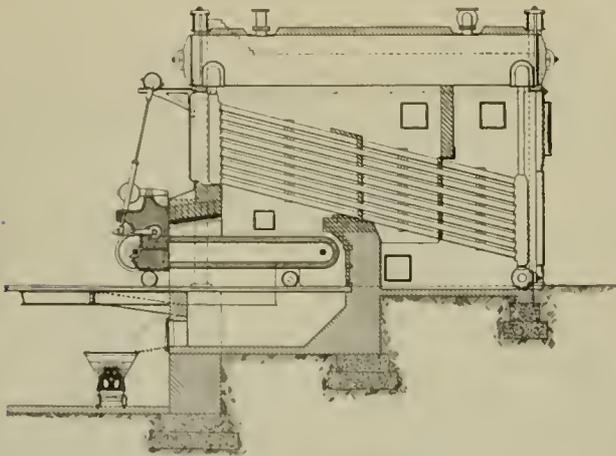
The boilers are of the "Cahall" sectional water tube type made by the Aultman-Taylor Co.; one of the illustrations shows a section of the boiler and furnace. There are four boilers each having 2650 sq. ft. of heating surface, made up of two steam and water drums 30 in. in diameter and 20 ft. long, and 126 four-inch tubes, 18 ft. long. The tubes connect vertical iron headers, and are arranged in staggered sections fourteen tubes wide by nine tubes high.

These boilers and furnaces are guaranteed to transform at least 70 per cent of the heat units of the fuel into energy in the form of dry steam at 150 lb. gage pressure and under full load conditions will probably do even better.

The fact remains, however, that 20 per cent of the heat energy originally contained in the fuel escapes from the smoke connection at the rear of the boilers. The plant is planned to eventually intercept much of this latent heat energy and transform it back into the boiler system by means of an economizer, and this desirable adjunct will probably be installed at the time the station is completed. At present, however, the hot gases are conducted by means of a sheet steel breeching directly to the intake of a Sturtevant induced draft fan. This fan has a wheel 9 ft. in diameter by 4 ft. wide and is mounted on an iron platform located at one side and toward the rear of the boiler settings so that the breeching outlet discharges directly into the fan intake without making any turns or bends.

The fan discharges into a stub stack 5 ft. in diameter, made of sheet steel, and mounted directly over the fan outlet. A by-pass is provided with suitable dampers so that the fan inlet and outlet can be closed and the gases passed directly to the stack. The top of this stack is only 40 ft. above the grates, but this height has proved sufficient to operate the plant upon light loads without the use of the fan.

The speed of the fan determines the force of the draft, and this speed can be adjusted either by hand or by an automatic valve connected to the main steam header in such a way that as soon as the steam pressure drops, the fan engine is speeded up. The draft, therefore, becomes a function of the demand upon the boilers. A draft gage is mounted in a location convenient for the fireman, and the behavior of this part of the plant is under constant supervision. Ordinarily the fan engine turns about 100 r. p. m., but it may be increased to 250 r. p. m. or more, and if occasion should arise



SECTION OF BOILER SETTING.

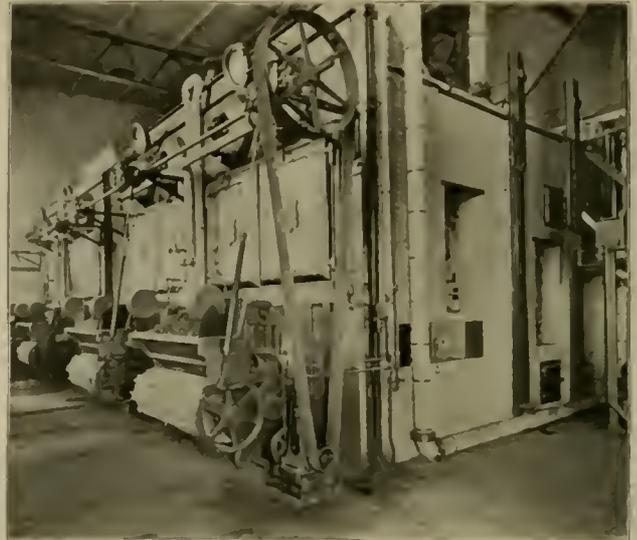
to force the boilers to their limit for a period it is possible, by means of the fan and engine which has been installed, to get a draft equal to two inches of water.

The mechanical draft equipment cost much less than a steel stack, and up to date has given practically no trouble. It is designed with sufficient power to eventually draw the gases through an economizer. This economizer is to be placed back of the boilers and just sufficient distance above the floor to allow a by-pass flue to be located beneath. A runway between the back of the boiler and brick economizer flue allows a space for getting at the rear of the boiler tubes, at the blow-off valves, and at the economizer header.

Heater and Pumps.

The fan engine, it is true, requires a certain amount of steam, but at the same time this engine, in common with other auxiliaries about the plant, exhausts into an open heater, and a good share of the heat of the steam used is returned to the boilers through the feed water.

There are several paths for the feed water to reach the boiler. It may be taken directly from the outside source of supply by a tank



BOILERS WITH GREEN CHAIN GRATES.

pump in the engine room basement, and delivered either directly to the pumps or to the feed water heater. This same tank pump may also receive its supply from the discharge main of the condensers from which it will receive the water at a temperature of about 110 deg. F. It is also possible by closing a gate valve in the condenser discharge pipe to raise this water to a pressure sufficient to deliver it either to the boiler feed pump or even to the elevated heater, and there is a pipe connection provided for this purpose.

After leaving the pumps the water will eventually be passed through the economizer before it reaches the boilers, and here it will be heated to nearly 300 deg. F. At the present time it leaves the heater at about 200 deg. F. and enters the boilers through a connection at the front part of the upper drums after passing through a quick opening valve, a check valve and a globe valve, all within reach of the fireman. An auxiliary safety connection is made between the pump discharge header and the boiler blow-off headers, so that in case of a serious accident at the front of the boilers it would still be possible to supply them with water. In addition to all these precautions two Penberthy injectors are placed between the two batteries, so that cold water can be lifted from the source of supply and injected directly into the feed water supply system without the use of any of the pumps or condensers. With the addition of a reserve supply of water in an elevated tank, which is to be added when the car barns are built, it is hard to see how the boilers will ever suffer from a water famine.

High Pressure Steam Piping.

The steam, on its way from the boilers, passes first through an automatic valve which is mounted directly on the boiler outlet. In order to open this valve the steam in the boiler must reach a certain pressure, and the valve will immediately close again if the steam pressure drops below this point. This valve is intended as a precaution in case of the failure of any one of the boilers through any cause as in such an event it automatically cuts itself out of service. From this automatic valve a full sweep half-circle bend delivers the steam to the top of the header through a gate valve. This header is 12 in. in diameter and parallels the dividing wall between the engine and boiler room at a short distance above the boilers. It is supported on roller brackets with two sets of rollers at right angles, which allow for movements in two directions. The header gallery, which is provided for convenient access to any of

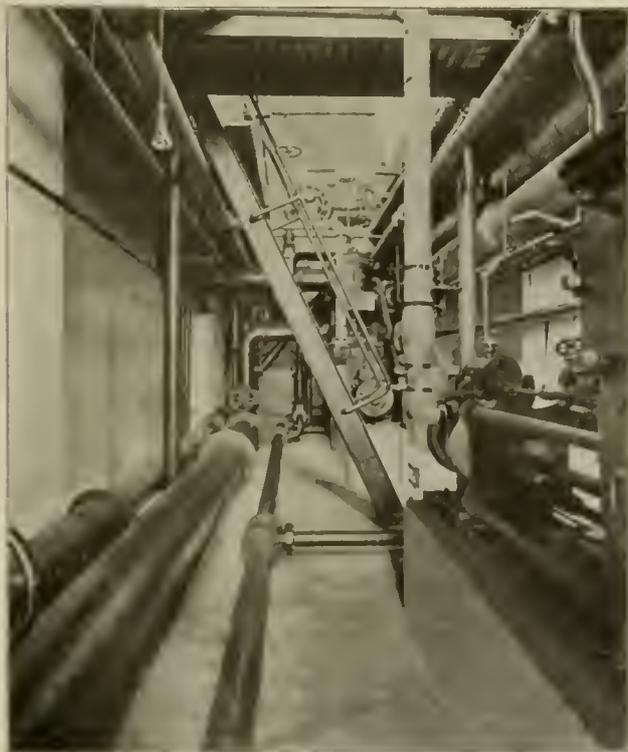
the valves, can be reached from both ends of the plant. The header is divided in the middle by a by-passed valve, so that in case of accident either half of the plant can be run independently of the other half. All valves in the plant are of Crane make and all high pressure piping 4 in. in diameter and over is flanged. All live steam and hot water piping is covered with heat insulation, made by the Manville Covering Co.

An auxiliary header supplies the steam to the exciter engine to the condenser pumps, to the boiler feed pumps, to the air compressor, and to the fan engine. It is paralleled by the auxiliary exhaust pipe, and by the main exhaust, all of which are located underneath that part of the floor which forms a runway on the wall side of the condenser pit.

Engines and Connections.

There are two engines rated at 750 h. p. each. They are of the vertical cross-compound condensing type and run at 150 r. p. m. The cylinders are 21½ and 45 by 24 in. Each engine has a fly-wheel 96 in. in diameter and weighing 16,000 lb. Both high and low pressure cylinders are jacketed and the receiver has reheating surface.

Both engines and generators are of the direct connected type, but the method of connection departs somewhat from standard practice. The engine shaft extends beyond the main bearings a distance sufficient to receive the hub of a flanged coupling. The revolving fields of the generators are carried on an independent shaft resting in two adjustable bearings through which the generator shaft extends to receive the other half of the flanged coupling. The halves of the couplings on the engine and on the generator are thus in position to be connected by means of three taper bolts. In this way the generators are built and installed entirely independent of the engines without the usual delay resulting in an effort to secure co-operation between the engine and generator builders. The generators being independent of the engines it is possible to shift the generators from

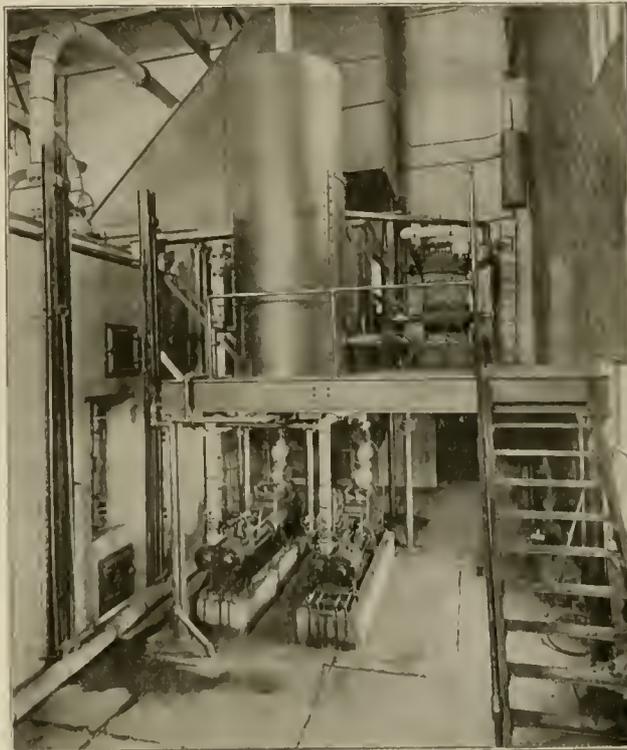


CONDENSERS AND PIPING.

one engine to another in case of accident to either the engines or the generators. This arrangement gives a certain amount of reliability greater than is found with the ordinary independent unit plan, in which the breaking down of an engine or generator cripples the entire unit.

The connecting system described has proven to be a particularly fortunate one for this plant, as it developed in buying the electrical equipment that it would be impossible to secure shipment of the

generators inside of eight months, whereas the road itself would be ready to operate inside of five months. To overcome this difficulty the engines were installed without waiting for the permanent generators, and a temporary belt pulley on an independent shaft was put in place in the bearings of one of the generators, a belt being run through a window to a belted double current generator installed in a lean-to shed. The consequence has been that the road



HEATER, PUMPS AND FAN ENGINE.

has been independent of the serious delay in starting usually encountered with enterprises of this character.

Condensers.

The water for condensing and boiler feed is taken from Rush Creek, some 225 ft. from the power house. The water enters through a crib, constructed of 2 x 8-in. timber, properly cribbed and filled with cobble stones to prevent displacement, then passes through two 18-in. vitrified tile to an intake well, intercepted by settling basins.

The intake well is 12 ft. in diameter. From this supply two cast iron injection mains of 10 in. diameter, and one 6 in. boiler feed water main run directly to condenser pit of power house.

The discharged water mains from condensers are two 12 in. cast iron pipes until the intake well is reached, when from this point to creek vitrified pipe 24 in. in diameter were used. Should the creek ever "dry up" or the stream decrease in volume, a self-cooling tower can be placed over intake well with but little additional expense.

A marble board containing the steam, vacuum and air gages, as well as a clock, is mounted in a central location on the steam side of the station and indicates the operating conditions of steam pressure and vacuum. The air compressor for the car brake system is located on an elevated foundation in one corner of the basement, and in line with the condensers.

Electrical Equipment.

The alternators are of the three-phase, 25-cycle rotary field stationary armature type, of 500-kw. capacity, made by the Westinghouse Company, and are provided with armature sliding frame to permit access to all windings for repairs without requiring use of a crane. They have 20 poles and operate at a speed of 150 r. p. m. The rating is 722 amperes per terminal. The two exciter dynamos are 125 volt 30-kw. each and either is sufficient for supplying full field current for the two 500-kw. alternators. The separately excited fields require 120 amperes at 100 volts at full rated current

output per terminal, at 380 volts, working on 100 per cent power factor. With an 80 per cent power factor, on full load, an increase of 20 per cent in field current is required. The alternator armatures are star connected and of the slotted drum type. The armature has large ventilating ducts and is substantially constructed.

The direct current exciter generators are direct connected to horizontal simple engines running at 300 r. p. m. These exciters are set on concrete foundations, built directly on the floor beams, with the result that no space is taken up in the basement by auxiliary foundations. The exciters and draft fan engine are located on a level and in the same part of the plant, thus reducing the work of the operator to a minimum. The steam reaches the exciter units through pipe bends connected to the auxiliary steam header.

The switchboard consists of 10 panels, all of blue Vermont marble, mounted on the usual framework of angle irons, distributed as follows:

and the usual delta connections are made. These transformers on both primary and secondary windings are arranged for cutting in or out coils or sections for voltage adjustment.

Two 300-kw. rotary converters are installed in the power house, for handling the sections of the line adjacent to the power house. The rotaries are started by an induction motor direct connected to the armature shaft, and synchronized by means of lamps connected on one side to bus bars and on the other to the alternating current side of the rotaries. The switch controlling the starting motor is of the double throw type, arranged for high and low voltage connections to transformers. Consequently, with one position of the switch the motor develops a speed slightly in excess of the synchronous speed and with the other position, a speed below it. This permits of the proper speed being reached as indicated by the synchronizing lamps.

Each governor arm of the 750 h. p. engine, driving the alternator,

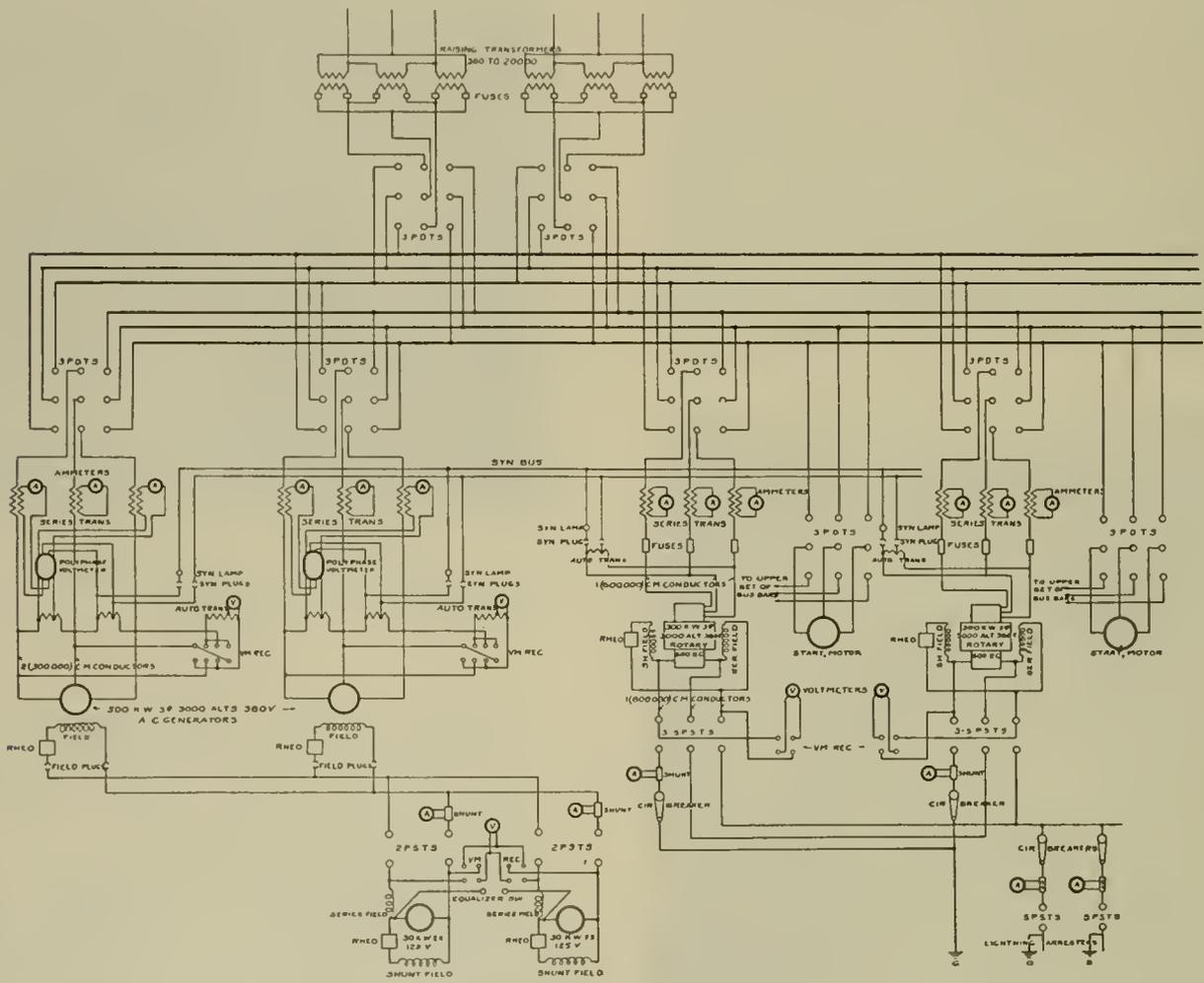


DIAGRAM OF STATION WIRING.

One exciter panel (two exciters), 2 alternator panels, 2 transformer panels, 2 alternating current rotary panels, 2 direct current rotary panels, 1 direct current trolley double feeder panel.

This switchboard is of the Westinghouse standard pattern. The principal features of the boards are a totalizing, integrating wattmeter, placed on each alternator panel; a double, low tension bus bar arrangement for flexible manipulation of alternators with transformers and rotary converters, and separate ammeters for each phase reading to 1200 amperes.

Synchronizing lamps and shunt transformers are used, when machines are to be synchronized with bus bars.

The step-up static transformers, which are located in a gallery, are of the Westinghouse oil cooled type, and are seven in number (two sets of these each and one spare), each being of 200 kw. capacity. The ratio of conversion is one to fifty. Two fuse cut-outs are placed on the low tension, or machine side of each transformer,

is equipped with a series wound 1/4-h. p. 125-volt, Sprague electric motor, for controlling the speed of the engine in synchronizing generators. The control of this motor is from special switches and rheostats on the switchboard.

Lead encased cables are used for connecting the alternator units with the switchboard and transformers and these are carried under the engine room floor on wooden brackets fastened to the I-beams. The two rheostats for the generator fields rest on suspended shelves in basement.

For some months past, a 1000-kw. rotary converter has been in operation, pending the delivery of permanent alternators. This machine is belted to special pulley fly-wheel on the engine shaft and runs at 300 r. p. m. A 5.62-kw. 500-volt exciter dynamo is belted to the shaft of the rotary and supplies the fields with current. A three-phase alternating current of 380 volts is delivered to static transformers and a direct current, approximating 600 volts, or such

voltage as follows the departure of the generator from a true sine wave, is delivered to the trolley wire of the line sections adjacent to the power house.

This temporary arrangement has worked well, excepting for the regulation, which has been poor at times, occasioned by the reactive effects.

The station lights, consisting of some 65 lamps, are operated off of a special transformer of 125 volts secondary and 400 volts primary. After the shut down of the plant at night, should light be required, the exciter dynamo is started and switches transfer this duty to the exciter.

The six high-tension wires after leaving the step-up transformer are interrupted at the high tension board, by six single pole combination fuse switches or circuit breakers.

In the station low equivalent arresters are mounted on a marble panel 24 in. x 65 in. One single pole arrester is used on each end of each transmission line.

Static interrupters which resemble transformers in external appearance take the place of the choke coils commonly used, and are much more effective. On high tension circuits, switching, grounds and short circuits may produce static effects similar to those of lighting. The static interrupter protects the transformers against sudden static disturbances. The interrupter includes a choke coil in series with the line and the condenser connected between line and the ground,—nearer the transformer than the choke coils. The choke coil and condenser are placed in a self-cooling tank. The base dimensions are approximately 20 x 27 in. Three leads are brought through the top of the case through insulating bushings for connection to line, to transformer and to ground.

The interrupters are single-pole and three are used for each group of three transformers, the interrupters being placed in the leads of the delta. No switching of live high tension wires is permissible within the interrupters, except that a transformer may be cut in or out when its high tension voltage is maintained interchangeable by potential on the low tension winding. In this case the high tension switching is not dangerous because it produces no change of potential.

It will be noted that the arresters which serve to prevent an abnormal rise of potential due to lightning are placed on the line wires where they enter the stations and that the interrupters whose function it is to prevent short circuits from static disturbances are placed between the transformers and the transmission line switchboard, so that no switching of high tension circuits will be done within the interrupters. These lightning arresters are of the most approved pattern, made by the Westinghouse company and known as the low-equivalent type.

The wiring for this station consists of rubber covered wires placed on brown porcelain insulators, supported by standard oak pins. A well seasoned wooden frame work, carries the high tension switches and lightning arresters.

Six aluminum wires of 52,630 circular mils each leave the Jenison power house, carrying current at 20,000 volts, and follow along the railway tracks easterly to the Zeeland sub-station, 15 miles distant, and at this sub-station, these six wires pass through the building and continue on to Macatawa sub-station 10½ miles, from Zeeland. The six high potential wires comprise two circuits. Although one circuit would suffice for the operation of the two sub-stations, it was deemed best to split or divide the three conductors of the 105,500 c. m. of aluminum required, into six wires of 52,630 c. m. each, allowing both circuits to be normally run in multiple. In the event of accident by grounding or the breaking of a single wire or wires of one circuit, the other is in readiness to carry the load. Although effecting a greater drop in voltage by this make shift, the cars would be kept in continuous operation with speed slightly impaired. Other combinations of the three wire circuits are as follows:

Of the two alternators installed at the Jenison power house, one may deliver current over one circuit to the Zeeland sub-station, and the other alternator over the second circuit, may operate the Macatawa sub-station, or circuits and sub-stations may be put in multiple with the alternators. Again one of the circuits can be and the multiple combination continue between Zeeland and Macatawa, or vice versa. This arrangement permits of great flexibility, made inoperative or dead, between the power house and Zeeland, with but comparatively slight increased cost. The two, three-wire three-phase, alternating current circuits have the wires 24

in. apart at the corners of an equilateral triangle. All joints on these circuits are made with McIntyre connectors and the joint has been found very satisfactory. High tension wires are tied to number two Provo glass insulators, weighing six pounds each, with a diameter across the base of 7½ in.

The bottom of the insulator is fully 5 in. above the cross arm. Glass was preferred to porcelain and has worked effectively. The line received its first current of high voltage in a downpour of rain and no trouble was given by a single insulator, in fact no part of the equipment gave any trouble whatsoever. The glass insulators are believed to be much superior to porcelain, and the lower cost is not the least thing to be considered. They do not require a test before being placed in service and the life without deterioration is longer.

Insulators are placed on special oak pins, 14 in. long which have been boiled in paraffine oil. These pins are socketed in cross arms, 6 ft. and 8 ft. long and are held firmly in place by plugs, made of

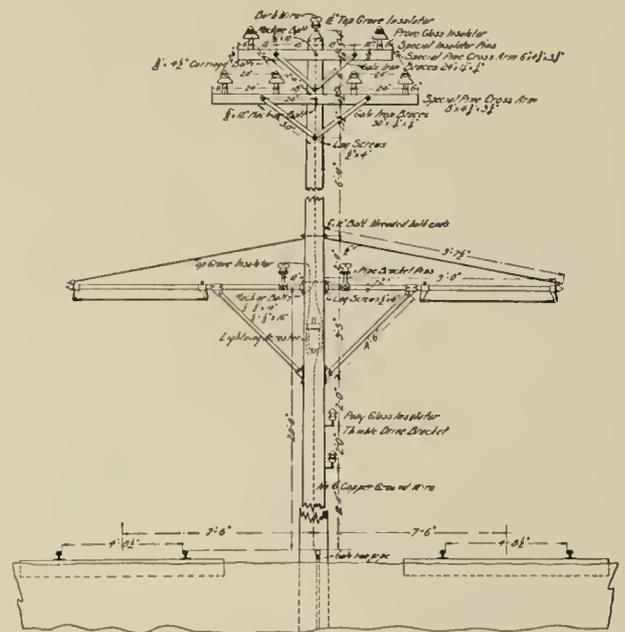


DIAGRAM OF POLE.

¼-in. round maple dowelling stuff, which is driven through holes in the cross arm and pin. This method is used in preference to nails. The usual braces, bolted to cross arms and lagged to pole, hold the cross arms in position. The illustration showing the pole with cross arm and bracket construction gives other measurements in detail. The poles are 40-ft. and 30-ft. lengths with 7 in. tops and 13 in. in diameter, 6 ft. from the base and were shipped from L'Anse, a northern Michigan timber point.

Considerable difficulty was experienced, in securing poles that would pass inspection and the writer's experience the last year with this part of overhead construction, indicates that Michigan will soon be barren of suitable timber for 30-ft., 35-ft. or 40-ft. poles. Already the telephone companies are using the Washington and Idaho cedar, and the increased freight charges make the poles from the latter states cost more than those that Michigan can furnish, though the latter are much superior in every way. Poles are spaced 100 ft. apart and are midway between tracks which are 15 ft. between centers, and are placed on an average of 7 ft. in the earth. All poles are tarred on the butts and painted from ground line to roof. Where poles were set in marsh or swampy ground, they were well barreled. At the side of each sixth pole is driven a 12 ft. section of galvanized iron pipe to which is connected a No. 6 copper wire, leading directly to the top of pole and tapped into a barb wire carried on a top-groove glass cable insulator. These pipes form a good earth connection for lightning discharges that may strike the high tension circuits. The barb wire is of large size and composed of two No. 9 B. & S. wires; this was used in the belief that there would be less danger of breakage, than with a smaller size, which in falling would menace the high tension wires. The top groove insulator, on which the barb wire rests, is not used for

insulation, but after some investigation, it was found that this form of support for barb wire was the cheapest and most substantial, consequently it was used in preference to a more simple arrangement.

The first circuit runs continuously without transposition, from the power house to Macatawa, while the second circuit receives one complete turn or twist between the power house and the Zeeland sub-station and between the latter and Macatawa. Direct current feeders of aluminum are also used and these were supported on the trolley brackets, rather than upon an additional cross arm. This method is not only neat and substantial, but less expensive than additional cross-arms. The trolley bracket used was of a special pattern made by the Ohio Brass Co. of Mansfield, O., 2-in. steel tubing being used with heavy re-enforced castings. These brackets were fastened to the pole by lag screws and machine bolts, the latter being used where extra strength was required. The brackets are very strong and are specially adapted to interurban high speed work. It will be noticed that this bracket is braced both from above and below the horizontal arm. Brackets are placed 20 ft. above the rails and 8 ft. 10 in. from the lower cross arm. On the 40-ft. high-tension poles, a distance of 5 ft. 5 in. is maintained below the telephone circuit and horizontal arm of brackets, with a separating distance of 20 in. between the two No. 10 copper telephone wires. Steel thimble, angle, drive-brackets are used for supporting the pony glass insulators. The transpositions of the telephone wires occur every four poles and a straight drive-bracket with a transportation glass insulator is used. The transpositions are made, by soldering No. 12 weatherproof insulated copper wire across incoming wires. Thus far the telephone circuit has been very sensitive and worked well, but as soon as a ground occurs, the circuit is then too noisy to hear ordinary speech. Telephones are installed at the power house, turn outs, sub-stations, offices, and car barns. A dispatcher is employed to direct the movements of the cars by the medium of the telephone line.

The General Electric M. D. type of lightning arrester is installed and four of these are placed to the mile, giving the most efficient lightning protection for the direct current circuits.

The trolley wire used is No. 000 figure 8 section supported by the type W. cap and cone hangers made by the Ohio Brass Co. A lock washer is inserted between the stud of the hanger and the clincher ears attached.

Taps, from direct current feeders to trolley wire, are made on every twelfth pole and consist of a special mechanical aluminum clamp joint soldered to No. 0 insulated stranded copper cable. This is supported along the horizontal arm of trolley bracket by special insulator clamps, and then passes into feed-in ears attached to the hangers. The direct current aluminum cables, are connected by mechanical joints, the receptacles being compressed on the cable and joined by a lock nut, with right and left hand threads. The usual strain guys are used where necessary, always broken by globe strain insulators. Through several villages that the road passes span construction is resorted to.

Section insulators in both trolley wires bridged by 800-ampere circuit breakers, are placed between power house and Zeeland and the latter sub-station and Macatawa. The normal position of these breakers is closed, causing all sub-station rotaries to be in multiple on their direct current side. Should a heavy short circuit come upon any section the circuit breakers immediately open, lighting a bank of signal lamps. As a car approaches, on the section not affected by the short circuit, the lighted lamps are observed by the motorman, who stops his car, opens the line switch, closes the circuit breaker, and then closes the line switch. If the circuit breaker does not open again, it is understood that the trouble is removed and the car proceeds. Should a disablement or break down of machinery occur at any sub-station, it is possible to continue operation of cars at reduced speed as before mentioned.

The old steam power plant at Macatawa, of 500-kw. capacity has not been dismantled, but will be used during the summer months, when excessive loads on the Holland terminal require its operation.

The main sub-station room at Zeeland has interior dimensions of 39 ft. 8 in. x 27 ft. and contains two 300-kw. Westinghouse rotary converters, seven 120-kw. step-down oil-cooled transformers, six static interrupters and lightning arresters and six combination fuse switches, also emergency switches, for putting the high tension circuits in multiple. At Zeeland switches for controlling the lines to Macatawa sub-station are provided. A seven-panel switch-

board is installed and all wiring under the floor was done with lead encased cable.

In the gallery, some seven feet above the floor, are placed the static interrupters, combination fuse switches, and emergency switches. The switches controlling the Macatawa sub-station, are located on the opposite wall and are reached by ladder.

The switchboard consists of 2 transformer panels, 2 alternating current rotary panels, 2 direct current rotary panels and 1 direct current double feeder panel. A swinging bracket holding 2 direct current voltmeters is attached to the latter panel.

All transformers are earthed and are piped up, with individual valves on each transformer, for draining oil from the cases.

Car Equipment.

Six closed passenger cars 47 ft. long length and four closed passenger cars 41 ft. long, with motorman's cab on one end only, are already in operation. These cars with trucks, brakes and motors, weigh 23 tons and 25 tons respectively, and with the passenger load 4 tons more. The cars were furnished by the Jewett Car Co. and the G. C. Kuhlmann Car Co. They are finished in cherry and oak; a smoking compartment is provided on part of the cars. Where a baggage compartment is used, small folding seats are distributed about the enclosure, for smokers. The windows have very low sills and are of the Pullman type.

The trucks are of the Peckham 14 A. extra strong type with outside hung brakes, and are equipped with four Lorain Steel Co's. No. 34 motors of 50 h. p. each with inside hung rigid suspension. The current required to start car is 175 amperes, and the normal running current is 135 amperes at 500 volts. These motors are protected by "A-P" circuit breakers. The trolley base installed is of the Bleasdale & Holland type. The cars are heated by the Peter Smith hot water heaters; some are placed with sheet iron partition, back of the rear seat, in the rear end of the car, and others are located in a separate enclosure, adjoining the toilet room. All cars are equipped with the storage air brake system furnished by the Magann Air Brake Co. The air reservoirs are charged from a large storage tank, set between the two tracks, at Jenison, 900 ft. from the power house. The air compressor is of the Hall Steam Pump Co's. manufacture, and a part of the power house equipment. An additional air compressor, of the belt driven type and of same make, is placed in the Macatawa sub-station and operated by a series electric motor. Ham sand boxes are on all and cars work effectively. The Beverly wheel hand brake is also provided. The car seats are from the Hale & Kilburn Manufacturing Co. and are of the well-known high back, "walkover" type. The short cars (41 ft.) are provided with rattan seats and the long cars (47 ft.) have a handsome plush covering. The shorter cars seat 46 people and have wide aisles. The company has recently ordered five 50-ft. passenger cars, which is proof that the long cars are considered best suited for its interurban business. It is confidently expected that trains of two cars will be necessary for handling the summer business. Ultimately, the shorter cars will run during that part of the day when travel is light. The road also has in addition to this car equipment, three 35-ft. closed passenger cars and seven 35-ft. 12-bench open passenger cars, equipped with two 35-h.p. motor Walker equipments. These cars are mounted on maximum traction tracks.

A terminal barn and shop are located at the Macatawa sub-station, and another will be built in the spring at Jenison. A feature of the latter barn is, that the main tracks pass through barn and are provided with inspection pits. Every car will receive an inspection of motors, wheels and trucks, every round trip. Adjoining these tracks are two car storage tracks, also one pit tracks for repairs.

The freight equipment consists of three 35-ft. closed cars, similar in exterior appearance to those used for passenger purposes. Oil headlights are used and cars are equipped with fenders. The company has six 26-ft. box cars and six 30-ft. gondolas, also one combination freight locomotive and nose snow plow and one Ruggles rotary snow plow. These snow plows have done excellent work during the past winter.

The rates for freight are low, ranging from 2½ cents to 23 cents per 100 lb., dependent upon distance rate basis and classification. The express rates vary from 20 cents for a package weighing not more than 10 lb., to 45 cents for packages weighing from 50 to 100 lb. Over 100 lb. a rate of 45 cents per hundred is made. These

rates, however, vary somewhat, dependent upon the distance, classification and risk. While on the Grand Rapids Railway Co.'s tracks freight cars operate on a mileage basis.

Village franchises call for a rate not to exceed $1\frac{1}{2}$ cents per mile, for carrying passengers, with no fare accepted less than 5 cents, but the steam railroad competitor has recently reduced its rates, and as a result the interurban company is making special rates during certain hours of the day, when the steam road has trains moving between terminal points. For track privileges in Grand Rapids, the interurban company receives 2 cents on every fare in either direction on local or interchanged traffic, free transfers being given and the local Grand Rapids road provides train crew and power, furnishing and maintaining the track.

The Grand Rapids, Holland & Lake Michigan Ry. was financed and built by the Detroit Construction Co., of Detroit, of which John Winter is president and B. S. Hanchett, jr., vice-president. The electrical and mechanical engineering work was under the direction of W. D. Ray, at that time electrical engineer for the Detroit Construction Co. L. B. Wilson was the civil engineer.

The contract for the complete power plant including the building was awarded to the Arnold Electric Power Station Co., of Chicago, and this part of the work was done in accordance with plans and specifications submitted by the Arnold company.

CONVENTION OF RAILWAY COMMISSIONERS.

The National Association of Railway Commissioners met at Charleston, Feb. 11-12-13, 1902, this being the 14th annual convention of the railroad commissioners of the United States. The Association of American Railway Accounting Officers and the Street Railway Accountants' Association of America are each represented in the commissioners' association by a committee of three, and on the occasion of the Charleston meeting the latter association sent as its committee, H. C. Mackay, of the Milwaukee Electric Railway & Light Co.; C. N. Duffy, of the Chicago City Railway Co., and W. F. Ham, of the Washington Traction & Electric Co. Mr. Duffy had also been appointed as a member of the Railway Commissioners' committee on statistics.

It will be remembered that at the San Francisco meeting of the Railway Commissioners a committee consisting of L. M. Read, of Vermont, Ashley W. Cole, of New York, and George N. Bishop, of Massachusetts, was appointed to confer with a committee of the American Street Railway Accountants' Association and prepare a form of "Report for Electric Roads." H. L. Wilson, of the Boston Elevated Railway Co., W. F. Ham, of the Washington Traction & Electric Co., and Elmer M. White, of the Hartford (Conn.) Street Railway Co., were appointed on behalf of the Accountants' Association. These committees met in New York Jan. 10, 1902, and it was decided to lay a prepared form before the Street Railway Accountants' Association at its Detroit meeting, and then present a report at the 1903 convention of the Railway Commissioners.

The next meeting of the National Association of Railway Commissioners is to be held in Maine July, 1903. Mr. B. F. Chadbourne, of Maine, is president, and Mr. E. A. Moseley, secretary of the Interstate Commerce Commission, Washington, D. C., secretary.

TRANSFER SYSTEM IN COLUMBUS, GA.

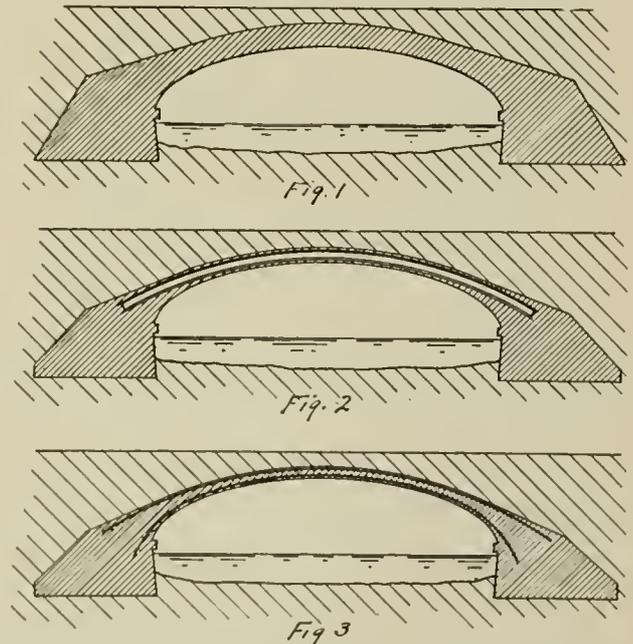
A complete transfer system has been devised for the Columbus Railway Co. which will be put into operation within the next few weeks. An ordinance is now pending in the council preventing the sale or giving away of transfers, and as soon as this is adopted the Columbus Railway Co. will put on transfers. Several years ago this company gave transfers, but the privilege was abused to a considerable extent, as the system was a rather loose one, and for this reason the transfers were subsequently abolished. With the new system about to be put into effect the officers of the company claim that while transfers will be granted to every line, the system is such that it cannot be abused.

The Eastern Indiana Traction Co. is making rapid progress in securing rights and franchises for the proposed line from Upland to Gas City. The project has been financed, and it is expected that cars will be in operation over the entire route within six months.

CONCRETE-STEEL BRIDGES FOR INTERURBAN RAILWAYS.

BY DANIEL B. LUTEN, LA FAYETTE, IND.

Concrete has had so many adaptations to bridge abutments and arches in the past few years, and has so cheapened this kind of construction, that many engineers have overlooked the fact that still more efficient structures may be constructed of concrete reinforced with steel. Concrete-steel is, in fact, as much more reliable and efficient than concrete as steel is than wrought-iron. And just as steel has almost entirely superseded wrought-iron in bridge construction, so concrete-steel will, when better understood, replace concrete, except for members that are perhaps entirely in compression. At present prices, concrete is a more economical material than steel for transmitting compressive stresses, but steel is much the more efficient material for transmitting tension. In combinations of the two materials then, the greatest efficiency will in general be secured by placing the steel so as to resist the tensile stresses, while the concrete is relied upon to resist the compressive stresses and to act as a protective coating for the steel; such a combination for example as is used for flat floor arches or girders



where the steel is embedded in the concrete in the form of suspension cables.

Figs. 1, 2 and 3 are arches of the same span and rise designed according to the more popular methods of concrete and concrete-steel construction. Fig. 1 is of an arch of concrete alone, that is with no steel reinforcement whatever. The thickness of the arch at the crown and abutments was determined by Trautwine's empirical formulas for highway bridges of first-class masonry. The curvature of the intrados is approximately that of a transformed catenary, the curve of equilibrium for a loading of earth filling.

Fig. 2 is a concrete-steel arch, designed according to the Melan system, which consists in embedding steel ribs in the concrete of the arch ring, the beams being curved to follow the central axis of the ring. The steel beams are usually I beams, with web placed vertically, and spaced at intervals of three or four feet. This method of construction relies mainly upon the steel ribs to support the loading, the concrete acting as a protective coating to prevent corrosion of the steel. It is therefore not a very effective arrangement of steel reinforcement. A much more effective device is the Thacher type of arch illustrated in Fig. 3, in which the concrete rib of the arch is reinforced by bars in pairs, one bar of each pair being placed close to the inner edge of the arch rib, and the other close to the outer edge. The pairs of bars are placed at intervals of three or four feet. The bending moments produced in the arch rib by concentrated loads are resisted by the bars, one bar of each

pair being in tension and the other in compression at any given section of the rib. Since the bending moments in an arch rib differ in kind, a bar may be in tension at one point and in compression at another. To prevent the bar from slipping in the concrete under these variations of stress, ribs, or corrugations, are rolled into the bars, or rivets are driven at intervals of six or eight inches, the heads projecting into the concrete. The new Y bridge at Zanesville, O., having eight spans, of which the largest is 122 ft., is of the Thatcher type. So also are the concrete steel arch bridges form-

are in compression, retaining only those parts that are in tension, the condition shown on the right of Fig. 4 would obtain. The parts of rods may easily be made continuous by filling in the portions shown in dotted lines on the left of the same figure. In an arch of this kind, the loads may of course be concentrated at points other than the crown, but when the arch supports a considerable load of earth filling, the loads near the crown are the only ones that produce appreciable moments in the rib. Hence an arch of the type shown in Fig. 5 is an effective structure when supporting

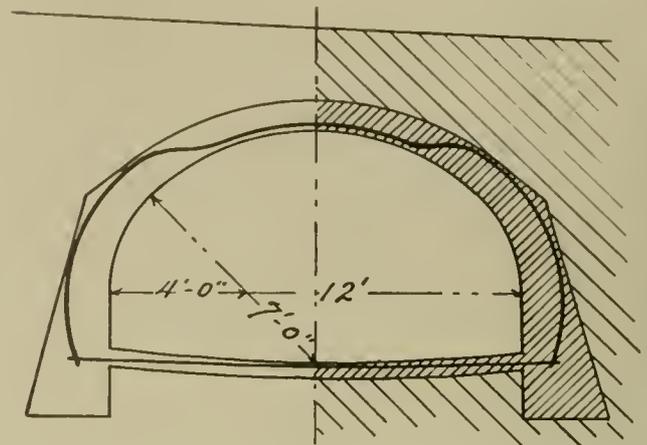
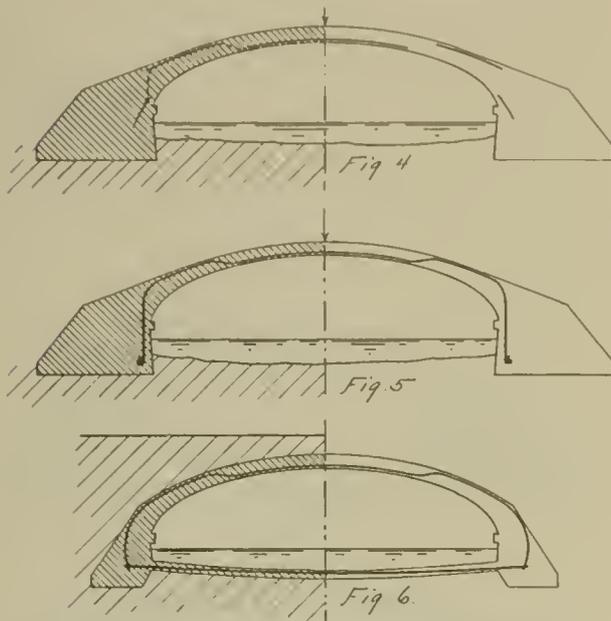


FIG. 8.

ing the islands in the river immediately above Niagara Falls. The Topeka (Kan.) bridge was erected on the Melan system, and consists of five spans, the maximum being 125 ft. The two concrete steel bridges at Indianapolis, Ind., on Meridian and Illinois streets, are of this latter type.

Another rather novel type of concrete-steel arch has been developed by the National Bridge Company, of Lafayette, Ind., and has been applied in numerous small structures, some of which are illustrated in Figs. 7, 9, 10 and 11. The type of construction, which consists of a single series of steel rod or bar reinforcement, is

an earth filled roadway, and requires but one reinforcing rod. Moreover, since this rod will be in tension throughout its entire length, the variations in stress will be much less, and corrugations or rivets are unnecessary.

In Fig. 6 a desirable addition is shown for bridges spanning shallow streams, where the difficulties of construction are not too great. The horizontal thrust of the arch against the abutments which ordinarily is resisted by making the abutments very massive, is in this type resisted by steel tie rods from abutment to abutment beneath the bed of the stream. These rods are joined to the upper reinforcing rods in the abutments. In order to prevent the tie rods from rusting, they may be embedded in a pavement of concrete six or eight inches thick. Such a pavement also renders the structure flood-proof, and for this purpose aprons of concrete may be provided at upstream and downstream ends, dipping two to three feet



FIG. 7—CONCRETE ARCH ON MT. LOWE ELECTRIC RY.



FIG. 9—CULVERT ON BIG FOUR RAILROAD.

shown in Figs. 5 and 6. If the Thatcher arch of Fig. 3 be subjected to concentrated loads at or near the crown, as in Fig. 4, bending moments will result that will produce tension in the lower rod near the crown, in the upper rods at the haunches, and in the lower rods again near the springings. The remainder of these rods will be in compression; if, then, on the principle that steel is not economical in compression, we reject those parts of the rods that

into the bed of the stream. The pavement also provides a very satisfactory foundation for the support of the forms for the arch ring.

The amount of material that may be saved by these two devices of a steel rod reinforcement and steel ties, is considerable. After making allowance for the steel, the arch of Fig. 6 contains but 60 per cent as much material as that of Fig. 1, and the former

is a much stronger and more reliable structure, since it is designed without the doubtful assumptions that are necessary in the other arch as to resistance of the abutments, stability of foundations, and pressure of earth backing.

Fig. 7 is a photographic view of a 12-ft. arch erected for the Mt. Lowe Electric Ry., near Pasadena, Cal. It is shown in section in Fig. 8. By making the curve of the intrados three-centered a much better appearance is secured than would have been possible with a full-centered arch of the same span and rise. In this bridge the reinforcing rods and the ties were 3/4-in. round steel rods.

PROFIT SHARING AT COLUMBUS.

In the "Review" for August, 1890, page 526, we published the announcement of the Columbus (O.) Street Railway Co. that on and after August 1st the company would, at the end of each quarter, pay to each employe the same percentage on the wages or salaries received by him during that quarter that the stockholders of the company received as dividends on their stock. This plan has now been in operation for 2 1/2 years and the 10 quarterly "so-called" dividends paid to the employes aggregate \$40,000, a quarterly average of \$4,000. Concerning the effect of this, we understand that it has been most satisfactory in promoting harmonious relations between employes and the management.

We quote the following from a recent issue of Public Policy, which commented on the Columbus road's plan of profit sharing:

"We have never known of a profit-sharing experiment in this or any other country which has not been broken up or attempted to be broken up by a class of labor agitators whose socialistic theories and incendiary occupation is destroyed by any arrangement that brings contentment and thrift to wage-workers. In the opinion of these false friends, the worst of all crimes is committed when workmen become small capitalists. These agitators thrive on the discontent and poverty of their dupes. Contentment and thrift spells death to their propaganda of hatred, malice and prejudice against employers and capitalists. The usual method followed by these false friends of workmen is to get some of their emissaries employed wherever a profit-sharing experiment is instituted and then to use every means possible to poison the minds of the workmen, with whom they are thus enabled to associate, against some rule, officer, or superintendent, inveigle the men into a union under by-laws requiring them to strike without cause when ordered to do so, and then create a disturbance on any pretext that will answer the purpose and declare a strike. This was the way the great Pullman strike was initiated. It was entirely due to the designing work of emissaries who were never regularly employed in the Pullman shops.

"A coal mining company in Kentucky has been operating for some time on a profit-sharing basis. Several unsuccessful attempts have been made to induce the men employed at these mines to go on a strike. No opportunity is lost to condemn these workmen for becoming partners with capitalists. The Rev. Herbert S. Bigelow of Cincinnati is reported on Jan. 6, 1902, in the Columbus (O.) Evening Press to have said:

"What can striking miners do when capital has a monopoly of the mines and is in league with the railroads? And suppose mine-owners should decide upon the policy of giving the mine operators a larger share of the profits? They might thus avoid a strike, but they would thereby make their operators partners with them in their conspiracy and the public would be at their mercy, as before."

"To such agitators wealth is a crime, poverty the only virtue. Every workman who finds a fair employer and reciprocates fair treatment received by giving fair treatment in return, and thus becomes contented and thrifty, is held up to scorn by these false friends as a criminal.

"But all honest and intelligent men know that the conditions of life are made better for everyone only by making poor men richer, not by making rich men poorer. We hope the employes of the Columbus Street Railway Co. will never permit its profit-sharing system to be broken up, but will encourage it until they secure an arrangement by which they can buy the stock of the company on favorable terms and then keep at it until they own the company. Regeneration will come through a correct use by workmen of the resources that are their own, their power to labor and save, not by beneficence conferred by a socialistic state."

STORAGE BATTERY PATENT DECISION.

We are informed by the Electric Storage Battery Co., of Philadelphia, that a decision has just been rendered which again sustains the validity of the Brush storage battery patent owned by this company. The decision was rendered by Judge Lacombe of the United States Circuit Court and an order is granted restraining the Porter Battery Co., from the further manufacture or sale of secondary battery elements which infringe this patent.



FIG. 10—CULVERT FOR INDIANAPOLIS & MARTINSVILLE TRACTION CO.

smooth, and spaced at intervals of 16 in. The concrete was mixed in proportions of one portland cement, three sand and five gravel.

Fig. 9 is a railroad culvert of 18 ft. span, on the Big Four railroad, 13 miles southeast of Indianapolis. In this arch the thickness at crown was 17 in., base of abutments 7 ft., and thickness at springing 30 in. The steel rods were 1-in. smooth, round, spaced 2 ft. on centers. This bridge, as well as two others of the same type in use on the Big Four, have carried the heavy traffic of that road, including 150-ton locomotives, without showing cracks or flaws of any kind.

Figs. 10 and 11 are of a small full centered culvert on the electric road built by the Indianapolis & Martinsville Traction Co. near Friendswood, Ind. The culvert is intended mainly as a cattle pass, is of 4 ft. span and 6 ft. clear opening. On account of the

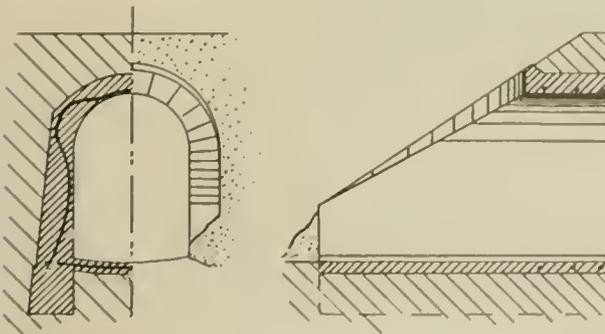


FIG. 11.

pressure of the earth filling against the high bench walls, the reinforcing rods return to the inner edge of the walls, and the ties are of little use except to reinforce the concrete of the pavement which here acts as a butt between the two bench walls. For economy of material this arch has warped ends, instead of the usual parapet and wings. The form of this end will be readily made out from the photograph and sections. Two of these arches, each 30 ft. from end to end, were completed in seven days after the award of the contract. The contract price for each of these two culverts was \$230.

BION JOSEPH ARNOLD.

The selection by the New York Central Railroad Co., of Mr. Bion J. Arnold to design a feasible system for electrically operating its trains (about 600 per day) in and out of New York, as well as his notable work in connection with electric railway developments in recent years, has made him today one of the most prominent figures in the field of electrical engineering, and at this time a biographical sketch is of particular interest.

Mr. Arnold was born in Grand Rapids, Mich., in 1861 and three years later his family removed to Ashland, Neb., where his father, who was a lawyer, became a member of the Territorial Legislature of Nebraska which framed its constitution prior to its admission into the union. Mr. Arnold received his early education in the public school of the latter town and commenced his course in engineering at the University of Nebraska in 1879. After one year at this institution he entered the scientific course at Hillsdale College, Mich., from which he was graduated with the degree of B. S. in 1884. Here he took a mathematical prize for a six year's course and three years later received the degree of M. S. In 1899 the same college conferred the degree of M. Ph., upon him in recognition of the engineering work done by him subsequent to his graduation. In April, 1899, Mr. Arnold finished a post graduate course in electrical engineering in Cornell University and in 1897 he received the degree of E. E. from the University of Nebraska.

From his school-boy days Mr. Arnold evinced a decided taste for mechanical pursuits and when a mere boy much of his time was spent in the construction of small engines, electrical machinery and other mechanical appliances. His proficiency in this respect was the more marked for the reason that there were no machine shops or railroads anywhere near his home and his devices were produced from crude materials with such tools as are found in a country blacksmith shop. When 15 years of age he began to spend his summers running traction engines doing threshing work on farms, from which he acquired a certain amount of skill in handling machinery. His vacations while at college were spent traveling as a representative of several engine building companies, and one summer was spent with a surveying party in the field. In 1884 he engaged as general agent for an engine for two years in order to gain business experience, and then went with the Edward P. Allis Co., of Milwaukee, as a draftsman. He was next engaged as the chief designer for the Iowa Iron Works, of Dubuque, and subsequently with the Chicago Great Western road as a civil engineer. He was also employed as mechanical engineer on this road after it was taken over by the operating department, but resigned this position in 1888 when he entered upon his graduate study in Cornell. His next engagement was with the Thomson-Houston Electric Co., as agent and engineer in charge of its St. Louis office and after two years he was made consulting engineer for the Chicago office of the same company, where he remained for two years after the consolidation of this company and the Edison company into the General Electric Co. He then started for himself as a consulting electrical engineer and since 1893 has been identified with many notable electrical enterprises and has made a number of inventions and improvements in engineering methods which have given him a wide reputation.

A feature of Mr. Arnold's work is that much of it has been in advance of the profession and his engineering work, therefore, has often been carried through in the face of considerable opposition. The almost general system of operating long distance electric railways by means of high tension currents with rotary transformers and storage battery sub-stations was first introduced by Mr. Arnold, in connection with the Chicago & Milwaukee Ry. The opposition to these methods was such that Mr. Arnold in order to demonstrate the advantage of the plans which he had advocated as consulting engineer of the company, contracted to build and equip the road, guaranteeing its successful operation. As the designer and builder of the Intramural Railway power plant at the World's Fair in Chicago, 1893, he gained an international reputation by embodying many new ideas in its construction which have since become common practice. The use of direct connected units for this power station was an important innovation, but realizing that independent direct connected sets may often be at a disadvantage he designed what is known as the Arnold system by means of which several direct connected machines are so ar-

ranged that by means of clutches and an auxiliary shaft two or more generators may be driven by any one of the engines. This system has been installed in many of the largest plants within the past few years, and its practicability has been fully demonstrated. In regard to storage batteries, also, Mr. Arnold was one of the pioneers and well in advance of his contemporaries; he early advocated the installation of storage batteries for regulation and peak work in electric light and power stations.

Another important invention of Mr. Arnold's is a magnetic clutch which has been made in sizes up to 3,000 h. p. capacity and which is used for throwing one dynamo out and another in its place without stopping the driving engine. The ordinary friction clutch was not considered reliable for this and his invention of the magnetic followed the demand for such a device, and it is being rapidly applied for various classes of work.

Mr. Arnold's professional work now requires him to maintain offices both in New York and Chicago and he has become largely interested in numerous engineering and industrial enterprises. He is president and mechanical director of the Arnold Electric Power Station Co., which has attained a notable success in designing and constructing large electrical power station properties. He is president of the Kenosha Street Railway Co., vice-president of the Kentucky Western Railway Co., consulting electrical engineer for the Chicago, Burlington & Quincy Railroad Co. and for the New York Central & Hudson River Railroad Co. He is a member of the American Institute of Electrical Engineers and was one of its five representatives at the Paris International Electrical Congress. He is a trustee of the Western Society of Engineers and was a charter member and director of Technical Club of Chicago. He is also a member of the Union League Club of Chicago, of the American Association for the Advancement of Science, of the American Society for the Promotion of Engineering Education, of the board of governors for the Chicago Automobile Club and a member of the Transportation Club of New York.

Mr. Arnold is in demand as a lecturer on engineering subjects and in this capacity has addressed the students of the University of Illinois, the University of Michigan and Purdue University. He also delivered a course of lectures at the University of Nebraska on the design and construction of electrical power plants, his work being recognized by the faculty of that institution by the honorary degree of E. E. which was conferred upon him. He was awarded a gold medal at the Omaha Exposition in 1898 for his personal exhibit which consisted of some of his crude models of earlier years and devices he had built when a boy in conjunction with the drawings of his electrical inventions and engineering works. His natural ability has been supplemented by habits of industry and perseverance and a mature judgment so that at an unusually early age he has achieved a success which has won him the highest respect and esteem for his valued work in the engineering field.

FREIGHT ON ROCKFORD-BELVEDERE LINE.

The Rockford-Belvedere Electric Ry., which has been in operation but a few weeks, is about to put on a number of freight cars for hauling freight on certain trains only which will make stops at all farms between the two terminal points. The experiments in freight hauling which have been made by the company have proved very successful and new cars for this service are being built at its shops at Rockford. The tariff has been placed at about 12 cents per 100 lb. on the class of freight under which most farm produce is shipped. The farmers along the road are well pleased with the service and have already done considerable shipping in the freight compartments of the passenger trains.

The company is also building a private telephone line along the right of way and arrangements for making connections on poles at convenient intervals are also being provided. All the cars on the road will be equipped with telephone instruments so that they can make connections at any of these points and communicate with a number of telephones on the line.

The Columbus (O.) Railway Co. has installed four new boilers of 400 h. p. each, and this is said to be the initial move in the reconstruction of the company's electrical system.



Brong F. Arnold

California and Combination Cars.—II.

BY W. E. PARTRIDGE.

Some years elapsed after the introduction of the California car on the Pacific Coast before it was built by any of the eastern car shops. This was not remarkable perhaps because the car was supposed at that time to be adapted exclusively to the western part of the country on account of its mild uniform climate. Cable roads worked their way east, though somewhat slowly. With them came, either the open independent grip car, or the open compartment at the end of a closed car.

When the builders east of the Rockies began to turn out California cars they usually introduced decided modifications in both



FIG. 1—CALIFORNIA CAR BUILT IN THE EAST.

design and construction. Of all the photographs and plans which have come into the author's hands from car builders east of the Rocky Mountains, showing California cars, that shown in Fig. 1 by the St. Louis Car Co. is the only one that closely follows Mr. Hammond's plans in all its essential features. It has the longitudinal seats coming close to the edge of the car leaving a space between them for the motor or gripman. The roof framing and the posts are light at the open part. Stiffness for the posts is obtained by ornamental brackets of considerable depth. The sills are plated and there are double steps. The bulkheads at the ends of the open parts have drop sash. The whole car follows the original pattern very closely except in the arrangement of the life guards and fenders.

The next car of which photographs and description came to hand is by the American Car Co. of St. Louis, and is shown in Fig. 2.



FIG. 2—MODIFIED FORM OF CALIFORNIA CAR.

Here we have an important modification of the original design. The car was one of a lot built for the Phoenix Railway Co., of Phoenix, Ariz. The seats in the open section instead of being longitudinal are transverse, but the aisle in the center of the open part is retained, or perhaps it would be more correct to say that the space between the seat backs which in the original design was used for the motorman is here turned into an aisle. The completely open end of the original car is retained and motorman and passengers are entirely without protection in front. The cross seats have an important advantage, because this construction enables curtains to be used at the side. These come down to the floor. This is a step towards gaining protection, in case of storm, for the open end. The curtains are only possible by the use of cross seats, they are practically out of the question with the longi-

tudinal seats as they could hardly be placed on the slender posts of the original design. The placing of the seats transversely makes it convenient to place a metal panel at each post. In this way the posts instead of being mere hood supports are part of the car frame and stiffen the roof, and additional strength is imparted to the structure. The roof design is materially changed by carrying the letter board out to the corner posts, or the posts that stand at the ends of the roof. It must be noted that in this car the roof is not carried out to the dasher. Its framing extends only to the front posts, which are connected at the top by a heavy bow carlin and the end frame of the monitor deck. The end of the roof is finished by an ordinary clam shell hood carried by two hood supports at the ends of the dasher. The body of the car is of the usual box car type with plated sills and truss rods extending from bolster to bolster. The grab handles are of the eastern pattern. In fact the whole car has been modified, and on the whole the modified form should be stronger than the first form supposing the workmanship to be equal.

One important point in this design deserves attention. By retaining the central aisle between the cross seats, passengers when



FIG. 3—CALIFORNIA CAR FOR ISLAND OF TRINIDAD.

entering or leaving do not, or need not disturb those remaining seated. The aisle also gives ample standing room, which however is greatly increased by the space inside the dasher. The entrance guards are a good feature since they tend to reduce the number of accidents by making it difficult to enter the car on the wrong side. Usually when they are used a chain to close the space between the corner post and the dasher is provided.

Another car by the American Car Co. makes some further alterations in the California type which are interesting. It is shown in Fig. 4. This was one of a lot which was built for the Island of Trinidad. These cars were finished complete and then knocked down and shipped in boxes. They have some of the leading features of the car just described, such as roof construction, absence

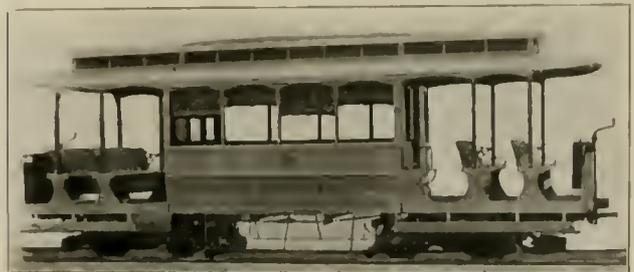


FIG. 4—MODIFIED CALIFORNIA CAR BUILT IN THE EAST.

of an end bulkhead and of a buffer beam. The seats are transverse in the open ends but are entirely without an aisle. This arrangement gives the open ends a seating capacity for 20 persons, but it provided little or no standing room. At least there can be no standing except behind the seats next the door and dasher without great discomfort for those who are seated. The

entrance and exit from the open seats is not easy being no better than that of any open car. However the car has great seating capacity, carrying 38 persons on a length of but 26 feet over the corner posts, the closed part of 12 ft. seating 18 persons and the open seats 20. Like the last mentioned car it is mounted upon double trucks. In the eastern built cars it is quite rare to find wheel guards protecting the spaces between the wheels.

This car has one feature to be commended and which is rather unusual. Each of the openings is closed by a folding gate which reaches from the floor within a couple of feet of the tops of the

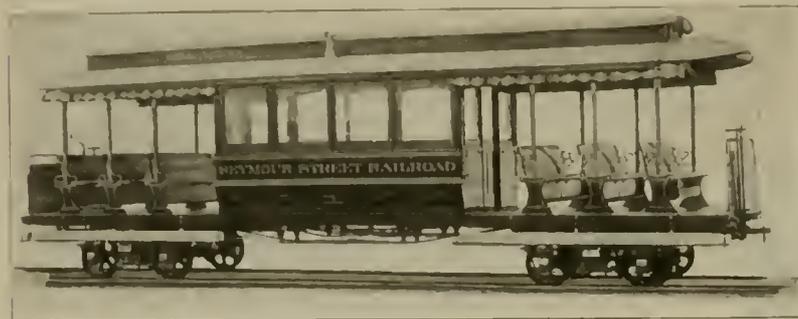


FIG. 5—SIX-BENCH CALIFORNIA CAR.

windows. These gates completely close one side of the car making entrances on that side practically out of the question. Curtains, steps and other details are the same as in the last described car.

The Brill company has built a number of varieties of the California type, of which Figs. 4 and 5 are two that were built for the Pacific coast. Fig. 4 is one of a lot that went to Spokane. Although carried on double trucks, the body is brought low enough so that only single steps are needed. There are two long transverse seats and in each open end one short seat. The roof is of the Brill standard form though the corner post appears lighter than would be used by the company at the present time. As a whole the car was a close adherence to the early California design with the exception of the arrangement of the seats. The second car, Fig. 5, was an enlargement of the other. The seating capacity of the open ends was increased so that there were accommodations for 30 persons. That it was one of the early cars is easily seen from the carriage curtains which were used to close the sides. The type was even then undergoing changes, and improvements were evidently in mind. The next car of the kind which the Brill company produced was one of the most remarkable which has been built on the lines of original California pattern. This car is shown in Fig. 6. It was for the San Diego Railway Co. and has a double deck as well as the open ends with cross seats. The seats on the upper deck were longitudinal and placed back to back. There was ample standing room on the lower deck. For the size of the car the platforms were of unusual length while the closed body was rather short. The car was mounted on a single truck. It appears to be admirably adapted to the warm climate in which it was to be operated.

The California type has appealed strongly to foreign railway managers. Not only in Europe but in South Africa and Australia these open cars seem to meet the wants of the street railway companies as well as of the passengers. This seems somewhat strange when the cool damp climate of England is considered on the one hand the the heat and dryness of South Africa on the other. The fact however remains and shows that the type is one which has a much wider range of uses than we have generally considered possible. This point may be profitably considered by those who have expressed the opinion that the California car is not suited for operation in the extreme eastern portions of the United States.

Some of the English car shops have taken up the construction of cars of this type and have produced interesting designs

The writer has received from Mess. George F. Milnes & Co., Ltd., of Hadley, England, blue prints of California cars which they have built for Wolverhampton and for Middlesboro. The first of these is a four-wheel car. In Fig. 7 are given side elevation, cross sections plan and end elevations of this car. The closed compartment accommodates 16 persons and the open ends 8 persons each or 32 in all. This seemingly small seating capacity is due to the fact that the cars are for a narrow (3 ft. 6 in.) gage road and are but 6 ft. 2½ in. wide at the sills and only 6 ft. 6 in. long and the whole length over the platform 26 ft. The height inside is 7 ft. 9 in. In spite of the narrow space into which it was necessary to compress the design a very satisfactory result has been accomplished.

In looking over the details of construction one distinctly English feature is noticed in the excessive size of the sash. Large glass is very attractive no doubt to the passenger, but a car of this kind needs a larger number of posts in the body. Built in this way with but three posts the racking strains are not sufficiently resisted and the durability is sacrificed to appearance. Many American roads have followed this style and the early breaking up of the frame showed that the design was faulty. To make this form of framing strong enough to endure hard service the letter board should be increased in thickness and width and ought to be halved upon the posts.

The central post also needs to be much larger than shown, in fact a narrow central panel with double posts would be better. For durability of the structure the posts ought to be quite as large as those on the platform or at the corners of the body.

The steps are within 16 in. of the head of the rail and are brought within the outside width of 6 ft. 6 in.

The mounting of the car needs a word of notice. The wheel base is 6 ft. 6 in. The journal springs are of the half elliptic pattern. They are used in this position to overcome the tendency of four-wheel cars to gallop or pitch. This advantage is neutralized to some extent by the helical springs which are used to carry the body.

These cars are handsomely finished inside in quartered oak, birch veneer head linings and beveled edge mirrors in the ends. The floor is covered by loose rugs, which have the corporation initials woven in the centre. At the end of the cars there are three drop

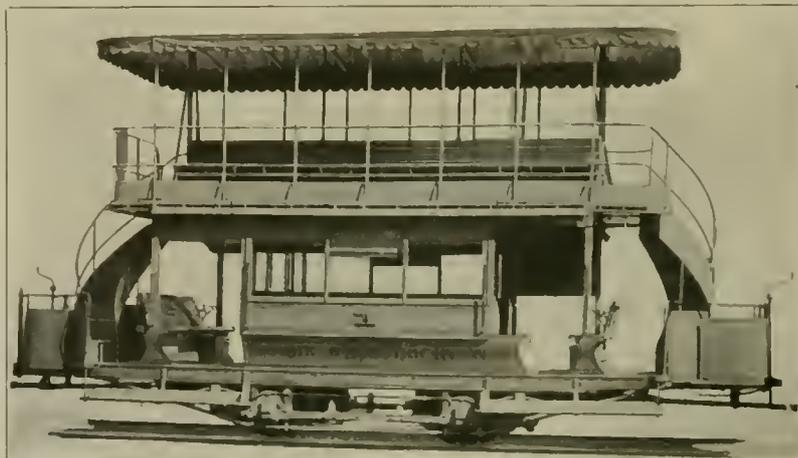


FIG. 6—DOUBLE-DECK CALIFORNIA CAR FOR SAN DIEGO.

each platform. The specification received from the company calls for three windows on a side of quarter inch polished plate glass. From this we judge that this is standard construction rather than that shown in the engravings.

Incidentally it is interesting to note that drapery curtains are used instead of those on spring rollers. Evidently the curtain is more of an ornament than in America, where it has to perform hard service in keeping out the sun. In England with less sun to trouble them the drapery curtain is much liked.

Another feature of English practice is worth consideration. The ventilators are glazed to receive advertising transparencies. This in effect doubles the advertising space within the cars.

The second car from the George F. Milnes company is shown in the California pattern would have been more economical in construction. The seating capacity would have been the same and by making a bulkhead at the end of the car, the whole platform could have been protected by the curtains.

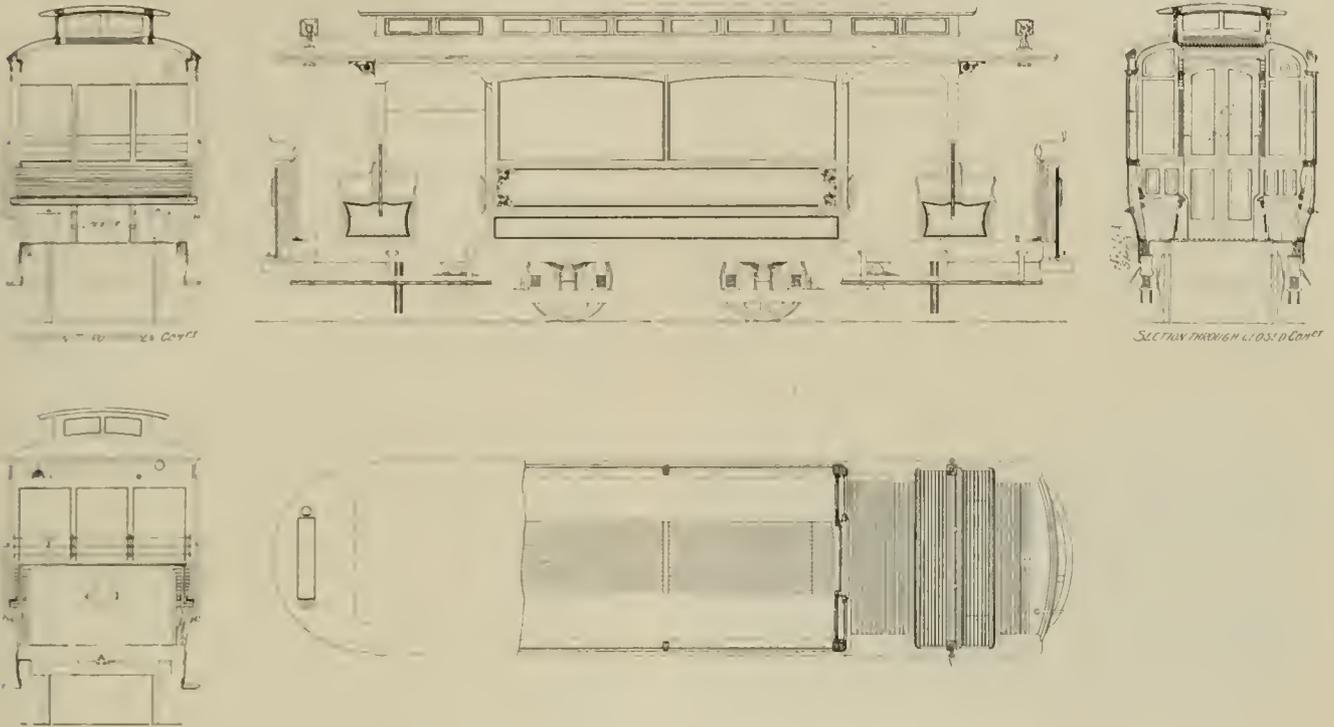


FIG. 7 - DIAGRAMS OF 4-WHEEL CALIFORNIA CAR BUILT IN ENGLAND.

in Fig. 8 and is mounted on eight wheels (two maximum traction trucks). This car is for the 3 ft. 6 in. gage and in most of its details is similar to the one previously mentioned. The steps, however, are carried some inches lower making access to the car much easier.

On the open ends of the car an extra seat is placed, so that the

In considering the strength of this car, it should be noted that the posts in the open part are greatly aided by the framed panels at the ends of the seats. Iron panels at the same points however would have been better as they are stronger and more durable.

One feature of construction of the car shown in Fig. 7 should be copied by American car builders. Instead of using a simple

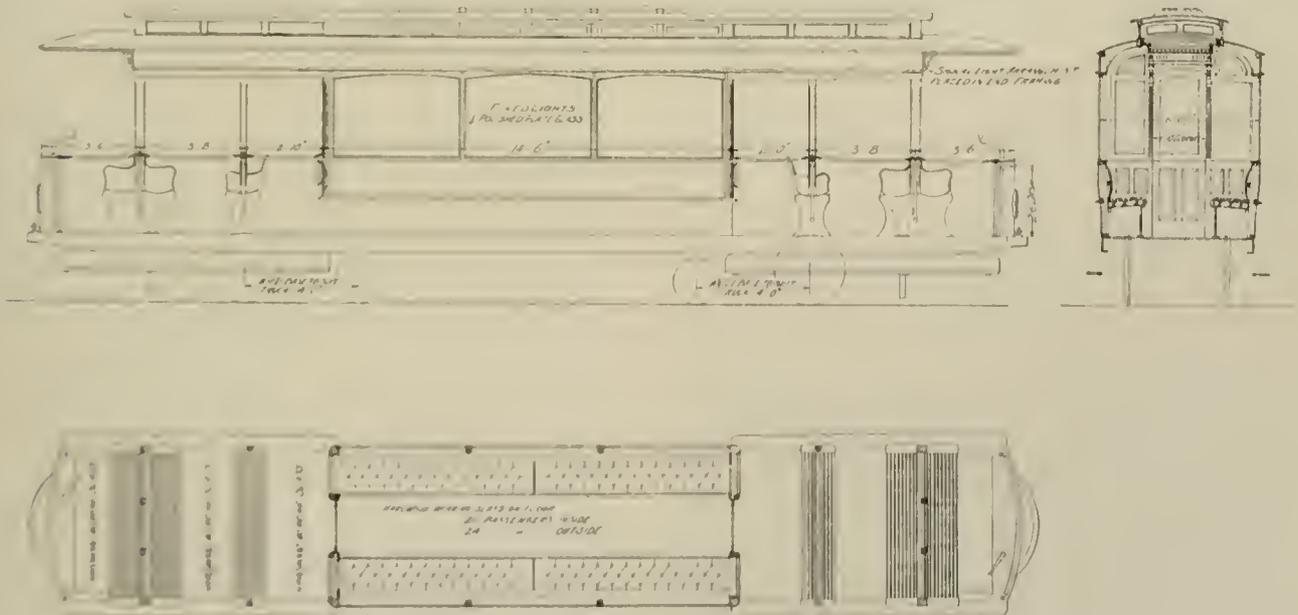


FIG. 8 - DIAGRAMS OF 8-WHEEL CALIFORNIA CAR BUILT IN ENGLAND.

entire seating capacity of the platform becomes 24. The body is 14 ft. 6 in. long and seats 20 per ton, making a total of 44. Most of the details of construction are similar to those of the car just described. In the case longitudinal seats after the original Cali-

plated sill, which is heavy and does not use the metal to the best advantage, a deck beam or its equivalent is employed. This has a web only 3/8 in. thick, but it is 7 7/8 in. deep and has a horizontal flange practically 3 in. wide. A timber filler, or sill, is used inside

of it and also a small rider of wood in order to get a suitable attachment for the posts and ribs. This construction produces great strength with a small expenditure of material and consequently small weight.

In the large car the sill is of channel iron. It has a small rider of wood but is without a filler. This is very fair construction and is lighter than that which is common in this country. Where suitable pockets are employed to hold the cross timbers the floor is both stiff and light.

An important and valuable improvement was made in California cars about six years ago by the Brill company. This consisted in dropping the platforms or open ends of the cars so that a single step was within easy reach of the ground. The support of the dropped end is accomplished in a very neat manner by using a subsill of angle iron under the closed body. At the end this subsill is offset, or bent, so as to carry the platforms. The car illustrated has two stationary seats at each end with a three sash bulkhead between them. A number of variations of this style have been made. Sometimes the bulkhead is omitted and a single seat with a reversible back used. In the car shown in the illustration the curtains come all the way to the floor, which makes their protection quite perfect. An aisle is sometimes added. These cars

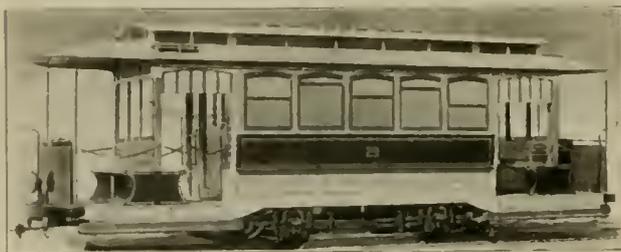


FIG. 9.—BRILL TYPE OF CALIFORNIA CAR.

have been received with great favor. Many have been built for various roads in South Africa where they are peculiarly adapted to the service. They have also gone to England and many of them of slightly modified forms are in operation on the Pacific Coast.

This type mounted on double trucks and having a vestibule front instead of a bulkhead ought to make rather a popular car in many towns where the summers are short and much interrupted by fogs and cold winds. It would seem after an experience with Boston east winds or Portland fogs that such a car would be highly desirable for lines near our eastern sea coast, where after a hot blistering day the late afternoon becomes so cold and fierce that winter overcoats are comfortable.

Probably there are few lines in the Atlantic states which operate open cars that do not find that a closed body would be appreciated during the evenings of half the open-car season. There are certainly many arguments in favor of the open and closed body combined which are worth consideration.

WATER FRONT PURCHASED BY BROOKLYN RAPID TRANSIT.

A large water front property belonging to the South Brooklyn Terminal Co. was purchased last month by the Brooklyn Rapid Transit Co. for a sum reported to be in the neighborhood of \$1,000,000. The property covers two city blocks, from 37th to 39th street, on the water front, and for a long time past has been leased by the Brooklyn Rapid Transit Co. It contains a large building 700x200 ft. in dimensions, which has been used for the storage of cars. The property also contains in the neighborhood of 50 three-story tenements. The object of the purchase at the present time has not been announced, and President Greatsinger states that it is too early to give out the plans in regard to the projects of the company at present. It is generally considered that this neighborhood is destined in time to become one of the greatest commercial districts in Brooklyn.

The Columbus (O.) Railway Co. is making rapid progress in the erection of additional sub-stations. New switches are being laid in the down town district.

OPERATING NOTES ON HIGH SPEED ELECTRIC RAILWAYS.

BY E. G.

The development of interurban railways has received an impetus which is too recent to need comment. We are at present at what may be termed the interurban stage of railway development, but in fact, the industry already seems to have put a foot forward into a still larger and more important field. Just what shall be the name of this new form of development is not yet quite clear. It is hardly correct to designate a railroad which has discarded steam locomotives and substituted electricity as an "interurban railway" as that term is usually understood. It retains all its distinctive operating features as a steam railroad, changing nothing except its motive power, which on the grand scale on which the business of steam railroading is conducted, must always remain a minor detail. Such a change of motive power in an already existing, or new road on the same lines, brings with it many new conditions in the matter of operating and equipment details, which are radical departures from existing standard methods of interurban railways. There is a merging of identity between the "interurban" and "steam" road somewhere in the present stage of developments.

For a number of years there has been much talk at street railway conventions and other places where electric railway men gather about dispatching systems and standard steam railroad methods and their adaptability to electric railway conditions. Indeed many electric roads have adopted the very latest improvements in the line of operating details from steam road practice with results advantageous to themselves and passengers. It is quite obvious that the organization of "street" railways has undergone a vast change during the past ten years, and little by little we see the art being revolutionized by the introduction of men and methods from other and hitherto more highly organized industries. Such men as hold over from old horse-car days are those, who prove by their capacity in new surroundings the principle of the survival of the fittest, and would have been a success under any circumstances. The growing tendency of all electric railways to introduce steam railroad methods, if not actually steam railroad men, calls attention to the fact that American railroads are without doubt the best and most highly organized industrial bodies in the world. One is reminded that there is considerable resemblance between the make-up of a railroad system and the organization of an army of soldiers, and that the latter, with their centuries of experience of what is best in organization and discipline, have no doubt been the preceptors of many a famous railroad organizer, who has obtained there many cues and ideas, which have become incorporated in every day operation. The class of electric railways which have come to be known as "high speed" certainly deserve to have bestowed upon them the attention of the most expert of railway organizers, especially so, since in most cases their operation is much more difficult than it would be, were they operated by steam.

Suppose the superintendent of a single track branch of, say the New York Central, were asked to operate over his branch line trains at 15 minute intervals in each direction, making meets at out of the way switches where no agents or operators are stationed, also sandwiching in a freight "extra" or two running on no particular schedule and switching loaded cars whenever there is an opportunity. He might undertake to do this, and he might not. If he did, he would have a condition which is being paralleled every day in electric railway operation, and that at schedule speeds fully as high as those of the above mentioned example would be capable of. Apropos, it may be mentioned that the superintendent of said branch line is no doubt receiving a salary much larger than that of the man who is doing this difficult thing every day. It is clear that the position of superintendent is no sinecure on a railway of the kind under discussion and will require the full and undivided attention of an exceedingly capable and experienced operating man. It is at this point, however, where in electric railway practice there is often retrogression to the old horse car day ideas of organization, in which the superintendent was also responsible for motive power, track, maintenance, purchases, repairs, etc. Many a man's ambition prompts him to accept such responsibilities, and in most cases the trust is faithfully administered with no more serious result than an early grave for the holder of the office. Our steam railway friends have a somewhat different standard and one it

would be well to adopt. In so doing, however, it should be borne in mind that we cannot revolutionize the system of operating electric railways by borrowing one of their men and putting him at the head of such a railway. The problem must be approached and the system built from the ground upward to the conditions which have been found best in operating steam roads most closely akin to electric high speed roads.

Unfortunately there is no source from which may be drawn a sufficiently skilled corps of trainmen experienced in handling electric cars, and drilled in the system of train orders in use on steam railroads. Roads of the sort under discussion must obtain their train crews from either existing street and elevated railways, or from steam railways. If the first course is decided upon, a corps of men may be secured well trained in the handling of controllers capable of remedying on the spot many minor defects liable to develop in the electrical equipment of the car, and accustomed to operate their cars in the crowded streets, which are apt to be the termini of such roads. Men from elevated roads will usually lack the latter requisite, but, on the other hand, have a thorough acquaintance with block signals and many other valuable operating details in use on "L." roads. This class of men will usually fall short, however, in the matter of dispatcher's orders, failing to comprehend their importance, and under no circumstances are they accustomed to the discipline and the operating rules of the steam road.

Suppose again that the superintendent of the above mentioned branch lines were asked to employ men as locomotive engineers who had served their time and become fully capable of operating steam trains on, say, the Manhattan Elevated. No doubt the men are fully as capable and intelligent as the best class of steam railroad employes, but their training has been in a different direction entirely.

To become a locomotive engineer or conductor on a railroad means several years of patient labor, thorough drilling in discipline, and familiarity with train dispatching orders. When an employe is appointed to either of the above positions he has had in addition sufficient experience to enable him to keep a cool head in emergencies. There is no valid reason why the same standard of excellence should not be maintained in the personnel of high speed electric railways, and at present this can only be accomplished by drawing on steam railways for experienced train crews and make the handling of a new form of motive power a matter of special instruction. Secondary in importance only to their ability to carry out the train dispatcher's orders and understanding of the signs and rules of the road.

The dispatching systems of electric roads have recently experienced some very marked improvements. There are few modern electric railways which do not employ an experienced train dispatcher, and do not use at least the rudiments of the modern dispatching systems. The telephone has been a great aid, enabling the dispatcher, as it does, to be in direct communication with his train crews. Recently there has been some discussion of the telephone versus the telegraph for train dispatching, and the argument has been made repeatedly that the telegraph is to be preferred to the telephone because the latter leaves no record of its message. Such an argument we can well afford to smile over, for what is the telegraph, as used in this country, but an oral transmission of a message? The writing of a telegraphic dispatcher's order is done by an intermediary, and there is a chance for a mistake both in the receiving of the message and in writing it down. It is certainly more simple to let the dispatcher talk directly with his train crews, letting the man in charge of the train write down the orders, giving a carbon copy to the motorman. This corresponds to the system of giving copies of orders to conductors and engineers of a steam train. The only argument which may be brought against the system is that it consumes the time of the train crew while they are receiving such orders. One must be prepared, however, to expect such small delay, unless one is willing to maintain station agents every few miles along the road. The delay in receiving the orders will never seriously affect the schedule, and a large saving is made by the abolition of salaried men at stations.

Almost all recent high speed railways of any length have been designed to use alternating multiphase currents, feeding direct currents from sub-stations placed at regular intervals along the road. Unfortunately there is not always proper checking of plans between the operating force and the electrical designers of the system, or perhaps more correctly the latter consider solely the proper feed-

ing points, and electrical features of the system, without regard to the fact that the sub-station may also serve the operation of trains and be fully as useful as an adjunct to the dispatcher's office as it is to the power house. To fully realize its proper value it is often necessary to place the sub-station some little distance away from what would theoretically be its correct position. As an example may be mentioned the case of a road where a sub-station is placed about $\frac{1}{2}$ mile away from a siding which is a regular meeting point for trains on a single-track road. Electrically the sub-station is correctly placed, but its value might be doubled were it located immediately at the passing switch, where it could be used to operate signals, issue orders, etc., to passing trains, which are all obliged to stop at this siding, but do not regularly stop at the sub-station. If orders are to be given to passing trains, they must be flagged to stop for such orders under the present arrangement. The proposed change of the sub-station might slightly unbalance the symmetry of the electrical distributing system, but this disadvantage is doubly counterbalanced by the advantage gained in the operation of trains.

In order to fully take advantage of sub-stations for assisting the operating of electric trains, it is necessary to have a properly trained corps of attendants at such stations. These positions are probably the most difficult to fill of any on a railway of this character. The salaries of the places are not unusually very high, and this is all the more reason why the utmost care is necessary in choosing men for them. Somehow an illusion has gained prevalence among engineers and managers that it is a "snap" to operate a sub-station, and the salaries are therefore small and the hours long. One engineer of standing expressed himself once within the writer's hearing that all a sub-station attendant had to do was to occasionally "close the circuit breaker." Needless to say, that engineer never, himself, operated a road equipped with rotary connected sub-stations. If sub-station duties are compared with those of the power station, there is less manual labor, no doubt in the former, but in case of emergencies there is always present a skilled and experienced man in an authoritative position at the power house, while the sub-station attendant has to fall back entirely upon his own wits and experience, supplemented perhaps by a little telephonic advice from his superior, if the latter can be reached. It seems self-evident that a considerable amount of judgment and self-reliance is required for such work, and if, in addition, we add to these duties the responsibilities of receiving and delivering train orders, the operation of signals, sale of tickets, collection of freight bills, handling of baggage, etc., the position becomes one which is not to be filled by any man presenting himself and willing to accept the wages. The writer's experience has been that it is quite impossible for men to attend to these duties and do so for twelve hours each day, and seven days per week. Every man who has attempted it, to the writer's knowledge, has in course of time failed; either his health succumbed or his duties were neglected, mostly the latter. An eight-hour relief for sub-station men whose duties include those of station agents plus the attendance of electrical rotary apparatus seems to be the only solution of the question. There is too large an amount of property at stake, as well as the lives of employes and passengers to make the practicing of too much economy at this point good business judgment, all the more so when it is considered that the sub-station as a rule is much less fool-proof and accident-proof than the power station. It should not be necessary to mention that the cost of sub-station attendance and maintenance should not be charged against the cost of motive power entirely, in the cases above cited or assumed. From one-third to one-half this cost is properly chargeable to the cost of train operation.

Considering all the devices for the safe operation of trains on single and double track steam railroads, it is remarkable that such devices have not yet come into general use on electric roads of similar character. With the latter's frequent train service, the block system of signals would seem almost a necessity. Unfortunately the bonding of the track necessitated by electrical operations spoils the beautiful simplicity of the block signal system as applied on steam railroads. What is there more solid and simple than a pair of rails for a circuit, and a pair or several pairs of car wheels and axles to act as a circuit closer or switch? Until we attain such simplicity on a bonded track, the block system will always be handicapped for electrical service. Overhead devices and "track boxes" are too unreliable. Some genius who will devise a system overcoming these objections will no doubt reap a rich reward.

The number of high speed electric railways is steadily increasing and the tendency is unmistakably towards steam railroad practice. Already many such roads designate their trains by numbers which are marked on time tables, and are also conspicuously marked on the front of trains or cars. Classification signals are in use for designating extra trains, second sections, etc. Markers, switch lights, whistle-signals, etc., follow standard steam railroad practice. Cars are provided with flags, fuses and torpedoes, and trainmen required to protect their trains in case of stops. In many cases the train dispatching system is quite as complete, and discipline as strict, as on the best of steam railroads. Yet all these precautions will avail nothing if the personnel of the operating department are novices in the art of railroading. As an illustration may be mentioned the case of a splendidly equipped high speed railway, which adopted steam railway standards throughout, and had an expert steam railway train dispatcher organize the operation of trains. The management and heads of operating departments to a man were former steam railroad men of the most splendid experience and capacity. Train crews were recruited partly from the street railway field, and partly from steam railroads. This road had one serious collision costing six lives and several hundred thousand dollars in damage claims. There were also some minor accidents and a few hair-

POSTING SCHEDULES ON INTERURBAN ROADS BY MEANS OF DIAGRAMS.

The practice of announcing the daily runs of car crews by the aid of diagrams possesses several advantages over the more common methods of posting runs by chalking up a column of figures on the bulletin board, or by verbal or written instructions, just as a map of the road presents the routes in a form more easily and quickly understood than does a written description. The practice is especially applicable to posting schedules on single track interurban electric roads.

The Worcester (Mass.) Consolidated Street Railway Co. uses diagrams for announcing runs at all its dispatching stations and the system will be made clear by describing it as applied to the Fitchburg division of the Worcester company. This division is about 30 miles long and is in charge of Mr. George H. Burgess, division superintendent.

After the schedule for the season has been determined (in this case a half-hour service is given between Worcester and Fitchburg) the superintendent plots all the runs on a sheet as shown in Fig. 1, using cross-section paper with 1/4-in. rulings for the purpose. The vertical lines designate intervals of time (in this case intervals

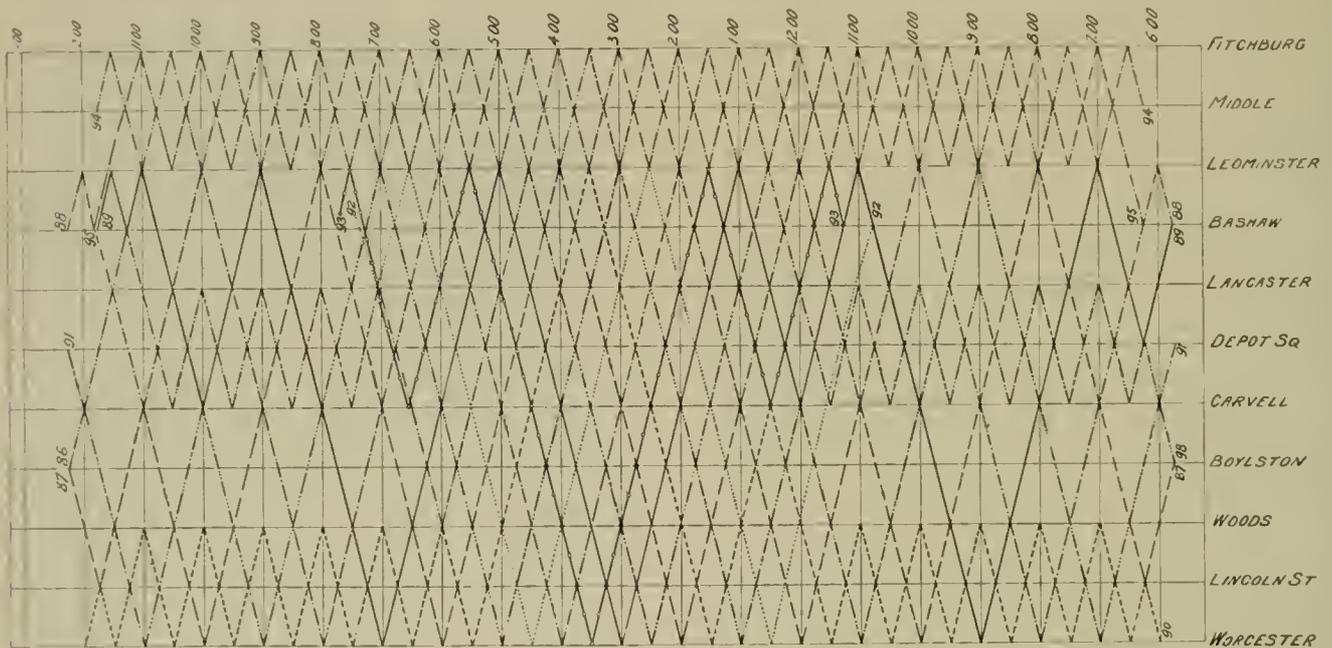


FIG. 1—SUPERINTENDENT'S RUN SHEET.

breadth escapes from what might have been even more serious accidents than that first mentioned. In each and every case it was men from the street railway field who were the offenders and their ignorance or disregard of the rules the cause of the accidents. Yet these men were carefully selected from a large number of applicants and in intelligence were much above the average found in street railways. Furthermore they had been carefully drilled and instructed and passed an examination by the above named expert dispatcher in the rules.

NEW CASTLE & LOWELL ROAD OPENED.

The New Castle (O.) & Lowell R. R. was opened for traffic February 15, four cars being put into service. The line has since been in regular operation and cars are run from Youngstown at intervals of one hour, the last one arriving at 10:30 in the evening. The trip to New Castle is made in 1 1/4 hours, but the schedule will be faster when the special cars are put in service. The present local cars stop at all street corners in the cities and towns through which they pass to take up passengers, but the specials will stop only at certain points. As a large portion of the company's tracks are laid on a private right of way the special cars will be enabled to make fast time without difficulty.

of 1 hour) and certain of the horizontal lines designate turnout points.

The runs are numbered and for convenience in distinguishing intersecting lines on the diagram each run is plotted with a different colored pencil. (In the accompanying engravings reproduced from the diagrams the runs are shown in different symbols.) Referring to Fig. 1, a single example will suffice to explain the diagram. The car moving on run No. 88, for instance, will leave the operating barn at Bashaw's turnout at 5:45 a. m., run to Leominster and then turn and make the through run to Worcester, arriving at Worcester at 8:00 a. m. It will immediately turn and run to Leominster and so on as indicated until turned into the barn at 12:15 at night.

This large sheet is for the use of the superintendent only. For the information of the employes small diagrams of each run are posted on the bulletin board each morning. In Fig. 2 for example is shown run No. 88 for the entire day. The crew that has been assigned to this run takes the car out 5:45, makes the run to Leominster and back to Worcester, and then back to Leominster, arriving Leominster at 10:00 a. m. On the next trip instead of running straight through to Leominster they run only to Carvell's turnout and "swing" with the crew running on run No. 87, that is, the two crews change places, the cars proceeding on the trips in the direction in which they are headed, but the crews doubling back so as to reach their respective stations in time for their mid-day relief. Un-

der this schedule the crew on run No. 88 are due at Bashaw at 11:45 a. m., and are not posted

to make another trip until 1:45 in the afternoon, giving them two hours' relief. They go to work again at 1:45, making the trips as indicated, and arriving at Bashaw at 5:45 p. m., when they are through work for the day, having performed 10 hours' actual work within 12 consecutive hours. The lower half of the diagram, Fig. 2, indicates run No. 88a, which is the relief run on run No. 88.

A diagram similar to Fig. 2 is prepared for each run on the division.

In connection with these diagrams we reproduce a portion of the printed schedule which the company causes to be posted in public places along the division for the convenience and information of the public. By referring to this table and to diagram Fig. 1, it will be noticed that certain cars are assigned to shuttle service exclusively between certain towns. Thus a half-hour service is maintained by this means between Fitchburg and Leominster, between Lancaster and Clinton (Carvell's turnout), and between City Line (Wood's turnout) and Worcester, these shuttle cars serving the purpose of filling out the half-hour schedule which at certain hours of the day is not provided by the

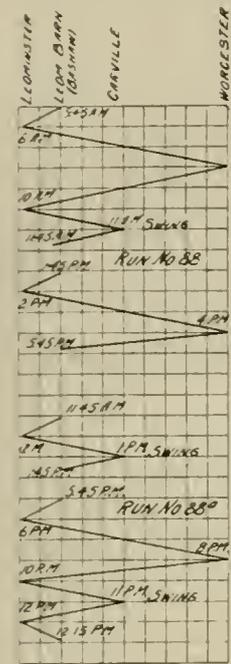


FIG. 2.

through cars, as will be seen by reference to Fig. 1.

The conductors and motormen are required to familiarize themselves with all meeting and passing points and are instructed to

TROLLEY EXPRESS IN ENGLAND.

The subject of conveyance of freight on electric trolley lines was recently discussed by Mr. A. H. Gibbings, of South Lancashire, before the Liverpool Engineering Society. Mr. Gibbings gave an outline of the proposed scheme for carrying merchandise on electric tramways between the Liverpool docks and some of the important manufacturing towns in the South of Lancashire. There is no doubt that such a scheme would be highly beneficial particularly to the manufacturers, and it is believed there would be no difficulty in laying electric lines on the dock sides in order that the cars can be loaded direct from the ships or depots. As each car was loaded it would proceed directly to its destination with an average speed, including stops, of 6 miles an hour. The form of car proposed is one having a detachable top with facilities for removing by means of cranes. In some cases it will undoubtedly be advantageous to lay special tracks and sidings to the warehouses, mills, etc., which are some distance away from existing railways, but in other cases the author suggested that steam road wagons or other form of automobile might be used to reach isolated places. Careful calculations had been made regarding the question of charges and the author stated that it was found possible to charge for carload lots only 50 per cent of the present railroad charges and still leave a sufficient profit. The principal public benefit which would be attained would be the great relief of the streets from heavy trucking. The author believed that the alleged difficulties of collecting merchandise at the docks and delivering it from the lines to the various mills and warehouses were problems which could be readily solved.

COST OF ELECTRIC MOTIVE POWER.

BY ALTON D. ADAMS.

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Electrical energy may be delivered to the lines outside of different generating stations at an almost uniform cost per unit, except as to differences due to the prices of fuel, where outputs are equal. With stations of different capacities there is a possible decrease of cost per unit of energy output until a certain point is reached, but thereafter expense goes up at the same rate as the amount of energy supplied. Line and track losses, the efficiency of electric motor equipments, the sizes and weights of cars, the construction and profile of the track, and the average number of passengers carried all enter to determine the cost of electric motive power per car-mile.

It is intended here to discover to what extent differences exist as to the cost of electric motive power per car-mile on different roads, and whether these differences are due to special locations and conditions of service, or to causes under the control of street railway companies. For present purposes the average cost of electric motive power per car-mile on all the street railways of the state of Massachusetts, and also on each of the more important systems is considered. During the year ending Sept. 30, 1900, operation on all street railways of Massachusetts amounted to 81,750,768 car miles at a total cost of \$1,672,252.08 for electric motive power, or an average of 2.04 cents per car-mile. The Boston system dominated the situation with a record of 38,171,984 car miles at an expense of \$519,955.07, or an average of 1.36 cents per car mile. Deducting the car-miles for the Boston Elevated from the total for the state leaves 43,578,784, and the expense of electric motive power outside of the Boston system, when divided by this last number, shows an average of 2.64 cents per car mile for all of the remaining roads. This figure of 2.64 cents is 1.94 times as great as the cost per car-mile of the Boston elevated system, and obliged the other roads of the state to pay out for the year \$559,626.45 more than their electric motive power would have cost at the Boston rate. Reasons for any such difference in the cost of motive power per car mile between the Boston and the other systems are hard to find in the conditions of service for the various roads. Obviously more power is required to propel a given car the greater the load which it is carrying, so an increase in the number of passengers per car-mile must raise the cost of motive power. In this particular the Boston system had to meet conditions more exacting than those outside its limits. For the entire state the average number of passengers per car mile during the year was 18

WORCESTER TO FITCHBURG												
	A. M.						P. M.					
Leave WORCESTER	6:00	6:30	7:00	7:30	8:00	8:30	9:30	10:00	10:30	11:00	11:30	12:00
CITY LINE	6:30	7:00	7:30	8:00	8:30	9:00	10:00	10:30	11:00	11:30	12:00	1:00
BOYLSTON	6:45	7:15	7:45	8:15	8:45	9:15	10:15	10:45	11:15	11:45	12:15	1:15
CLINTON	7:00	7:30	8:00	8:30	9:00	9:30	10:30	11:00	11:30	12:00	12:30	1:30
LANCASTER	7:15	7:45	8:15	8:45	9:15	9:45	10:45	11:15	11:45	12:15	12:45	1:45
LEOMINSTER	7:30	8:00	8:30	9:00	9:30	10:00	11:00	11:30	12:00	12:30	1:00	2:00
Arrive FITCHBURG	7:45	8:15	8:45	9:15	9:45	10:15	11:15	11:45	12:15	12:45	1:15	2:15
FITCHBURG TO WORCESTER												
	A. M.						P. M.					
Leave FITCHBURG	6:00	6:30	7:00	7:30	8:00	8:30	9:30	10:00	10:30	11:00	11:30	12:00
CITY LINE	6:30	7:00	7:30	8:00	8:30	9:00	10:00	10:30	11:00	11:30	12:00	1:00
BOYLSTON	6:45	7:15	7:45	8:15	8:45	9:15	10:15	10:45	11:15	11:45	12:15	1:15
CLINTON	7:00	7:30	8:00	8:30	9:00	9:30	10:30	11:00	11:30	12:00	12:30	1:30
LANCASTER	7:15	7:45	8:15	8:45	9:15	9:45	10:45	11:15	11:45	12:15	12:45	1:45
LEOMINSTER	7:30	8:00	8:30	9:00	9:30	10:00	11:00	11:30	12:00	12:30	1:00	2:00
Arrive WORCESTER	7:45	8:15	8:45	9:15	9:45	10:15	11:15	11:45	12:15	12:45	1:15	2:15

FIG. 3—DIVISION TIME TABLE.

follow closely the running time schedule and never under any condition to run ahead of the schedule time

The Granville (Vt.) & Poulney Electric Railroad Co., which was recently organized with William Nathaniel, president, expects to begin the construction of its proposed line from Granville to Poulney, with a branch to Lake Saint Catharine, in the early spring

A part of the machinery has been removed from the power house of the Marion (Ind.) Railway Co. to Richmond, where it will be installed in the plant of the Richmond Street and Interurban Railway Co. The Marion line is now operated from the new power house at Anderson

On the Boston system alone the average number per car-mile was 5.26, while the remaining roads carried only 4.44 passengers per car mile on an average. As the Boston road carried 18 per cent more passengers per car-mile, its cost of motive power should have been greater, other things being equal. The profile of the tracks of the Boston system seems to involve as much up-hill work as do those for the remaining street railways of the state on an average, so far as a somewhat extended observation indicates. Of the remaining inherent conditions that determine the cost of motive power per car-mile, the only one subject to important variations for different roads is the extent of operation, measured in car-miles for each system.

It may be at once suggested that the great excess in the amount of operation for the Boston system over that of any other road, its number of car-miles being about fifteen times as great as that of the next largest system, is sufficient to give it the superior economy shown as to cost of electric motive power per car-mile. With a view to test the soundness of this position, the cost of motive power per car-mile has been determined for each street railway system of the state that operated more than 200,000 car-miles during the fiscal year of 1900. In the table the railways are arranged approximately in the order of the number of car-miles operated, to facilitate comparisons. In order that due allowance may be made for passenger loads, the number of passengers per car-mile of operation has also been determined for each road. The street railways included in this table number 43 out of the 118 systems in the state at the beginning of the year named. These 43 roads operated 74,011,315 car-miles during the year or 90 per cent of the operation for all the systems.

The most notable feature of the table is the great variation presented in the costs of electric motive power. Extremes of this variation are seen for the Newton & Boston road where the cost was 1.31 cents per car-mile, and for the Worcester & Webster where this cost was 5.71 cents, an increase over the former of 335 per cent. On eight roads the cost of motive power was less than two cents and on five roads it was more than four cents per car-mile. It appears at once that a low cost of electric power is not confined to the largest systems, nor is an excessive cost peculiar to the smaller roads. The Newton & Boston Ry., which enjoyed a lower rate for motive power than the Boston system, operated only 534,676 car-miles during the year, or less than two per cent of the car travel on the Boston system. The Lowell & Suburban road with 2,031,777 car-miles to its credit, or less than 6 per cent of the distance covered at Boston, had a rate of 1.49 cents per car-mile for electric power, which is not quite ten per cent more than the like rate for the Boston system. For the Leominster & Clinton road with 263,892 car-miles the cost of motive power was only 1.79 cents per unit of car travel.

This last case represents an increase of about 20 per cent in the power rate with a decrease to less than one per cent of the car travel on the Boston road. Turning to the higher power rates, it seems that the figures for the larger roads are often higher than the rates for many of the smaller systems. Six roads that operated more than 1,000,000 car-miles each show a rate of more than two cents for motive power per unit of car travel, and in three of these cases the rate was more than three cents. For the Worcester system, the fourth in extent of operation for the entire state, where the car travel was 2,653,952 miles, the motive power cost 3.61 cents per car-mile, or nearly three times the rate on the Newton & Boston where the car travel was less than one-sixth as great. The South Shore & Boston road, with 1,346,167 car-miles to its credit, was obliged to pay for motive power at the rate of 3.89 cents per car-mile. The highest rate for the cost of electric motive power was that of the Worcester & Webster road at 5.71 cents per car-mile, where there were only 238,791 miles of operation, but the next largest rate, that of 4.88 cents per car-mile was the cost on the Interstate Consolidated road where the operation went up to 693,171 car-miles. Of the twelve systems each of which operated more than 1,000,000 car-miles, six had a power rate of less than two cents, three systems a rate between two and three cents, and three systems a rate between three and four cents per car-mile. Eight roads operated more than 500,000, but less than 1,000,000 car-miles each, one of these at an expense for electric motive power of 1.31 cents, five roads at between two and three cents, one road at between three and four cents, and one at between four and five cents per car mile.

Of twenty-three systems that operated from 200,000 to 500,000 car-miles each, one expended less than two cents, eight expended between two and three cents, ten expended between three and four cents, three expended between four and five cents, and one system expended between five and six cents per car-mile for electric motive power.

From all this it is evident that the low cost of electric motive power at Boston is not a result peculiar to the great size of its street railway system, since the Boston rate is higher than that of the Newton & Boston road, and only a little below the cost per car-mile of motive power for the Lowell & Suburban, Holyoke, Springfield, and the Leominster and Clinton systems. True, a low rate of cost for motive power is more frequent among the larger roads.

Cost of electric motive power per car-mile, and number of passengers per car-mile on street railways of Massachusetts, year ending August 30, 1900:

Name of Railway.	Total Car Miles Operated.	Cents Per Car Mile.	Passengers Per Car Mile.
Boston Elevated	38,171,984	1.36	5.26
Brockton	2,565,023	2.32	4.67
Fall River	1,441,527	1.93	5.79
Holyoke	1,268,961	1.74	3.88
Lowell & Suburban	2,031,777	1.49	4.50
Lowell & Haverhill	1,921,815	2.83	5.73
Lynn & Boston	7,508,170	2.01	5.16
South Shore	1,346,167	3.89	3.62
Springfield	3,586,242	1.80	3.83
Union New Bedford	1,088,803	1.98	4.21
West Roxbury	1,055,972	3.41	4.28
Worcester Consolidated	2,653,952	3.61	5.38
Fitchburg & Leominster	800,785	2.65	4.21
Interstate Consolidated	693,171	4.88	5.01
Milford & Framingham	531,583	2.84	4.73
Newton	529,714	2.60	4.64
Newton & Boston	534,676	1.31	3.47
Northampton	583,287	2.32	3.58
Quincy & Boston	622,662	2.44	4.62
Worcester Suburban	698,492	3.37	5.02
Newburyport	342,789	3.17	4.39
Commonwealth Ave.	426,560	3.00	3.00
Gardner & Fitchburg	275,155	3.80	3.27
South Middlesex	282,683	2.66	4.47
Wellesley & Boston	260,810	3.42	5.01
Woonsocket	360,180	2.71	4.49
Natick & Vochitute	405,654	2.08	3.76
New Bedford & Brockton	306,501	4.50	3.19
Newton & Taunton	381,681	2.78	2.54
Pittsfield	354,947	2.62	4.48
Haverhill & Amesbury	474,690	4.38	4.20
Hoosac Valley	490,450	3.18	3.80
Leominster & Clinton	263,892	1.79	3.78
Worcester & Clinton	266,059	3.30	4.28
Worcester & Marlboro	318,215	3.26	4.07
Westfield	366,408	2.20	2.97
Warren & Spencer	380,291	3.01	3.27
North Woburn	201,185	3.61	4.96
Palmer & Monson	221,465	3.64	3.15
Plymouth & Kingston	224,832	4.25	3.88
Wakefield & Stoneham	226,287	2.42	2.64
Worcester & Webster	238,791	5.71	3.95
Lexington & Boston	248,893	2.53	4.73
All street railways in the state	81,750,768	2.04	4.8
All street railways except Boston Elev.	43,578,784	2.64	4.44

This fact, however, seems to show simply that the larger systems more frequently adopt methods of construction and operation that lead to high efficiency than do the smaller roads.

Comparison of the costs of motive power per car with the average passengers per car mile shows that heavy passenger traffic cannot account for the great differences in the power rates. Of the eight roads with power rates of less than two cents per car mile, two carried more than five passengers per car mile, two carried more than four but less than five passengers, and four roads carried between three and four passengers per car-mile on an average. On sixteen street railways the costs of electric motive power were

between two and three cents per car-mile. Of these sixteen roads, two carried between five and six passengers per car mile, nine carried between four and five passengers, two carried from three to four passengers, and three carried two to three passengers per mile of car travel.

Expenses for electric motive power were at rates between three and four cents per car mile on fourteen roads. Among this number three had an average of more than five passengers, five had between four and five passengers, and six had between three and four passengers per car mile. Of the four street railways that paid out between four and five cents per car mile for motive power, one carried over five passengers, another carried between four and five passengers, and two carried between three and four passengers per car-mile. A single road expended more than five cents per car-mile on motive power, but carried less than four passengers per car-mile. From the foregoing it appears that the roads with low power rates had as large or larger passenger traffic per car-mile than the roads with higher power rates.

Costs of electric motive power per car mile on roads of different car travel:

Car Miles Operated.	No. of Roads.	Between 1 and 2 Cents.	Between 2 and 3 Cents.	Between 3 and 4 Cents.	Between 4 and 5 Cents.	Between 5 and 6 Cents.
Over 1,000,000..	12	6	3	3		
Between 500,000 and 1,000,000	8	1	5	1	1	
Between 200,000 and 500,000	23	1	8	10	3	1
Totals of all Roads.....	43	8	16	14	4	1

The table shows the number of roads of each class that had each rate for motive power per car mile. Considering all the roads, the number operating at a cost of motive power between 1 and 2 cents 2.1 per cent of the total number. Dividing the entire number 3 and 4 cents 32.5, between 4 and 5 cents 9.3, and between 5 and 6 cents 2.1 per cent of the total number. Dividing the entire number of roads into groups according to the number of passengers carried per car mile, it seems that 18.6 per cent carried 5 to 6 passengers, 39.5 per cent 4 to 5 passengers, 34.9 per cent 3 to 4 passengers, and 7 per cent 2 to 3 passengers per mile of car travel.

Number of roads with each power rate carrying the stated number of passengers per car mile:

Number of Roads.	Cost of Power Per Car Mile.	Roads with 5 to 6 Passengers Per Car Mile	Roads with 4 to 5 Passengers Per Car Mile	Roads with 3 to 4 Passengers Per Car Mile	Roads with 2 to 3 Passengers Per Car Mile
8	Between 1 & 2	2	2	4	
16	" 2 & 3	2	9	2	3
14	" 3 & 4	3	5	6	
4	" 4 & 5	1	1	2	
1	" 5 & 6			1	
43		8	17	15	3

ELECTRIC TRACTION IN SWEDEN.

A report from Mr. R. S. S. Bergh, U. S. Consul at Gothenburg, states that the problem of employing electric power instead of steam on railroads in Sweden is receiving constantly increasing attention. He states that the managers of the state railroads are making investigations in this direction and that a number of private concerns are also interested in the matter. A Gothenburg newspaper reports that a number of managers for the Falun-Vesterdalarnes Railroad Co. has sent to the government a petition for the gradual adoption of electrical locomotives instead of steam engines throughout the whole country, and the utilization of water power. The petition mentions that a manufacturing company in Switzerland has made a proposition to use the Huber system by which an electric current can be generated by a train passing down inclines which current can be utilized by other trains on the same road. A Swiss firm proposes to furnish the necessary rolling stock, a Swedish company the electrical power and the railroad company is to furnish lines for the experiment. About \$27,000 is needed for building transformers, for the equipment of the road with electricity, bonding the rails, etc. The government is asked to furnish the money for the electrical apparatus and construction.

MAGNETIC TRACTION.

Reports from Seattle, Wash., state that recent tests of a device invented by Mr. A. A. Honey for increasing traction on locomotives and street cars by means of magnetism, have shown remarkably successful results and that the increase in tractive effort on an electric car equipped with this device amounted to over 300 per cent. These tests were held at the barn of the Jackson St. car line, at Seattle, on a double truck car 35 ft. long. Around the axle of each wheel is wound a coil of wire, through which current is passed by means of a switch. The car is equipped with two motors of 40 h. p. each and during the tests stood on the rails within the car barn. One end of the car was attached by means of a cable to a dynamometer which registered the tractive power of the motors. The dynamometer used is the invention of Mr. H. H. Walker, master mechanic of the Northern Pacific, and it registered the pull in tenths and twentieths of a ton. Several distinct tests were made both with and without the magnetic device. Without this device the dynamometer showed the pull of the car to be less than half a ton, while after the application of the current to the magnetic device the pull jumped to somewhat over 2 tons, and on one test as high as 2¼ tons. Practically similar results were obtained at each of the different tests.

By means of this device magnetism is substituted for increased dead weight and to increase tractive force. By the use of magnetism to create adhesion between the drive wheels and the rails nothing is added to the weight of the vehicle and consequently no extra power is required for propelling the extra weight.

Another device which is being prepared for test by Mr. Honey is claimed to be a considerable improvement over the present one. A locomotive and one or two street cars are to be equipped with it at an early date. It can be attached to any vehicle of this kind without making any changes whatever in the running gear. Instead of using the driving wheels as magnetic poles, an independent helix is constructed with small wheels about 1 ft. in diameter which run on the rails as close as possible to the driving wheels. This closes the magnetic circuit through the rails, drive wheels and axles, thus giving an uninterrupted metallic circuit. Any number of these independent magnets may be used in connection with the train to multiply the tractive effort to any desired extent.

PROPOSED NASHVILLE INTERURBAN.

Two extensive interurban lines are being projected in the neighborhood of Nashville, by Messrs. C. W. Ruth and Frank Haskell, Pittsburg, Pa. It is planned to connect Nashville with Gallatin, Franklin, Columbia, Mt. Pleasant and a number of intermediate towns. Two separate lines are planned, one running to Gallatin, a distance of 30 miles and the other directly through to Mt. Pleasant via Franklin and Columbia, a distance of about 55 miles. Charters for these companies have been applied for under the names of the Nashville & Gallatin Electric Ry., and Nashville & Columbia Electric Ry. Mrs. F. P. Bond, attorney for the companies, states that the roads will be built speedily if the rights of way are granted through the city of Nashville. The capital to be expended is Pittsburg money and the parties behind the enterprise do not ask for any local help. All that is required is the good will of the people of Nashville and those along the route and reasonable aid in the matter of right of way. Power for operating these roads is to be secured from Scroggins Falls, in Cumberland County, and the same water power will be utilized to furnish light and power in the city of Nashville and the towns along the lines of the railways.

The Newcastle (O.) & Sharon Electric Railway Co. has expended approximately \$60,000 for rights of way in Lawrence County. The road will extend from Newcastle to Hubbard, where connections will be made with the Sharon & Youngstown line.

The St Charles Street Railway Co., of New Orleans, recently sold \$300,000 of 4 per cent, 50-year gold bonds, the proceeds of which are to be used in construction of its new lines. The bonds were largely over-subscribed and good premium was secured on them. The bids accepted ranged from 101.35 to 107.25.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

NOTES ON THE CARE OF THE POWER HOUSE.

BY ARTHUR B. WEEKS.

It sometimes occurs that repairs on station circuit-breakers are necessary, hence the following notes will be of value to the practical man.

The type K circuit breaker herewith described is built for several different capacities, that illustrated being 800 to 1,200 amperes. Before putting a breaker of this style into service, first remove the front blow-out yoke, the top fiber piece called "fiber cap for arc

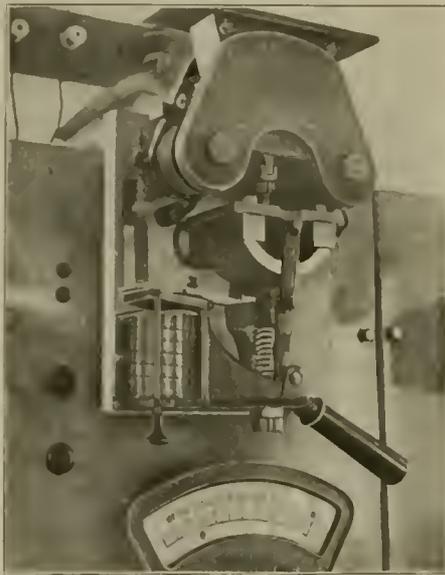


FIG. 1—TYPE K CIRCUIT BREAKER.

deflector," and the fiber front piece for the arc deflector, in order to gain access to the shunt connections where the arc is ruptured.

While the breaker is open, note the opening at the main contacts, also the shunt, or secondary opening. This secondary opening should be about $\frac{1}{4}$ inch when the main contacts are open $\frac{3}{4}$ inch. This allows the shunt, or secondary contacts, to make a firm contact before the main circuit is closed; and, naturally, as the circuit breaker opens, the main circuit is broken considerably in advance of the secondary contacts. This is to prevent an arc on the main contacts.

This breaker should be inspected occasionally to maintain the secondary heads in good condition. Sometimes copper heads will form on these heads, preventing a good contact. Again, they will burn away and out of shape, when it will be necessary to remove and touch them up with a smooth file, or, if too badly burnt, to replace with new parts which should be kept in stock. A material alteration in adjustment is at no time necessary. It sometimes occurs that the main contacts become badly burned. They must be smoothed up before putting into service again, and can be done as local conditions of service permit.

If it becomes necessary to replace the blow-out spools, when ordering from the manufacturers designate them as right-hand and left-hand blow-out spools, giving also the number of the breaker. If wound at some local works, see that the winding is exactly like

the original, and that the free ends are brought out properly to make the connections. It is easy to make a mistake here, if one is not familiar with the principle upon which the spools blow upward and rupture the arc. It is possible to so connect the spools as to cause the arc to blow down, which of course is to be avoided. The following sketch will illustrate the connections, as well as the path for the shunt circuit.

In adjusting the contact heads, try each to be sure that there is no binding which will cause them to "hang fire." The flexible springs are liable to cause this trouble if not properly set, especially if the springs are twisted sidewise.

If necessary to remove either the right-hand or left-hand main contact, it will of course be necessary to disconnect them at the back of the panel, and ordinarily it will be more convenient to remove the breaker itself to a bench where every part can be gone over thoroughly. To remove a main contact stud, take out the cap screws that secure the fiber separator to the studs. The particles of copper which fall from the secondary contacts due to the rupturing of the arc lodge here.

There is a fixed core centrally located inside the flat spiral of copper through which the main current passes. Above it is pivoted a flat piece of iron, called an armature, which is drawn down

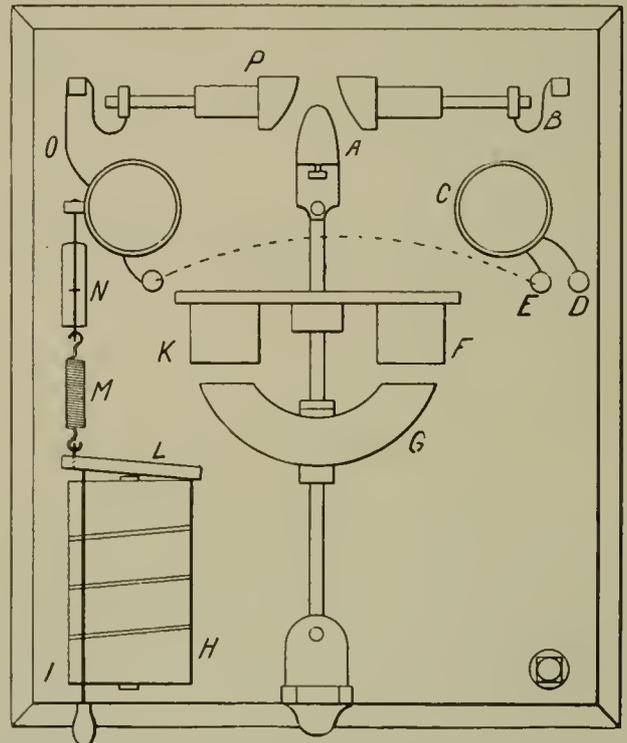


FIG. 2—DIAGRAM OF CONNECTIONS—TYPE K CIRCUIT BREAKER.
A, P, secondary contact heads; B, flexible copper spring; C, blow-out spool; D, inside wire; E, O, outside wire; G, main contact; F, K, main contact stud; L, armature; H, solenoid; M, calibrating spring; N, scale.

against the action of a coil spring called a calibrating spring. This spring contains twenty-seven turns of .205-in. steel wire. A calibrating rod secured to the upper end of the coil spring has a washer indicating upon a scale opposite the amperes for which the breaker is set. This amount is determined by the tension upon the coil spring.

If this breaker is in use for a 500 kilowatt generator, 500 volts,

the normal current is 900 amperes. Should the maximum load occasionally reach 1,200 amperes, if the breaker is properly adjusted and in good condition it will rupture the arc if set at 1,200.

The generator will stand a considerable overload for a short period, but one should be governed largely by the heating and local conditions regarding the length of time the generator can carry such a load. Such a generator is guaranteed to run at 50 per cent overload for short intervals only.

It sometimes follows, after a railway switchboard has been erected for a certain duty on its feeders, that conditions unexpectedly arise bringing about results which were not anticipated. For example,



FIG. 3—LEAF SPRING CIRCUIT BREAKER.

the load on a certain feeder was suddenly greatly increased, and its breaker consequently very frequently opened. When it came out, the current jumped across to an adjoining breaker. On another occasion, the breaker failed to rupture the arc, and not until the machine circuit-breakers were opened by the electrician did the arc cease. In this case the breaker was entirely ruined.

There was no time for delay, being an especially busy day with the street railway company, so a trolley line jumper was put on at the trolley line section insulator, connecting that trolley section with another feeder which was able to carry the load for a short time. It tided things over until midnight, when the circuit-breaker shown in the accompanying illustration was secured to a block of wood, and set up temporarily at one side of the switchboard, out of the way, until the other panel could once more be put into proper condition.

The cables were disconnected from the burnt out circuit breaker and transferred to the temporary one, using the old switch as it was unharmed. When emergencies of this kind arise, the handy man, ready on all such occasions, proves himself invaluable. Many plants have such a man, who is often remarkable in improvising devices to tide over troubles.

The circuit-breaker illustrated is thoroughly reliable, of the leaf contact type. The main contact is through the leaf springs. In opening, the leaf springs leave their seat first, then the flat carbon, as shown in the upper part of the illustration (Fig. 4), separate and receive the arc as intended, preventing any arcs upon the leaf contacts. Its action is like that of any circuit-breaker, though dissimilar to the styles with which street railway men are most familiar. The lower part is a modified horse-shoe magnet, and when an excessive current passes, its armature is drawn up, releasing a trigger which trips the breakage. The coil springs illustrated then throw it into the position as shown. It can be adjusted for more or less load, as may be necessary. This is indicated by the scale at the lower extremity of the breaker.

To close the breaker, pull down insulated handle of the long

lever, when it is again reset. If insulated upon a panel, or in use as above mentioned, the feeder switch is of course opened before the breaker is closed, and the switch closed last.

This breaker also gives most excellent results when used on alternating circuits, being designed especially for severe duty. It is a familiar breaker in heavy power work for A. C. current. The illustration (Fig. 4) shows another form of this breaker in service upon a two-phase alternating circuit of 2,200 volts. There is still another similar type of breaker which has a time element attachment, set to open on a short circuit after a predetermined number of seconds.

In connection with the station in question I recall the case of a rotary converter whose armature had been taken out of its bearings but once in five years. It was due to hot bearings that it became necessary at that time. Some of the oil ways were completely filled with sediment, and the babbitt considerably scored.

To test re-babbitted or scraped boxes before putting the rotary into regular service, run it as a direct current motor for a time if direct current is available, and the alternating current motor not large enough to propel it without overheating. But if run as a direct current motor, should the machine circuit-breakers open, do not close its breaker until the other breakers have been closed and this one again brought up to the bus-bar voltage.

The oil should be renewed before it has become thick with accumulated sediment. Clean out cavities thoroughly, using coal oil for the purpose. Steam, if it can be procured, will give best results. A mistaken idea frequently obtains, that, since it is no longer necessary for a man to go around with an oil can filling oil cups every half hour or so, as was once the case, the automatic oiler with revolving rings can be depended upon indefinitely. The time will always come when a cleansing of the oil cavities and renewal of oil will be imperative.

If a bearing allows the oil to run down upon the rocker arms of the brush-holders, saturating everything in its wake and fre-



FIG. 4—2,000-VOLT CIRCUIT BREAKERS.

quently working over on to the commutator, hunt a remedy for it for it will surely give trouble in time. Oil spattered over the floor under a commutator looks careless and untidy, to say nothing of the waste bunches of waste wedged between cross-connections of the brush holders below a bearing also have a bad appearance. A leaky glass gage for an oil bearing is another nuisance.

To sandpaper a rotary converter commutator, run the armature with alternating current, with direct current switches open.

Without apparent cause, a case occurred in which the mica between different commutator segments $\frac{1}{4}$ in. deep and $\frac{5}{8}$ in. long burned away. When first discovered, a flash at the brushes caused a serious buck, which opened all the machine circuit breakers. In

vestigation disclosed these burnt places. A test with a volt-meter from bar to bar revealed no defects. An insulation test proved it sound in that respect. But the bucking was caused by local short-circuits from copper and carbon-dust which had collected in the cavities, and was remedied by cleaning them out thoroughly and filling with a stiff paste of pulverized mica and shellac, thoroughly dried.

The burning away of the mica might have resulted from soft mica, which arcing at the brushes finally loosened and started an opening. Again, it might be but the beginning of more serious trouble, that of a grounded commutator, which will eventually burn through to the iron core, as was the case several months ago on another rotary converter which came under my notice. But it was not due to loose or broken connections, as all were found intact; furthermore, in that case, the mica would have been affected the entire length of the bar.

POWER STATION DAILY REPORTS.

The value of a certain class of records such as power house, repair shop and mileage reports is not infrequently greatly reduced by reason of the fact that when most wanted they have to be rooted out from a mass of papers and books by a clerk, and it often happens that the particular record desired by the manager is not on file at his office, but for some reason is held at another part of the system.

Power Station Daily Report.

Cumberland Coallbs.
 Screenings lbs.
 Boiler Supply.....Gals.
 Kilo Watts
 Car Miles
 Cars Operated
 " 4 Motor Box
 " 2 " "
 " 4 " Open
 " 2 " "
 " Snow Plows
 Engineer.
 Date 19

necessitating a considerable amount of telephoning or correspondence before the information wanted can be placed on the manager's desk. This delay is avoided somewhat by having heads of departments make reports each day on properly prepared blanks, but here too the end sought is often defeated by trying to have these reports too elaborate. Daily reports from all branches of the service have been found to be of the greatest value for comparison and checking purpose, but if insisted upon should be more in the nature of preliminary statements to be followed later by more elaborate and permanent records.

For daily reports from the power house the accompanying blank used by a prominent road in New England is suggested as giving in condensed and convenient form a complete record of power station performance for each day. The engineer of the station just before going off duty fills out the blank, partly from his own readings and partly from data furnished by the traffic department, and this record is laid on the general manager's desk each morning. As

the blanks are printed on slips 5x3 $\frac{3}{4}$ in., they take up but little room, and are filed daily on a filing standard within easy reach. Examination of the blank will show that although general it is an exceedingly comprehensive history of each day's operation and presents in "get-at-able" shape data that can be used to very good advantage. Sudden increases in coal consumption can be detected and checked; kilowatt output checked with car mileage; and car miles run referred to the schedule and operating departments for explanation or revision. The blank is one furnished us by Mr. Horace B. Parker, general manager of the Lexington & Boston Street Ry., of Lexington, Mass.

TAKING SAMPLES OF WATER.

The first preliminary to treating boiler water is to secure a chemical analysis of the water, and as the analysis of water involves considerable time, labor and expense and if the sample is not properly taken the results of the analysis are valueless and misleading, the following instructions for sampling water which are published by Kennicott Water Softener Co. will be of interest. About two gallons of water should be submitted for a complete examination and this is best done in demijohns enclosed in wicker. If these cannot be obtained glass bottles will do, but jugs or tin cans should not be used; likewise vessels that have previously held vinegar, oils, spirits, molasses, etc., are not to be used, as the vessels must be absolutely clean. Clean new corks should also be used. The vessel in which the sample is enclosed should be rinsed several times with the water to be sampled and then be filled only within two or three inches of the cork, leaving space for expansion with change of temperature. If the sample is from a running stream or pond it should be taken from near the center. The surface of the water should be avoided and also the sediment at the bottom. If the sample is taken from a tap or pump let the water run for some time before filling the vessel. Care should be taken in each case to get a sample that will represent fairly the average of the water. The cork should be rinsed in the water that is being sampled, the vessel tightly corked and sealed with sealing wax. Each vessel should be plainly labeled giving the source of the sample and the date when taken.

FIRE ON THE BROOKLYN ELEVATED.

February 21st the shops and car barns of the Brooklyn Rapid Transit Co., at 5th avenue and 37th street, were destroyed by fire, together with 25 cars. The total loss is estimated by the officers of the company at \$100,000. The fire started shortly after 11 o'clock in the evening in the work shop, which is a frame building on the elevated structure. Before the first engine arrived it was apparent that the work shops must be destroyed and the firemen and those of the railroad company's employes who were present, directed their attention to the saving of the barn and its contents. Fifty-five cars were stored in the barns, but through the persistent efforts of some of the motormen 30 of them were taken out. The cars were brought out in trains, but many of the rear cars were in flames as the trains passed out of the barns. The origin of the fire is unknown, but it is thought to have started in a motor car as the result of an overheated heater.

JIMCROW CARS IN VIRGINIA.

A bill which has recently been introduced in the Virginia Legislature provides for separate street cars for white and colored passengers and the street car employes of Richmond, who have a strong association, are making a fight to prevent the passage of the bill. The reason given by the men for opposing this measure is that it will be the means of deteriorating the personnel of the men engaged in operating street cars throughout the state either by having negro motormen and conductors or by bringing a tough element into the business. They assert that no men of the class now available would want to take the position of motorman or conductor on a jimcrow car.

Canadian capitalists have formed a company to build an electric line from Toronto to Cornwall, with a branch from Brockville to Ottawa.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

LIABILITY FOR WILLFUL MISCONDUCT OR NEGLIGENCE OF EMPLOYEES.

Hart v. Metropolitan Street Railway Co. (N. Y. Sup.), 72 N. Y. Supp. 797 Nov. 15, 1901.

Once the relation of carrier and passenger is entered upon, the carrier, the second appellate division of the supreme court of New York holds, is answerable for all consequences to the passenger of the willful misconduct or negligence of the persons employed by it in the execution of the contract which it has undertaken towards the passenger.

ALL INTERSECTIONS OF STREETS ARE CROSSINGS UNDER ORDINANCE REQUIRING SOUNDING OF GONG.

Schneider v. Market Street Railway Co. (Cal.), 66 Pac. Rep. 734 Nov. 9, 1901.

A city ordinance requiring a bell to be rung or gong sounded as a car approaches the limit of 25 feet from a street crossing, the supreme court of California holds applies where the intersecting street does not pass beyond that on which the car is running, but terminates it. In other words, a junction of two streets is a street crossing under such an ordinance, the term, according to its common use, including, the court says, all intersections of streets, and applying equally though one of them may terminate at the point of intersection.

FRANCHISE PART OF REAL ESTATE AND NOT TAXABLE SEPARATELY.

Dallas Consolidated Electric Street Railway Co. v. City of Dallas (Tex. Civ. App.), 65 S. W. Rep 201. Oct. 23, 1901. Rehearing denied Nov. 27, 1901.

The franchises of a street railroad appurtenant to the use of its property, the court of civil appeals of Texas holds, are a part of its real estate and not subject to a separate tax. Moreover, here it thinks was an especially strong case for the application of this doctrine because not only was the whole of the property, real and personal, owned by the street railway company, taxed, but, in addition for the very privilege sought to be taxed, a large "bonus" or "franchise tax" was being annually paid, independent of what the privilege to operate the railway might be worth.

INJURY BY JERK OF PASSENGER GOING ON STEP TO ALIGHT WITHOUT KNOWLEDGE OF CONDUCTOR.

Sims v. Metropolitan Street Railway Co. (N. Y. Sup.), 72 N. Y. Supp. 835. Nov. 15, 1901.

Before an agent of a company can be said to be negligent in not stopping a car at a crossing, the first appellate division of the supreme court of New York thinks that the passenger must in some way indicate to the agent that he wishes to stop. Nor can it see that where the conductor was collecting fares, and had his head turned away when the passenger stepped down on the step, that this action of the conductor would justify an inference of negligence. And it holds that if a passenger voluntarily places himself upon the step of a car approaching a crossing when the car is in motion, and is thrown off by the increase of the speed of the car, which happens before he has indicated to any of the agents of the company that he intends to alight, such a starting of the car, unaccompanied by any other fact, cannot be the foundation of a charge against the company of negligence.

LEAVING SIDE BAR UP ON OPEN CAR

Whitaker v. Staten Island Midland Railroad Co. (N. Y. Sup.), 72 N. Y. Supp. 814. Nov. 15, 1901.

An instruction given the jury in this case left it free to find that the company could be deemed negligent simply because it did not have the side bar or guard rail on the left side of the open

trolley car in which the party suing was standing as a passenger lowered at the time when she fell off or was thrown off the car at or near an abrupt curve, since it was tolerably plain that she could not have fallen off if the bar had then been down. This, the second appellate division of the supreme court of New York says, would have been correct if the purpose of providing the bar had been to guard against the falling out of passengers. But, in view of the uncontradicted evidence that such was not the purpose, it was error, the court holds, to tell the jury, as it was told, in substance, that it might infer otherwise, and hold the company responsible for the passenger's fall solely because the bar was up, instead of down.

INJURY OF WORKMAN IN TRENCH ALONG TRACK, FROM PUTTING HIS HAND UNDER CAR.

Nolan v. Metropolitan Street Railway Co. (N. Y. Sup.), 72 N. Y. Supp. 501. Nov. 8, 1901.

A bricklayer while engaged in laying terra cotta conduit pipes for electric wires in a trench about four feet deep along, and extending partially under, certain street railway tracks, put one of his hands on one of the rails of the track as a car was passing, and a portion of the car ran over it. This, however, the first appellate division of the supreme court of New York holds did not render the street railway company liable. It points out that the man was in a place of safety when the car commenced to pass over him; that he was familiar with the character of the work, and of the risks incident to it; that he had been engaged in the same kind of work before, and had observed the passing of cars on that very day; that, if he had not, it must have been obvious to him that, if he placed his hand upon the rail while a car was passing, he would sustain injuries; and it says that the rule is well settled that one who, knowing and appreciating a danger, voluntarily assumes the risk of it, has not, if injured, a just ground of complaint.

PRESUMPTION OF TRACKS BEING IN PUBLIC STREET—RIGHTS OF COVERED WAGON ON TRACKS.

Vincent v. Norton & Taunton Street Railway Co. (Mass.), 61 N. E. Rep. 822. Nov. 25, 1901.

The suggestion that there was no evidence that the place where the accident in question, the running down of a wagon, happened was a public way, the supreme judicial court of Massachusetts says was plainly a mere afterthought, and discredited the company's whole case. The court assumes that tracks might be laid over private land belonging to the company so that it would be a trespass for others to drive upon them, but of course, it continues, such a case is very unusual, and in the absence of special evidence a jury would be warranted in presuming and finding that street railway tracks were laid in a public street.

The wagon was a covered baker's wagon, and the rear of it was closed with drawers and boxes. It was not negligence, the court holds, to drive such a wagon in the public streets, even those containing street railway tracks. It was not negligent or unlawful to drive upon the tracks. The fact that the horse was walking made the case no worse. As against a car coming up behind him the driver would have done his duty by getting off the track when he knew of its approach. But the driver did not know of it. If the bell was rung those in the wagon testified that they did not hear it. They were not bound to keep an impossible watch upon the rear. The company could not run them down from behind under any ordinary circumstances without negligence or willful wrong, and this they may be supposed to have known.

BOY KICKED OFF CAR BY MOTORMAN KILLED GOING ON OTHER TRACK.

Pinder v. Brooklyn Heights Railroad Co. (N. Y. Sup.) 27 N. Y. Supp. 1082. Nov. 22, 1901.

Apparently without any justification, a motorman kicked off the car a bright boy of fourteen who was riding on the front platform. The boy fell, screaming, upon his back; then picked himself up,

turned, and walked slowly and lamely across the other track, where he was struck by a car coming from the opposite direction without warning and at a very high rate of speed, receiving fatal injuries. The second appellate division of the supreme court of New York holds that a nonsuit based chiefly upon the ground that there was no evidence given to prove that the boy looked or listened before he attempted to cross the track was erroneous, and that the question of contributory negligence should have been submitted to the jury. It says that if the act of the motorman, in the opinion of the jury, created a condition by which the boy was caused to walk at once in front of the oncoming car, without realizing what he was doing, or appreciating the danger he was incurring, the effect would be quite similar in principle as if the motorman had kicked him over to the other track, and directly in front of that car. It was apparent that practical men might reasonably conclude that the boy exercised all the caution which was to have been expected of him under the circumstances created by the company's wrongful act of violence, and that therefore contributory negligence could not be predicated as matter of law. If he was blameless, in a legal sense, for his act in stepping in front of the oncoming car, then the jury might properly determine, under suitable instruction, that the act of the motorman in kicking him off the first car was negligence imputable to the company, wholly independent of any question of negligence in the operation of the car by which he was killed.

CONSENTS CAN BE USED BUT ONCE AS A BASIS FOR MUNICIPAL ACTION.

State (Currie, Prosecutor) v. City of Atlantic City (N. J.), 50 Atl. Rep. 504. Nov. 15, 1901.

Under the acts regulating the construction and maintenance of street railroads in New Jersey, approved, respectively, May 16, 1894, and April 21, 1896, before a railway company can lay its tracks in the streets of a municipality it must have the municipal consent and also the consent of a majority in lineal feet of the abutting owners. Before the municipal permission can be obtained by the passage of an ordinance expressing its consent, there must be on file with the clerk of the municipal body the required consents of such majority in interest of the abutting owners. And the court of errors and appeals of New Jersey holds that when upon the filing of the necessary consents of the abutting owners the city council or other governing body has once regularly acted thereon, by the passage and approval of a valid ordinance or resolution giving or refusing such municipal consent, the council or other governing body becomes functus officio, or as having fulfilled its office, so far as the pending application is concerned, and the consents of the abutting owners, thus acted upon, cannot be the basis of further municipal action upon a second application. Upon the question as to whether the consent of an abutting owner, after being once filed, can be withdrawn or revoked before final action the court expresses no opinion. It observes, too, in passing, that the consents which it had been considering were, as it appeared, recorded in the county clerk's office soon they were obtained; but this, it says, was not a statutory requirement, and such recording could give to them no additional force or validity.

INJURING CHILD OF POOR PARENTS.

Cotter v. Lynn & Boston Railroad (Mass.), 61 N. E. Rep. 818. Nov. 26, 1901.

A child three years and ten months of age, whose parents lived in a tenement house on a street in which there was a line of electric cars, having been allowed to go down into the yard to play, where the gate was always open, and left unattended and unobserved by the mother for an hour or more, the supreme judicial court of Massachusetts holds that, there being no pretense that the child herself was using the care of a prudent adult, she could not recover for injuries sustained in being run down by a car, while trying to run across the street directly in front of it.

There being no evidence that the child used the care that would be expected of an adult, the court holds that, therefore, if there was negligence on the part of her parents in allowing her to be where she was she could not recover damages. While the limited powers of the poor must be taken into account as a general fact in drawing the line at which the company's responsibility shall begin, still, the court says, the other side must be considered also

before it, a third party, is made responsible for an accident, and this responsibility does not follow of necessity from the fact that the parents did the best they could. There is a certain minimum of precaution against the dangers into which infants will wander, which must be taken if another is to be made to pay.

Of course when the case gets near the line which divides those instances in which it can be ruled as matter of law that the parent was negligent from those in which it can be ruled that due care was shown, it is left to the jury. But in the cases most like this in which a jury has been called, the court says the precautions were greater, or the danger was less obvious and not so great, and the time shorter during which the child was left to itself.

PARK OWNER HAS NO RIGHT OF ACTION FOR DAMAGES FOR REMOVAL OF EXTENSION

Barney v. Indiana Railway Co. (Ind.), 61 N. E. Rep. 194. Oct. 3, 1901.

An owner of a driving park having advanced the money to buy the rails, and made a donation of \$500 out of the money so advanced, to secure an extension of a street railway line to his park, the company agreeing to "place said rails, lay said track, and operate it and have it ready for operation as early as" a certain date, the supreme court of Indiana holds that such park owner had no cause of action for damages for the subsequent removal by the company of said extension, as the right to determine how long it should operate the road remained with the company, so far as he was concerned, the contract not fixing any definite time during which the company should operate the road.

CATCHING HOSE TO WHICH MEN ARE HARNESSSED FLUSHING PAVEMENT.

Lasehinger v. St. Paul City Railway Co. (Minn.), 87 N. W. Rep. 836. Nov. 8, 1901.

Three city employes were harnessed to the nozzle end of a 5-inch hose 200 feet long used in flushing asphalt pavement. Their duty was to pull the hose, which was placed upon rollers, and handle the nozzle. A fourth employe was to keep the hose as straight as practicable, and in from the street car track. But a bolt under the rear step of a passing car caught one of the rollers at a point some 40 feet from the three men mentioned, whereby they were thrown into the air and to the ground, and injured. There was evidence on their behalf tending to show that this result was due to negligence in running the car along the street at a dangerous rate of speed, while the company, on the other hand, offered evidence to the effect that the car was going at a rate of speed not to exceed four to six miles an hour—a safe rate of speed. The supreme court of Minnesota holds that the evidence presented a question for the jury and sustained a verdict for damages in favor of each of the three men.

DUTY TO LOOK AND LISTEN FOR CAR DEPENDS UPON CIRCUMSTANCES—UNFAMILIARITY WITH STREET OF PERSON INJURED—PEDESTRIANS NOT ALWAYS TO BE DEEMED IN PERIL.

Russell v. Minneapolis Street Railway Co. (Minn.), 86 N. W. Rep. 346. May 31, 1901.

The supreme court of Minnesota says that it is not, as a matter of law, negligence for a pedestrian to cross a street railway track (at least, within the populous part of the city) without looking and listening for an approaching car. Whether the failure to look and listen be an act of negligence must be determined from all the circumstances of each particular case, guided by the rule of ordinary care and prudence. If a person by the exercise of such care could have discovered an approaching car and avoided the accident, and he failed to do so, he cannot recover. So the question in every case is one of ordinary care. Failure to look and listen might be conclusive, or at least very strong, evidence of negligence in one case, and in another of no particular controlling force at all. The ultimate determination of the question must depend largely in each case on the surrounding circumstances.

The mere fact that the plaintiff in this case was not familiar with the location of the street car lines in Minneapolis, and did not know at the time whether a line was located and in operation upon the

street she was crossing, the court holds, was not conclusive that she was not negligent. It says that whether an injured party is familiar with the location where an accident happens, and with the particular danger, is always an element to be considered in determining whether he was guilty of negligence, but it is not conclusive one way or the other. The rule is that if the person have no actual knowledge of the danger causing his injury, and could not by the exercise of reasonable care have discovered it, he cannot be said to be guilty of contributory negligence. But if ignorant of the danger, and the exercise of reasonable care would have made it known, and there be a failure to exercise such care, he is chargeable with negligence, and to the same extent as though perfectly familiar with it.

Furthermore, the court hold that the mere fact that a person is upon a street upon which runs a street car line is no evidence that he is in a position of peril. The motoneer in charge of a street car has the right to presume that pedestrians will exercise due care for their own safety and protection, and is not required to assume that every person in front of his car, at a considerable distance, will fail to exercise that care, or is in a position of peril.

DUTY TO STOP AT REGULAR CROSSINGS AND ON OCCASION TO BACK UP TO SAME FOR PASSENGERS.

Jackson Electric Railway, Light & Power Co. v. Lowry (Miss.), 30 So. Rep. 634. Oct. 28, 1901.

A street railroad company, the supreme court of Mississippi holds, is under a duty to the public to stop at its regular crossings, on a reasonable signal, to receive those desiring to take passage. It cannot avoid this duty by any practice or rules of its own. Its rules must be reasonable, and an absolute contrary rule would be unreasonable. It is unreasonable for it to have a rule that where its cars stopped beyond the crossing, they should not be backed to the proper place, in order to receive the person signaling, under all circumstances. Where the distance is short, and the road good, and no inconvenience given the proposed passenger, it is not meant to hold that such a rule might not be held proper. But it is highly improper for it to be made, or obeyed, to apply in a case like this one. Here it was a rainy night, and the road very muddy, and the stop 20 or 40 feet beyond the brick crossing, and the passenger, as known to the operatives, with 7 blocks to walk unless he got passage. As to damages, the court holds that this case was one in which exemplary damages could be recovered, it further appearing that when the car was on its return trip the passenger boarded it and paid his fare to get the names of those in charge of it and was treated insolently by the conductor and made sport of by him when he alighted.

DUTY OF EMPLOYEES TO REMOVE YOUNG CHILDREN FROM PLATFORM—WAYS TO DO IT—FORMER LANGUAGE EXPLAINED.

Levin v. Second Avenue Traction Co. (Pa.), 50 Atl. Rep. 225. Nov. 8, 1901.

The supreme court of Pennsylvania says that when this case was up before (194 Pa. 156, 45 Atl. 134) it held: "When the motorman discovered the boy on the platform of the car, it was his duty to stop, and take him inside, or put him off." This simply followed Railway Co. v. Caldwell, 74 Pa. 421, and what the language clearly means is that when a child of years so tender that negligence cannot be imputed to it is found by a conductor or motorman on the platform of his moving street car, his duty is to remove it from its peril. This can be done by stopping the car, and putting it off, or by taking it inside. In saying, "The youth of the boy exempted him from the charge of being a trespasser, in the legal significance of the word (Barre v. Railway Co., 155 Pa. 176, 26 Atl. 99), and no negligence was imputable to him," in 194 Pa. 45 Atl. above the word, mean that the boy was not a trespasser to whom no duty was owed, and they ought to be so understood. In Enright v. Railroad Co., 198 Pa. 106, 47 Atl. 938 cited by counsel for the traction company, while it is true the boy was held to be a trespasser upon the train of the railroad company, the court also decided that its employe could not eject him, or cause him, by fright or fear, to leave the train, while in rapid motion, so as to endanger his life; and that it was the duty of the defendant company and its employe not to eject him. The duty of a street railway company's conductor or motorman is to refuse to permit a child five years old to be on the platform of

his moving car, and, if it gets there without permission, through the oversight of the company's employe, the duty of the latter, as soon as it is discovered, is to remove it from its position of danger. Failure to do so is negligence.

MALICIOUS ASSAULT OF CONDUCTOR ON PASSENGER HELD TO JUSTIFY EXEMPLARY DAMAGES.

Lexington Railway Co. v. Cozine (Ky.), 64 S. W. Rep. 848. Oct. 23, 1901.

A passenger requested to be left off at a certain place. As the car approached the place, he signaled to the conductor to stop. Failing to attract his attention, he reached up to pull the bell cord, but by mistake got hold of the wrong cord, and rung up a fare. The conductor thereupon went back and asked what he rang the bell for, and said, "You owe me a nickel." The passenger responded, "I have already paid you, but I will give you another nickel," and shoved it along the seat, and at the same time arose for the purpose of alighting. The car, however, did not stop, and he remarked to the conductor, "If you do not stop the car, I will ring the bell again." At the time he said this he was holding to the side of the car with both hands, and standing on the footboard. The conductor responded, with an oath, "No, you won't," and immediately struck him twice in the face, bruising one eye and cutting a gash in his face. The passenger was a cripple, and partially paralyzed in both legs from the knees down, and was making no effort at all to assault or otherwise injure the conductor. The jury was instructed that, if they believed from the evidence that the assault made upon the passenger was inspired by malice on the part of the conductor towards the passenger they might allow the latter punitive damages, by way of punishment. This meets with the approval of the court of appeals of Kentucky, which affirms a judgment against the company. It says that while there was nothing in the record to show that the company either authorized or approved the conduct of the conductor in this matter, yet he was clearly acting in the line of his employment at the time of his brutal and unjustifiable assault upon a passenger who was entitled to his care and protection, and the case was clearly brought within the rule of law authorizing the instruction.

COLLISION WITH PATROL WAGON AT CROSSING.

Decker v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 72 N. Y. Supp. 229. Oct. 11, 1901.

A policeman in charge of a heavy patrol wagon, which another policeman was driving, was injured in a collision with a car at an intersection of streets. The patrol wagon was going at a brisk trot, one of the horses galloping, down grade, the ratchet bell ringing. When the horses reached the curb line, the car was near the crossing, perhaps from 30 to 100 feet away, running at about the usual rate of speed, and the driver of the patrol wagon whipped up his horses, and attempted to pass in front of the car. The result was the collision, the car striking the patrol wagon back of the rear hub. Upon this evidence, the second appellate division of the supreme court of New York affirms a judgment for damages against the company. It says that this accident occurred at a street intersection, where the rights of the parties were equal. The driver of the patrol wagon, whose negligence might, perhaps, be imputed to the policeman suing, was bound only to the exercise of that degree of care which a reasonably prudent man would or should have exercised in like circumstances; and it is of the opinion that the evidence supported the conclusion that the one suing did exercise the degree of care which was fairly to be expected of the driver of a patrol wagon. He was ringing the ratchet bell. He was driving in response to a call, and he had a right to assume that approaching street cars would be under control at street intersections. The jury had a right to take into consideration that the patrol wagon was acting in a public emergency; that it was, as is customary, being driven at a high rate of speed, and going down grade; and the fact that the driver used the whip, instead of attempting to stop the horses before they reached the track. It may have been prudent for the driver to attempt to pass over the tracks rather than to try to bring the team, with its heavy wagon, to a standstill within the few feet which intervened between the tracks and the horses at the moment of

discovering the approaching car, and it was for the jury, with all the evidence before them, to determine whether the driver was exercising that reasonable degree of care which the circumstances demanded.

FAILURE TO LOOK FOR CAR—CARE REQUIRED OF MOTORMAN—WHAT MAY BE ASSUMED OF VEHICLES MOVING TOWARDS TRACK.

Cowden v. Shreveport Belt Railway Co. (La.), 30 So. Rep. 747. June 3, 1901. Rehearing denied Nov. 18, 1901.

Not to look to see if a car is coming before attempting to cross the track of an electric car, the supreme court of Louisiana holds, is negligence such as will preclude recovery for injuries caused by a collision with the car, in the absence of proof that the persons in charge of the car by the use of ordinary diligence might have avoided the collision. But ordinary care for a motoneer, it holds, comprehends utmost vigilance. And it doubts whether a car with a speed of 10 miles an hour could be stopped in five seconds.

Then the court says that the motoneer in question could not be supposed to have been looking in the direction of an intersecting street. He must be supposed to have devoted his entire attention to the street on which his car was running. The side streets being opposite to each other, he could not turn his face in the direction of one without turning his face away from the other. He had, therefore, to divide his attention between the two, which meant that he had to devote his entire attention to the street he was traveling on. In other words, he, unlike the occupants of the wagon approaching the crossing from the side street, could not keep a sharp lookout at the corner.

And, even after the horses had fairly emerged from behind the corner building,—say when their heads had reached the sidewalk line,—he was not bound, the court holds, to divine the intention of the wagon to make straight for the track, and, so divining, to have recourse at once to heroic measures for stopping the car. The natural assumption in such a case was that the wagon would stop or turn aside. If a motoneer must, under penalty of negligence or worse, assume that every vehicle or every pedestrian he sees moving towards the track will keep on the even tenor of their way, and acting upon such assumption, must at once put on brake and reverse current, what becomes of rapid transit in cities?

DUTY OWED TO EMPLOYEES IN FURNISHING APPLIANCES—DEFECTIVE BROOKLINE—RELYING ON MANUFACTURER FOR INSPECTION.

Murphy v. Coney Island & Brooklyn Railroad Co. (N. Y. Sup.), 73 N. Y. Supp. 18. Nov. 22, 1901.

A lineman engaged in fastening span wires into a brookline or turn-buckle received a severe shock of electricity. Subsequent to the accident it was found that the brookline had leaked, and thereby had become defective, though there was no evidence that the defect was visible. At the close of the testimony it was held that there was not sufficient preponderance of any violation of duty upon the part of the company to justify a verdict, and that as it had bought the brooklines from a reputable manufacturer, who assumed the duty of inspection, the company was not negligent in failing to make another test. The second appellate division of the supreme court of New York holds that this was error, and reverses the judgment rendered in favor of the company, granting a new trial, upon the ground that the testimony required the submission of the case to the jury, but with the statement that it expresses no opinion as to the liability of the company.

The obligation of the company, the court holds, was to furnish its employees good and suitable appliances, and to use reasonable care to keep them so. The master's duty in choosing materials for his servants is to use care similar to that which a man of ordinary prudence in similar business, acting for his own safety, would use in choosing such materials for himself, were he doing the work. The rule is the same whether the master buy the appliance ready-made, cause it to be made, or purchase the materials and make it. Of course, it says, it does not hold that the obligation upon the master requires him always to inspect appliances, so that proof of omission to inspect is proof of negligence. But there were two features in the testimony in this case which in its opinion, made the question one for the jury: First. There was no proof what-

ever that the manufacturer ever made any tests of the brooklines. The testimony only went to show that the manufacturer made a verbal promise that he would test them. Second. There was testimony that practicable tests could be made by the company of the brookline in its finished form, which would have revealed the defect in question, and that the defect was not inherent in the material of construction, but was due to a leakage from the appliance. It was necessary for the lineman to connect the brookline with the span wires, and he had a right to rely upon the fact that the master had used due care in furnishing an apparatus the very purpose of which was insulation.

SUFFICIENCY OF COMBINED CONSENTS OF COMPANIES THAT MERGE—NATURE OF CONSENTS—EFFECT OF SALES OF PROPERTY.

Adee v. Nassau Electric Railroad Co. (N. Y. Sup.), 72 N. Y. Supp. 992. Nov. 15, 1901.

Two different companies having each obtained a number of consents for the construction of a street surface railway on a certain street, but neither company alone having sufficient, the second appellate division of the supreme court of New York holds that, on the merger of one of the companies into the other, the latter, with the combined consents of the two companies, which were from different parties, and were in the aggregate prima facie sufficient, was, upon the face of the papers, justified in entering upon the street and laying down its tracks. Nor does it consider that in this case, an action brought by an owner of property abutting on the street to enjoin the construction and operation of the road on the ground that the required consents had not been obtained, that conformity of the merger to law could be inquired into, that being a question to be dealt with in an action brought for that particular purpose, if at all. Neither does it consider that the rights of the surviving company were prejudiced in the matter because it had pending in the courts an action which it brought before the merger to get the authority through commissioners to construct the road on the ground that it was unable to secure the necessary consents.

Furthermore, the court says that if it reads and catches the spirit of the state constitution and statute aright, these consents are not mere licenses to be revoked at will, or by the transfer of the property before the construction of the railroad; nor do they contemplate a conveyance of real estate. If either of these two companies failed to record the consents it obtained, the sale and conveyance of the properties on which these consents were based did not invalidate the consents. The most that could be claimed would be that the new owners, having purchased without notice, would not be estopped to assert any property rights which might have come to them under their deeds as against the company. Continuing, the court says that if the surviving company had neglected to record its consents until the rights of third parties had intervened, it had only itself to blame, and it might not complain, perhaps, if it was called upon to pay for the property rights of subsequent purchasers in good faith without notice; but the fact that parties, strangers to the record in this case, might have a cause of action against the company for taking their property for a public purpose without just compensation, could not give the party suing in this case any rights in an action brought to restrain the company from constructing its railroad under the consents which had been given in writing by the property owners. In other words, the party suing could not be permitted to deprive the company of its property rights in these consents, which the statute declares "shall be effectual for the purposes therein mentioned," because some one else may have been deprived of his property in the highway.

The consent, if valid when made, is the consent of the owner of the property, and, in contemplation of law, vests a certain property right in the company to which the consent is given, which cannot be divested by any subsequent transfer of the property, although the purchaser without notice may acquire the full right to demand compensation for any injury to his rights which may follow from the construction of the road. So, the party suing, never having consented to the construction of the road, assuming him to be the owner of the fee (title) of the street in front of the premises, might maintain an action to compel the payment of damages, but he had no right to prevent the construction of the road under the consents given by the owners of one-half in value of the abutting property.

The Operation of Street Railway Parks.

Some Experiences at Birmingham, Binghamton, St. Louis and Elsewhere — Suggestions for 1902 — A Novel Plan for Overhead Lighting.

SUBURBAN GARDEN, ST. LOUIS.

The St. Louis & Suburban Railway Co., of St. Louis, is interested in an amusement park which has proved to be very popular and consequently has been successful from a financial standpoint. The resort which is known as Suburban Garden, is operated by the Suburban Garden Amusement Co., which is controlled by the railway company.

Suburban Garden is situated on an eminence at the western terminus of the company's main line, and is by all odds the coolest and most attractive resort of the many in St. Louis and its suburbs, although its area, while ample is not as great as that of one

been made an attractive place for equestrians and drivers of pleasure vehicles by affording ample carriage sheds and accommodations for horses.

Benefitting by the experience of its predecessors at this garden and that of its competitors the company eschewed all other classes of attractions in favor of high-class vaudeville and found that the higher the class of the attraction the more popular the resort became and the better the audiences were pleased. So gratifying was the experience in this direction that the one certainty about the future of the Suburban Garden, for the present year at least, is that high-class vaudeville will constitute the offerings to patrons.



SUBURBAN GARDEN, ST. LOUIS.

or two other St. Louis gardens. In addition to the theater which is fitted up with light veneer orchestra seats, arranged in sections and sold by chart numbers, the attractions include a scenic railway, an electric fountain, two pavilions, one containing a first-class cafe (conducted last year by Louis Caesar, one of St. Louis' fore-

By courtesy of Mr. T. M. Jenkins, general manager of the St. Louis & Suburban Ry. and president of the Suburban Garden Amusement Co., we are enabled to show here two illustrations of Suburban Garden.

EAST LAKE PARK, BIRMINGHAM, ALA.

A park at the terminus of a railway line has always proved a paying investment provided something was offered in the way of amusements to induce the people to patronize the resort. The Birmingham Railway, Light & Power Co. has controlled and operated a beautiful little park called East Lake at the terminus of its line of that name for seven years with varying success. A number of views taken at this park were published in the "Review" for July, 1898. The first year of its opening the railway company assumed complete charge of the amusements, building an enclosed theater and booking attractions for it in the usual manner. A coupon ticket, consisting of two street car tickets and an admission ticket to the theater was sold by conductors for 10 cents each, but this system was abandoned after the first season, as it only served to reduce the price to a certain number who attended regularly, and did not serve to increase the attendance. The attraction was a stock company playing light comedies interspersed with vaudeville numbers. This proved a good drawing card in itself, besides which there was the lake where those who cared to do so might boat, fish or swim and for the more indolent, an electric launch plied from one of the lakes to the other carrying passengers for 5 cents for the round trip. This was very largely patronized by the children.

The next season the same form of amusements were presented except that instead of booking independently the company joined a circuit of several other Southern cities, thinking thereby to secure the services of the theatrical people much cheaper, but this proved a failure for the reason that when an inferior actor was billed to



LIVING PICTURES AT ST. LOUIS.

most restaurateurs), and numerous attractions which have come to be known as "midway" shows, merry go rounds, etc.

It has been the object of the management to provide a high-class resort, catering only to the better classes and all the appointments were made with that idea in mind. While, naturally, it is primarily intended to be a "feeder" for the street railway it has

appear for a two weeks' engagement there was no remedy but to let him continue until the end of his engagement and until the next company was due to arrive. This of course was detrimental to good attendance and the company withdrew from the circuit as soon as practicable.

Subsequent seasons the railway company leased the Park to individuals or companies who agreed to assume entire charge of the theatrical attractions for the door receipts, while the railway company got the car fare. The bill was the usual summer park theatrical production changed twice weekly and was presented with varying success, according to the class of performances playing.

On Sunday afternoons a band of ten pieces dispensed popular airs from 3 to 6 p. m. The band was transported to the park on a special car built for the purpose, first riding around in the heart of the town playing inspiring music, and was closely followed by the regular passenger cars loaded to the guards. The band on Sunday afternoons has always proved itself a drawing card.

While the attendance was at all time very good the management thought that if there were other attractions besides theatrical ones that the attendance would increase accordingly and to that end for the ensuing season the park has been leased to Mr. W. H. Pickens, a popular salesman for Robert Johns, of Chicago, and an old theatrical and park manager. Mr. Pickens is going to build a "Shoot the Chute" of the latest improved plan, install a merry-go-round of large proportions and introduce such other attractions as may seem advisable later in the season. He has under consideration the erection of a "Loop-the-Loop" should the other features draw well.

A very attractive inducement to park patrons will be the excellent refreshment booths which will be located in desirable places about



CASINO PARK—BINGHAMTON R. R.

the park and in the center will be a large dance and refreshment hall. The service and the ices will be of the best. It is proposed to use the main refreshment hall for a roller skating rink, which should prove a good idea as the roller skating fad has seized Birmingham with a firm grip and to keep up with the crowd now one must be an expert on rollers.

The railway company is having plans prepared for an open air theater of 2,000 seating capacity. This is to be built after a rustic design out into the lake and is to be lighted with 500 incandescent lamps. The form of amusement is to be varied; for instance one week, vaudeville will be presented, the next melodrama, and the next light opera, thus avoiding a surfeit of one particular kind of theatrical attractions. Every evening before the performance in the theater a band, employed for the season will render a concert and on Sundays there will be no performance in the evening, but the band will present two concerts, one in the afternoon and one in the evening.

It is anticipated with such increased attractions at this park that the travel this summer will be very heavy and to that end the construction department is hurrying the work of relaying the double track with 70-lb. rails. With a heavy rail, double track and plenty of cars it is believed that unusually large crowds may be handled with comparative ease and dispatch, making East Lake Park one of the most desirable resorts to be found in which to spend an evening.

BINGHAMTON, N. Y.

The plans of the Binghamton (N. Y.) Railroad Co. for the ensuing season at Ross Park, Binghamton, and the Casino, Endicott (the new village recently established directly opposite Casino Park), the two summer resorts controlled and operated by this



BRIDGES IN CASINO PARK.

company, will be very similar in character to those in vogue heretofore.

Ross Park, Binghamton, is the public park, for which the railroad company control the amusement and refreshment privileges. The Casino and Casino Park are the property of the Binghamton Railroad Co. and controlled and operated by it. High class vaudeville entertainments are provided at both resorts, the company conducting the various privileges, refreshment and otherwise, in connection therewith.

By courtesy of Mr. J. P. E. Clark, general manager of the Binghamton Railroad Co., we are enabled to show here a number of views taken in these parks, and those of our readers who are interested in the details of the street railway park business cannot do better than refer to the "Review" for April, 1899, page 228, where we published an article on "Parks and Free Amusements as a Means of Stimulating Street Railway Traffic," by Mr. Clark, who has been most successful in making parks profitable for his company.

Among the principles for the conduct of such parks laid down in that article, are the following: No liquor must be sold. Keep your resort clean, wholesome and respectable. Use care in selecting entertainments. Keep within bounds as to expense.

SOUTH BEND, IND.

Mr. J. McM. Smith, general manager of the Indiana Railway Co.,



CHILDREN'S CORNER AT ROSS PARK—BINGHAMTON R. R.

of South Bend, Ind., in response to an inquiry advises us that the company is undecided as to the operation of its park during the coming season. The city has annexed part of the park and the company's track running to the park, so that it now becomes

necessary, in accordance with the terms of the franchise, to issue transfers to passengers returning from the park, which the company claims it cannot do because the distance is so short that conductors barely have time to collect fares. The company has before the council a proposition, which if adopted, will relieve it of the necessity of furnishing transfers, and in that case it will go ahead with its amusements; otherwise it will be obliged to close the park for the season.

NEW BEDFORD, MASS.

The Union Street Railway Co., of New Bedford, Mass., is operating one park, known as Lincoln Park, located about seven miles from the center of New Bedford and about the same distance from Fall River on the line of Dartmouth & Westport Street Ry. The



FOUNTAIN IN CASINO PARK, BINGHAMTON.

park is not on any body of water but depends for its attractions on a beautiful pine grove. It is supplied with the regulation park amusements, such as free dancing under certain restrictions, which is that perfect order must be preserved, a free Punch and Judy show for the children, free vaudeville shows, except that 5 cents is charged for a few of the most desirable seats, the show being given from the stage 30 ft. square, but the audience see the show from the open air. There are located on the grounds the ever present merry-go-round and toboggan slide for the use of which a charge of 5 cents is made. Clam bakes are served several times each week in a building built exclusively for the purpose and the bakes are well patronized. The main building is what is known as the casino and is supplied with a first-class restaurant and ice



WAITING FOR THE MATINEE BINGHAMTON.

cream parlor. There are many other small attractions and the grounds are well looked after so far as being kept clean. The grove is supplied with free swings and rustic seats and slight attempt is made at decoration in the way of flower beds and rustic vases, but nature needs little assistance to make the place very attractive. This park is probably the pioneer of suburban parks

operated by car lines in eastern Massachusetts, having been operated for about eight years. The company does not anticipate making any decided changes from its past method of operating or of introducing any new features. In addition to the attractions named free open air band concerts are given evenings and afternoons on Sunday.

MULTIPLE SERIES FOR PARK LIGHTING.

BY GEORGE K. HYDE.

The Park at Savin Rock, New Haven, Conn., containing about 3¼ acres is lighted by about 500 electric incandescent lamps arranged to give a canopy effect. The current for these lamps is taken from the trolley circuit, and as putting the lamps in series of five each would make too many wires overhead, I devised the multiple-series system here described, which will doubtless be of interest to others having similar work to carry out.

In the center of the park four poles were set at the corners of a 100-ft. square surrounding the electric fountain; these poles were 45 ft. above the surface of the ground. Poles 15 ft. above the ground were set at the outer corners and 100 ft. apart along the outer edge. Iron wire was run to connect the tops of the four

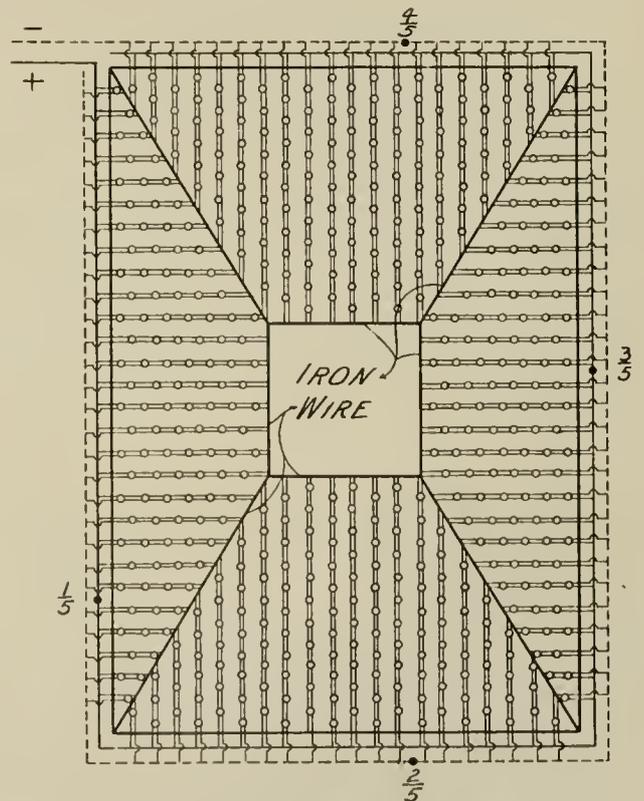


DIAGRAM OF PARK WIRING, NEW HAVEN.

poles forming the center square, around the outer edge of the grounds, and to connect the corners of the center square to the corresponding corner of the park boundary. These wires were to carry the circuit wires.

Fifteen feet from the corner two wires were fastened to the outside iron wire with insulators and were run, at right angles to the outside wire, until they touch the diagonal wire where they were dead-ended with insulators.

Fifteen feet from these wires, two more were run, parallel, till they met the diagonal wire, and so, every 15 ft. around the edge; these wires, of course, being different lengths, according to their distance from the corner, and, as the lights were to be 15 ft. apart, this distance was taken for a standard.

Starting on the first pair of parallel wires, a light was connected across the two 7½ ft. from the outside wire; on the second pair the light was connected 15 ft. from the outside, and so on, alternating. The number of lights on each pair of wires varied from one to eleven, according to their length.

All these parallel wires were connected in multiple to the two circuit wires around the outside. This method put all the lights in multiple. To get the series connections, a wooden insulator was cut in the top or portion of the outside wires, so as to have one-fifth of the total, being 104 lamps in this case, in multiple. Another insulator was cut in this wire, after two-fifths more or three-fifths of the total number from the starting point, and the wire dead-ended after the last light on the same pole from which it starts.

The bottom or negative of these two wires has an insulator after four-fifths of the total number, bringing the insulators on this wire half way between those on the positive, putting each multiple of lights in series with the next one, and so on through the five multiples, this negative wire also being dead-ended on the pole from which it starts.

Owing to the various lengths of the parallel wires it was not possible to get the multiples exact, but there being so many lights in each multiple, one or two more or less did not make any difference.

The advantage of this system, aside from the saving of wire, lies in the fact that when a light goes out, from any cause, that is the only light affected, and not five, as in the straight series.

CARD LEDGER SYSTEM ADOPTED BY BROOKLYN RAPID TRANSIT CO.

In the issue for Oct. 15, 1901, the "Review" published the first authorized description of the method of purchasing and storeroom accounting on the Brooklyn Rapid Transit system. In January of the present year the jurisdiction of the general storekeeper of the Brooklyn roads was extended to include certain other departments and as a result of the increase in the number of separate accounts to be carried under the new conditions the management has authorized the adoption of the plan by which the stock ledger is kept on cards, and which will supersede the book ledger described in the article referred to.

Under the new order the general storekeeper in addition to the accounts previously handled by him, will assume the custody and issue of all the stores for the track and power house departments

The new stock ledger card is 7 3/4 in. long by 5 in. high and is ruled (on both sides) as shown in the sample reproduced on this page. As has been told in the "Review," the Brooklyn company keeps a daily ledger with each class of material, as "Line," "Track," etc. This ledger is kept on sheets bound into book form and gives a daily balance for all material and supplies in store. This "daily" ledger sheet system will be continued as before. The cards displace the general supply ledger which is a book made up from the "daily" sheets giving "monthly" balances of quantity, unit, price, and total value of each item of material on hand and issued. The column headings on the card are self explanatory. A double set of columns is provided for the "credit" entries as goods are usually given out in smaller quantities than they are received and there are therefore a larger number of entries on the credit side than on the debit side.

D. L. & W. PENSIONS ITS EMPLOYEES.

In addition to the railroads making a practice of pensioning their employes, which were mentioned in the "Review" for January, 1902, announcement has just been made by the management of the Delaware, Lackawanna & Western Railroad, that a pension system for the benefit of the employes of the road was put into effect March 1st. The adoption of such a system has been under consideration by this company since 1899, and the plan finally accepted has been the subject of careful study to insure the inclusion of the best features of the systems in use by other large corporations. In the system adopted any employe engaged for 25 years in any capacity, who has faithfully performed his duties, is to be retired at the age of 65 and to receive thereafter a monthly allowance depending on his pay and length of service. The amount of the pension is gaged by the average monthly pay received for the ten years preceding retirement as well as by the actual time of service for the company. For example, if the monthly pay was equal to \$60 a month, and the time of service 30 years, the pension will be \$18 per month, equal to one per cent a year for 30 years, or an average monthly wage of \$60. If the employes from the ages of 60 to 64 years have served the company for 25 years or more, and have

CASES, GEAR, G. E. 800.

DR.							CR.							
DATE.	ORDER.	REQ'N.	QUANTITY.	UNIT.	UNIT PRICE	AMOUNT.	DATE.	S'N	QUANTITY.	AMOUNT.	DATE.	S'N	QUANTITY.	AMOUNT.
01-Dec. 6	25045	6873	11	Ea.	11 50	126 50	Dec. 1		13	149 50				
" 19	"	"	13	"	"	149 50	Balance.....		11	126 50				
			24			276 00			24	276 00				
02-Jan. 1	Balance.....		11	Ea.	11 50	126 50								

RULING FOR STOCK LEDGER CARD.

(except coal for fuel), of the freight and express carrying department and of all the company's extensive dock properties. He will also assume supervision of the department for transporting all material and supplies from the general storehouse to all points of the system, having direct charge of all flat cars and other equipment detailed to this work. Hereafter when any department needs material moved or emergency work done in transporting material and supplies, application is to be made direct to the general store-keeping department. The general storekeeper will also engage and discharge all stevedores, laborers and helpers employed at the docks and depots for loading, unloading and transporting material and supplies. General charge of the supplies required at the company's stables is also to be delegated to the general storekeeper. This will give this official the custody and issue as well as the transportation and distribution of all the stores required in every department of the Brooklyn Rapid Transit Co.

At the present time the company has on hand nearly \$600,000 in stock, having recently taken advantage of a low market to purchase extensively of certain classes of material, particularly copper. It is estimated that the interest on the investment tied up in stores is more than offset by the saving in prices at the present markets. As a result of the extended scope of this department it became necessary to add over 1,000 new accounts to the general stock ledger. It was determined that the ledger system in book form would not be sufficiently elastic to afford means for rapidly charging stores in and out and striking balances and the card ledger has therefore been selected to take the place of the book.

become physically or otherwise incapacitated they are either retired voluntarily or by a decision of the board, and pensioned. In case of injuries the board has jurisdiction in regard to awarding pensions.

The fund from which payments will be made is appropriated each year by the company. Employes are not required to contribute to it. For the remainder of 1902 an appropriation of \$50,000 has been made. The company does not consider the pension as a favor but as a permanent annuity earned by faithful and loyal service.

AMMETERS ON ROTARY PLOWS.

Mr. William Pestell, superintendent of motive power and machinery for the Worcester Consolidated Street Railway Co., writes us that the plan of placing an ammeter in the fan motor circuit of the Ruggles rotary plow, as described in the "Review" for February, page 95, is working very satisfactorily. It had been found that sometimes when working with the rotary in very hard snow the four motors on the plow would drive it faster than the fan could cut its way into the drifts and there was danger of overloading the fan motors. An ammeter was therefore placed in the fan-motor circuit enabling the operator to tell just what load the motors are carrying and aiding him in regulating the speed of the plow in accordance with the speed with which the fan is cutting into the snow. The fan on the plow is driven by two independent 40-h. p. motors.

New Work in 1902.

New Electric Railways, Extensions Proposed, Track to Be Rebuilt, Increase in Equipment, Additional Building Contemplated, Etc.

The following list of the electric railway companies which contemplate building or rebuilding tracks, erecting new buildings, increasing equipment, etc., has been compiled from divers sources and is believed to be correct for the companies named.

Those items which are followed by a date only are taken from statements sent us direct by the company. Where the information has been published in the "Street Railway Review Bulletin" that fact is denoted by the word Bulletin and the date.

ALABAMA.

Anniston Electric & Gas Co. Will build $\frac{3}{4}$ -mile extension, for which material has been purchased. H. W. Sexton, general manager, Anniston, Ala.

Warrior River Power Co., of Ensley, Ala. Recently incorporated to build an electrical plant on the Warrior River for the operation of the proposed Steel Cities Ry. between Birmingham and Ensley. J. S. Kennedy, of Ensley, is interested. Bulletin, Feb. 13, 1902.

ARKANSAS.

Citizens' Electric Ry., Eureka Springs, Ark. Will build new car house with capacity for storing 8 cars. The company recently purchased trucks and 8 car motors. M. D. Jordan, manager, Eureka Springs. Feb. 5, 1902.

Fort Smith Traction, Light & Power Co. Will build 2 miles of new track and buy 2 new cars. A. N. Sicard, manager, Fort Smith, Ark. Feb. 5, 1902.

CALIFORNIA.

Los Angeles & Redondo Railway Co. Will build 17 miles of new track and rebuild 19 miles of present system. Will build new car houses with capacity for storing 16 cars; will build 10 new cars and buy 40 car motors. H. B. Ainsworth, manager, Los Angeles, Cal. Feb. 11, 1902.

Redlands Street Railway Co. Will build one mile of new track, and increase capacity of power station 200 kw. Will buy one new car and two car motors. C. W. A. Cartledge, vice-president, Redlands, Cal. Feb. 14, 1902.

Market Street Railway Co., San Francisco, Cal. Planning a new power house of 2,500 kw. capacity.

Bakersfield & Kern Electric Ry. Projects an interurban line to be under construction this spring. M. H. French, Los Angeles, Cal., may be addressed. (Bulletin, Jan. 23, 1902.)

Oakland & San Jose Railroad Co., of Oakland, Cal. Recently incorporated to operate an 84-mile electric railway system connecting Oakland, San Jose, Los Gatos and Santa Clara, a 50-mile portion of which is now in operation. Will construct remainder of system this year. W. F. Kelly, general manager, Oakland. (Bulletin, Dec. 4, 1901.)

North Pacific Coast R. R., San Francisco, Cal. Recently purchased by John Martin, R. B. Colgate and E. J. de Sabla, jr., of the Bay Counties Power Co. Line between San Francisco, Sausalito and San Rafael at present operated by steam will be converted into an electric system. (Bulletin, Jan. 16, 1902.)

COLORADO.

Colorado Springs Rapid Transit Co. Will build 5 miles of new track, and rebuild 20 miles of present system. Will increase capacity of power station 2,100 kw. and build 3 car houses, 80x100 ft. and 60x100 ft. The company has bought 15 new cars and will buy G. E. 67 car motors. D. L. Macaffree, superintendent, Colorado Springs. Feb. 5, 1902.

Denver & Northwestern Railway Co. No definite information to give at this time, but contemplates extensions of its system in near future. William G. Smith, general manager, Denver, Col. Feb. 5, 1902.

Denver & Northwestern Ry., of Denver, Col. Grading under way for a 30-mile electric line to connect Denver, Lafayette and Boulder. S. M. Perry, Denver, president. (Bulletin, Jan. 2, 1902.)

CONNECTICUT.

Torrington & Winchester Street Railway Co. will build three miles of new track. Charles Alldis, superintendent, Burrville, Conn. Feb. 7, 1902.

Watertown & Litchfield R. R., Litchfield, Conn. Will build 12 miles of new track. T. H. McKenzie, secretary, Southington, Conn. Feb. 6. (Bulletin, Jan. 30, 1902.)

New London Street Railway Co. Will build annex to car house to accommodate 8 cars. Will buy 2 double truck 13-bench cars and G. E. 67 motors for same. L. Bentley, superintendent, New London, Conn. Feb. 6, 1902.

Norwich Street Railway Co. Will rebuild $2\frac{1}{2}$ miles of present system and enlarge its car house to accommodate 8 additional cars. W. L. Adams, superintendent, Norwich, Conn. Feb. 6, 1902.

DISTRICT OF COLUMBIA.

Capital Traction Co., Washington, D. C. Will renew rails for distance of 3 miles. D. S. Carll, chief engineer, Washington. Feb. 5, 1902.

Washington & Annapolis Electric Railway Co. Has 46 miles of street railway under construction to be completed by May 1, 1903. James Christy, general manager, Bond Bldg., Washington. (Bulletin, Feb. 13, 1902.)

FLORIDA.

Palatka & Heights Street Railway Co., Palatka, Fla. Will build 16 miles of new track and 19 miles of transmission line. Will purchase some equipment. W. P. Craig, treasurer, East Orange, N. J. Feb. 11, 1902.

An electric railway from Tampa, Fla., around Old Tampa Bay to St. Petersburg is projected by a syndicate of which John P. Martin, of Xenia, O., is at the head. Entire system will aggregate 100 miles. Jewett Car Co. will furnish 40 cars; boilers will be supplied by the Aultman-Taylor company. (Bulletin, Dec. 12, 1901.)

GEORGIA.

Augusta Railway & Electric Co. Will rebuild 3 miles of old track; also new car house with capacity for storing 10 cars. Will increase capacity of power station 1,000 kw. W. E. Moore, general superintendent, Augusta, Ga. Feb. 7, 1902.

Augusta & Aiken Railway Co. will build 20 miles of new and rebuild 2 miles of old track; will also build new power house and a car house with capacity for 10 cars. Cars and motor equipment have been bought. Walter M. Jackson, general manager, Augusta, Ga. Feb. 7, 1902.

Macon Consolidated Street Railroad Co., Macon, Ga. Has no construction plans under consideration, and expects to make no purchases. E. E. Winters, general manager, Macon, Ga.

Georgia Railway & Electric Co., Atlanta, Ga. Estimated expenditure for new tracks and equipment, \$500,000. H. M. Atkinson, Atlanta. (Bulletin, Feb. 20, 1902.)

HAWAII.

Manoa & Palolo Land Co., Honolulu, H. I. Has increased capital stock from \$40,000 to \$200,000 and will build an electric railway from Kapiolani Park to connect with a route already surveyed in Manoa and Palolo valleys by this company.

ILLINOIS.

Aurora, Elgin & Chicago Railway Co., Chicago, Ill. Now in course of construction. F. B. Bicknell, manager. Feb. 12, 1902.

St. Louis, Belleville & Suburban Railway Co., Belleville, Ill. Will build 15 miles of new track and rebuild 5 miles of present system. Will increase capacity of power station 1,500 kw., and purchase 15 new cars and 50 car motors. J. M. Bramlette, general manager, Belleville. Feb. 6, 1902.

Bloomington & Normal Ry. Will build six miles of new track. Will buy six new cars and three double car motors. J. Eddy, manager, Bloomington, Ill. Feb. 13, 1902.

People's Traction Co., Galesburg, Ill. Will build 10 miles of

new track; also new car house 40 x 100 ft. Will build 4 new cars and 16 car motors and equipment. F. W. Latimer, manager, Galesburg, Feb. 12, 1902.

Kankakee Electric Railway Co. Will increase capacity of power station 100 kw. and will buy 2 new cars and 4 car motors. C. H. Cobb, general manager, Kankakee, Ill. Feb. 12, 1902.

Macomb & Western Illinois Railway Co. Will build 95 miles of new track and buy a number of new cars. William A. Compton, president, Macomb, Ill. Feb. 7, 1902. (Bulletin, Nov. 28 and Dec. 19, 1901.)

Interstate Railway, Light & Power Co., Paris, Ill. Is securing franchises preliminary to proceeding with construction work. A. J. Hunter, president. (Bulletin, Feb. 14, 1902.)

Quincy & Southeastern Electric Railway Co. Has received a franchise through Calhoun County, and expects to receive franchises through Brown, Pike, Schuyler and Hancock Counties in 60 days, at which time the work of surveying will be begun. James E. Adams secretary, Quincy, Ill. Feb. 21, 1902.

Rockford Railway, Light & Power Co. Will build 1 mile of new track and rebuild 2 miles of old track; will build new car house with capacity for storing 36 cars. Will buy 8 new cars and 8 motor equipments. F. M. Ellis, general manager, Rockford, Ill. Feb. 14, 1902.

People's Light & Railway Co., Streator, Ill. Will build an 18-mile interurban line and rebuild 3 miles of its present system. Will also build new power station of 3,000 kw. capacity, car house with capacity for storing 18 cars, and new repair shops. Will buy 6 large and 8 small cars, 36 motors, controllers, etc. Six of the new cars are to be equipped with air brakes. J. A. Paul, manager, Streator. Feb. 12, 1902.

Galesburg & Oneida Electric R. R. Proposes 30-mile line with northern terminus at Kewanee, Ill. Rights secured between Galesburg and Oneida, 16 miles. Date of charter, December 1, 1901. Officers H. W. Crane, Oneida, Ill., president; P. F. Brown, Galesburg, Ill., vice-president; F. W. Emery, Knoxville, Ill., secretary, and H. C. Lucas, Galesburg, treasurer. Capital stock issued for preliminary work, \$10,000. Date of information, Jan. 11, 1902.

Local promoters contemplate an electric railway from Litchfield, Ill., to Coffeen, by way of Hillsboro. Franchises secured. Line is estimated to cost \$350,000. Six cars will be operated. O. W. Atterberry, Litchfield. Date of information, Nov. 2, 1901.

Olney, Lancaster & Mt. Carmel Electric Ry., Mt. Carmel, Ill. Will build 42-mile interurban line. Date of charter, June 19, 1901. Capital stock authorized, \$50,000. Officers: A. Knoph, Olney, Ill., president, and Robert Parkinson, Mt. Carmel, secretary. Date of information Nov. 27, 1901.

Rockford & Freeport Electric Railway Co. Has private right of way for proposed line between Rockford and Freeport, and surveys have been made. Construction work to be begun in early spring. T. M. Ellis, superintendent, Rockford, Ill. Date of information, Dec. 23, 1901.

Aurora, De Kalb & Rockford Electric Traction Co. Incorporated to build a line from Aurora to Rockford. W. P. Kopf, Chicago, is interested. (Bulletin, Dec. 12, 1901.)

Aurora, Elgin & Chicago Railway Co. Proceeds of bond issue of \$3,000,000 to be expended for the construction of extensions in Cook County. L. J. Wolf, president, Garfield Bldg., Cleveland, O. (Bulletin, Feb. 20, 1902.)

Illinois Valley Traction Co. of La Salle, Ill. Recently incorporated to build an electric line connecting La Salle, Ottawa, Peru and Spring Valley. W. B. McKinley, Champaign, Ill., is interested. (Bulletin, Jan. 23, 1902.)

Rockford & Freeport Electric Railway Co., of Rockford, Ill. Has completed surveys and is soon to begin construction of an electric line between Rockford and Freeport. T. M. Ellis, superintendent, Rockford, Ill. (Bulletin, Dec. 26, 1901.)

INDIANA.

J. S. Crump's Electric Street Railway, Light & Power Co., of Columbus, Ind., has not definitely determined what new construction it will undertake. R. F. Gottschalk, manager, Columbus, Ind. Feb. 8, 1902.

Indianapolis, Greenwood & Franklin Railroad Co., Columbus, Ind. Will build 21 miles of new track; also new power station and new car house. Will buy 8 new cars and 8 car motors. W. G. Irwin, general manager, Columbus. Feb. 8, 1902.

Evansville & Mt. Vernon Traction Co. Will build 16 miles of new track; also power station of sufficient capacity for the operation of its 16-mile road, and car house with capacity for storing 12 cars. Will buy 12 new cars and 8 car motors. A. D. Jones, secretary, Evansville, Ind. Feb. 4, 1902. (Bulletin, Nov. 14, 1901.)

Indianapolis & Western Traction Co. Will build 20 miles of new track. Charles F. Smith, president, Indianapolis. Feb. 7, 1902.

Jeffersonville, New Albany & Sellersburg Rapid Transit Co. Projects 20-mile interurban line. George H. Holzbog, secretary and treasurer, Jeffersonville, Ind. Feb. 4, 1902. (Bulletin, April 4, 1901.)

Lafayette Street Railway Co. Will build 4 miles of new track. C. D. Emmons, superintendent, Lafayette, Ind. Feb. 7, 1902.

Logansport Railway Co. Will build 4¼ miles of new track and increase capacity of power station 650 h. p. Will build new car house with capacity for storing 6 cars, and will buy 4 new cars and 4 car motors. George J. Marott, president, Logansport, Ind. Feb. 9, 1902.

Chicago & Indiana Air Line Railway Co., South Bend, Ind. Will build 70 miles of new track also car house with capacity for storing 30 cars, and power station of 4,000 kw. capacity. Will buy complete equipment. W. O. Orton, South Bend, Feb. 20, 1902. (Bulletin, Jan. 30, 1902.)

Indiana & Ohio Traction Co., Cincinnati, O. Now operating 40 miles of track. Will build 103 miles additional. Capital stock authorized, \$100,000. Officers: George M. Shirk, Brookville, Ind., president; Alfred A. Beard, Mt. Carmel, Ind., vice-president; John C. Shirk, Brookville, secretary and treasurer; Weston Brothers, Chicago, consulting engineers. George M. Shirk, Brookville, Feb. 25, 1902.

Evansville, Mt. Vernon & New Harmony R. R. Projects 35-mile electric line. Company recently organized, with Frank B. Posey, of Evansville, president, and A. D. Jones, of Howell, Ind., secretary. Date of information, Nov. 9, 1901.

Fort Wayne Dayton & Cincinnati Traction Co., of Fort Wayne, Ind. Will soon begin grading on proposed third rail system between cities named in the title. Road when completed will comprise 300 miles of double track. Samuel F. George, Dayton, O., president and general manager. (Bulletin, July 4, Oct. 22, Dec. 12, 1901, and Feb. 6, 1902.)

Fort Wayne & Southwestern Traction Co., of Fort Wayne, Ind. Will complete 46-mile electric line from Fort Wayne to Wabash, 20 miles of which are in operation. S. L. Nelson, Fort Wayne. (Bulletin, Feb. 6, 1902.)

Kokomo Railway & Light Co., of Kokomo, Ind. Recently consolidated with local lines in Logansport, and projects interurban line between the two cities. T. C. Reynolds, manager Kokomo Railway & Light Co. (Bulletin, Feb. 6, 1902.)

Muncie, Hartford City & Fort Wayne Railway Co., of Muncie, Ind. Projects a line to connect Muncie, Eaton, Hartford City, Montpelier and Fort Wayne. Will erect a power house at Eaton at a cost of \$125,000. E. P. Roberts & Co., Cleveland. (Bulletin, Dec. 12, 1901.)

Chicago & Indiana Air Line Railway Co., of South Bend, Ind. Projects an electric line from South Bend via Michigan City to Chicago. W. O. Orton, South Bend, is interested. (Bulletin, Feb. 6, 1902.)

Wabash River Traction Co., of Wabash, Ind. Present system to be extended from Peru to Logansport. Blakeslee & Co., 58 Waverly Place, New Haven, Conn., managers. (Bulletin, Jan. 2, 1902.)

IOWA.

Creston Electric Railway, Light, Heat & Power Co. Will build 40 miles to new track, and increase capacity of power station to suit the requirements of the same. Will build car house with capacity for storing the 25 new cars which the company expects to purchase. Lyman Waterman, general manager, Creston, Ia. Feb. 3, 1902.

Davenport & Western Electric Railway Co. Will build 25 miles of new track; also new power station and car house with capacity for storing 100 cars. Will buy 50 new cars. W. E. Snider, secretary, Davenport, Ia. Feb. 14, 1902.

Toledo Electric Railroad Co., Toledo, Ia. Will build 76 miles of new track, and buy cars and car motors. W. C. Walters, general manager, Toledo, Feb. 20, 1902. (Bulletin, Jan. 2, 1902.)

Ottumwa Traction & Light Co. Has ordered material for build-

ing 4 miles of new track and for rebuilding part of present system. Expects to buy 4 or 6 new cars and equipment for same; to build a new car house and increase capacity of power station. J. F. Springfield, general manager, Ottumwa, Ia. Feb. 7, 1902.

Oskaloosa & Tama Railroad Co. Expects to begin work June 1st on proposed 100-mile electric railway system. The company was organized in November with the following officers: Dr. S. W. Clark, Oskaloosa, president; Hon. E. G. Penrose, Tama, vice-president; U. C. Blake, Cedar Rapids, secretary, and John Hall, Montezuma, treasurer.

Waterloo & Cedar Falls Rapid Transit Co. Now operating 40 miles or urban and interurban street railways. Projects 35 miles of new track. The company has an authorized funded debt of \$700,000, of which \$350,000 has been issued. L. S. Cass, president, Waterloo, Ia. Nov. 23, 1901.

Charles City, Cresco and Eldora, Ia., will be connected by a proposed electric line, 58 miles in length, in which D. A. Lyons, of Cresco, is principally interested. Construction work will be begun in the spring. (Bulletin, Dec. 12, 1901.)

Davenport & Western Electric Railway Co., Davenport, Ia. Recently incorporated to build a 78-mile interurban line. Work to be begun at once. Robert Kercheval, president and general manager, Davenport. (Bulletin, Feb. 13, 1902.)

KANSAS.

Atchison Railway, Light & Power Co. Will increase capacity of power station 200 kw. and install 500-h. p. boilers. C. M. Marshall, general superintendent, Atchison, Kan. Feb. 6, 1902.

Fort Scott Consolidated Supply Co. Will build 1 mile of new track and rebuild 6 miles of present system. Will buy 4 new cars. E. T. Selig, superintendent, Fort Scott, Kan. Feb. 7, 1902.

Iola Electric Railroad Co. will increase capacity of power station 300 or 400 h. p. Expects to buy new cars. F. W. Crouch, president and general manager, Iola, Kan. Feb. 8, 1902.

Wichita Railroad & Light Co. will build new car house with capacity for storing 20 cars. Will buy 6 new cars. M. Morrison, superintendent, Wichita, Kan. Feb. 7, 1902.

Mineral Cities Electric Railway Co., of Pittsburg, Kan. Recently incorporated to build an interurban line between Joplin, Iola, Chanute, Pittsburg, Columbus and Fort Scott. Frank M. Moon, of North Orville, Pa., is principally interested. (Bulletin, Feb. 13, 1902.)

Topeka Railway Co., of Topeka, Kan. Entire system will be relaid with new rails, and other improvements effected. J. M. Patten, general manager, Topeka. (Bulletin, Jan. 2, 1902.)

KENTUCKY.

Blue Grass Consolidated Traction Co. Will build more than 100 miles of new track and erect new power houses. M. C. Alford, manager, Lexington, Ky. Feb. 17, 1902. (Bulletin, Dec. 12, 1901, and Jan. 16, 1902.)

Georgetown & Lexington Traction Co., of Lexington, Ky. Proposes to complete at once an electric line between the cities named in the title. Will purchase or erect a power house and car house. H. P. Montgomery, of Georgetown, is interested. (Bulletin, Dec. 4, 1901.)

LOUISIANA.

St. Charles Street Railroad Co., of New Orleans. Has issued bonds to the amount of \$300,000, and will expend the proceeds for improvements of the street railway system. Albert G. Phelps, president and superintendent, New Orleans. (Bulletin, Feb. 13, 1902.)

MAINE.

Penobscot Central Ry., Bangor, Me. Will build 9 miles of new track; also new car house with capacity for storing 10 cars. Will buy several new cars and car motors. F. A. Beal, president, Bangor, Me. Feb. 8, 1902.

Berwick & South Berwick Electric Ry. To be practically an extension of the Berwick, Eliot & York. Work not to be begun within a year. John P. Hill, Augusta, Me. Nov. 23, 1901.

Augusta, Hallowell & Gardiner Railroad Co. Will enlarge its power house at Hallowell and install additional equipment. G. E. Macomber, manager, Augusta, Me. (Bulletin, Jan. 9, 1902.)

MARYLAND.

Hagerstown & Boonsboro Railway Co. Has completed 5 miles of new track and will build 5 miles more. Will increase capacity

of power station 200 kw. The company is building 12 freight and passenger cars, and will buy two 2-motor equipments and one 4-motor equipment. W. C. Hepperle, secretary and superintendent, Hagerstown, Md. Feb. 6, 1902.

United Railways & Electric Co., of Baltimore. Contemplates building several miles of double track. W. A. House, general manager, Baltimore. (Bulletin, Jan. 30, 1902.)

Maryland Electric Railway Co. Has petitioned for franchises in Baltimore, projecting a 50-mile interurban between that city and Sparrows Point, St. Denis and Catonsville. R. S. Carswell, president. (Bulletin, Feb. 13, 1902.)

Frederick & Jefferson Electric Railway, Light & Power Co., of Frederick, Md. Has applied for incorporation, to build an electric line through Frederick County. Milton G. Rice is interested. (Bulletin, Feb. 13, 1902.)

Hagerstown, Smithburg & Pen-Mar Railroad Co. Has applied for charter for an electric line from Hagerstown to Rouzerville, Pa. James E. Hewes, engineer in charge of construction, may be addressed at Hagerstown. (Bulletin, Feb. 6, 1902.)

MASSACHUSETTS.

Martha's Vineyard Street Railway Co., Vineyard Haven, Mass. Will build a short extension of present system. John A. Duggan, 89 State St., Boston, Mass., manager.

Greenfield & Deerfield Street Railway Co. Will build 7 miles of new track; also new car house with capacity for storing 10 cars, and will buy 10 new cars. D. P. Abercrombie, Greenfield, Mass. Feb. 7, 1902.

Westborough & Hopkinton Street Railway Co. Will build 3½ miles of new track. G. L. Hemenway, Hopkinton, Mass. Feb. 7, 1902.

Concord, Maynard & Hudson Street Railway Co. Will build 20 to 25 miles of new track; also a car house with capacity for storing 20 cars. Will increase capacity of power station 400 to 600 kw., and buy 10 open and 7 closed cars and 4 motor equipments for same. John W. Ogden, superintendent, Maynard, Mass. Feb. 7, 1902.

Middleboro, Wareham & Buzzards Bay Street Railway Co. Will extend road from Onset Bay to Falmouth, 11 miles. The company has purchased new cars and equipment. Charles H. Cox, superintendent, Middleboro, Mass. Feb. 12, 1902.

Boston & Worcester Street Railway Co. Has 45 miles of new track under construction, to be completed in 1902. Thirty-two 4-motor equipments will be purchased by the General Electric Co. which will also furnish the generators. Two Rice & Sargent engines of 1,000-h. p. and 1,500-h. p. respectively will be installed. Three boilers of 500-h. p. each will be furnished by Thayer & Co. One power house 2 sub stations and 2 car houses under construction. Officers: W. M. Butler, Boston, president; H. Fisher Eldredge, Portsmouth, N. H., vice-president, and George A. Butman, Boston, secretary and treasurer. General contractors, Jas. F. Shaw & Co., Boston; consulting engineer, E. H. Kitfield, Boston. Date of company's charter, November, 1901. Capital stock authorized, and funded debt to be authorized, \$750,000. Date of information, Dec. 11, 1901.

Chicopee Falls & Ludlow Street Railway Co. Recently organized to build a line from Chicopee Falls to Ludlow. T. C. Page, of Chicopee Falls, is interested. (Bulletin, Feb. 6, 1902.)

North Attleboro & Cumberland Electric Street Railway Co. Has secured franchises for a line between the cities named in the title and Woonsocket, R. I. Theron T. Smith, of North Attleboro, is interested. (Bulletin, Feb. 6, 1902.)

MICHIGAN.

Detroit, Howell & Lansing Ry., Detroit, Mich. Will build 82 miles of new track; also power house and car house, 24 new cars and equipment for cars. A. L. Parker, second vice-president, Detroit. Feb. 6, 1902.

Escanaba Electric Street Railway Co. Will build 1 mile of new track; also addition to car house to accommodate 4 cars. Will buy 2 new 38-ft. cars and 4 car motors. A. R. Moore, manager, Escanaba, Mich. Feb. 7, 1902.

Grand Rapids Railway Co. projects no construction work this season beyond ordinary repairs. G. S. Johnson, general manager, Grand Rapids, Mich. Feb. 7, 1902.

Lansing, St. Johns & St. Louis Railway Co. Will build new track between St. Johns and St. Louis, 35 miles, and erect new

power station at Lansing. Will buy several new cars. F. H. Dodge, secretary, Lansing, Mich. Feb. 10, 1902.

Ludington & Northern Railway Co. Will build 1 mile of new track. Frank P. Dunwell, Ludington, Mich. Feb. 7, 1902.

Menominee (Mich.) Electric Light, Railway & Power Co.; Menominee River Gas Co., and Marinette (Wis.) Gas, Electric Light & Street Railway Co. Will build 2½ miles of new track; will buy 5 new cars and 10 car motors. Contemplate increasing capacity of power house. Edward Daniell, general superintendent. Feb. 7, 1902.

Saginaw Valley Traction Co. Will build 1 mile double track and rebuild part of present system. Will buy 2 new cars. P. P. Crafts, general manager, Saginaw, Mich. Feb. 7, 1902.

Trans-St. Mary's Traction Co., Sault Ste. Marie, Mich. Plans for new construction not yet complete. Trans-St. Mary's Traction Co., per secretary, Sault Ste. Marie, Mich. Feb. 8, 1902. (Bulletin, Oct. 31, 1901.)

Grand Rapids, Kalamazoo & South Haven Traction Co. Construction just begun on 110 miles of new road, to be completed by Sept., 1902. Date of company's charter, Aug. 27, 1901. Officers: John J. Patterson, president; W. H. Patterson, vice-president and general manager; F. H. Williams, secretary; J. G. Zook, treasurer; M. Van Harlinger, chief engineer. General offices, Grand Rapids, Mich.

Southern Michigan Traction Co. Date of charter, July, 1901. Organized with nominal capital stock of \$50,000 to procure rights of way, franchises and contracts. Company owns private rights from Grand Rapids to Kalamazoo and has been granted franchises in towns on route. Will build 44 miles of interurban railways and 4 miles of city lines. Expect to open for traffic in September, 1902. George T. Bishop, president; Frank H. Ginn, secretary and treasurer; E. P. Roberts & Co., Cleveland, consulting engineers. Date of information, Nov. 30, 1901.

Michigan West Shore Traction Co., of South Haven, Mich. Line under construction from South Haven to Benton Harbor and St. Joseph. To be running by July 1st. S. B. Downer, engineer, South Haven, Jan. 1, 1902.

Bay City, Harbor Beach and Lake Huron will be connected by a projected electric line for which stock to the amount of \$50,000 has been subscribed. Rights secured and surveys under way. F. A. Little, Cleveland, is interested. (Bulletin, Feb. 20, 1902.)

Michigan Traction Co., of Kalamazoo. Has awarded contracts for the equipment of the 32-mile line now under construction between Battle Creek and Kalamazoo. One power house, 6 substations and 2 car houses will be erected. D. A. Hegarty, purchasing agent, may be addressed in care of the Railways-Company General, Philadelphia. (Bulletin, Jan. 2, 1902.)

Saginaw Suburban Railway Co., of Saginaw, Mich. Grading under way for electric line between Saginaw and Flint. Proposed equipment to include 12 passengers and 30 freight cars. George Silsby, Saginaw, president. (Bulletin, Feb. 6, 1902.)

Minnesota & Iowa Electric Railway Co., of Preston, Minn. Recently incorporated to build a line from Decorah, Ia., to St. Paul, by way of Preston. H. R. Wells, of Preston, is president. (Bulletin, Jan. 16, 1902.)

MISSISSIPPI.

Vicksburg Railroad, Power & Manufacturing Co. Will increase capacity of power station 500 kw. and build new car house with capacity for storing 20 cars. Will buy ten 35-h. p. car motors. James George, general manager, Vicksburg, Miss. Feb. 14, 1902.

St. Louis, Kirkwood & Manchester Railroad Co. will build 13 miles of double track, and erect new power station. Will buy new equipment. D. C. Taylor, president, Manchester, Mo. Feb. 7, 1902.

Kansas City & Olathe Electric Railway Co., of Kansas City, Mo. Projects 18-mile interurban line. Will erect 2 power houses. F. C. Goodwin, president, Kansas City, Nov. 27, 1901.

MONTANA.

Helena Power & Light Co. expects to buy 2 second-hand double truck open motor cars. W. L. Walker, receiver, Helena, Mont. Feb. 6, 1902.

Citizens' Electric Co. of Billings, Mont. Recently incorporated to build local electric street railway. Christian Yegen, of Billings, may be addressed. (Bulletin, Feb. 20, 1902.)

NEBRASKA.

Nebraska City Street Railway Co. Will soon convert horse car line into electric system. A. M. Munn, engineer in charge, Nebraska City, Neb. Feb. 7, 1902.

Nebraska City Street Railway Co. Will convert its 3¼-mile horse car line into an electric system. H. H. Bartling, Nebraska City, Neb. (Bulletin, Jan. 16, 1902.)

NEW HAMPSHIRE.

Laconia Street Railway, Laconia, N. H. Expects to extend lines to Franklin and Penacook. Will relay local lines to standard gage. L. S. Pierce, superintendent, Laconia, Feb. 7, 1902.

Manchester Street Ry. Co., Manchester, N. H. Has petitioned for authority to increase its capital stock, proposing to use proceeds to extend its system. J. B. Smith, manager, Manchester. (Bulletin, Feb. 13, 1902.)

NEW JERSEY.

Camden & Suburban Railway Co. Will build 8 miles of new track and rebuild 3 miles of present system. Will increase capacity of power station 800 kw. and buy 10 new cars. W. E. Harrington, manager, Camden, N. J. Feb. 9, 1902.

Columbia Traction Co., Carlstadt, N. J. Will build 8 miles of new track; also a new power house and a car house with a capacity for storing 10 cars. The company expects to buy 8 new cars. E. F. Foote, president, Carlstadt. Feb. 10, 1902.

Delaware River & Atlantic Railroad Co., Atlantic City, N. J. Will soon begin grading 40 miles of road between Atlantic City and Camden. Site for terminal station and power house purchased. James B. Reilly, Atlantic City. (Bulletin Feb. 20, 1902.)

Elizabeth, Perth Amboy, Newark and Rahway will be connected by projected electric line which Governor F. M. Voorhees, Senator John Keane and Frank Bergen, all of Elizabeth, are promoting. Plans include a bridge across the Raritan River, estimated to cost \$150,000. (Bulletin, Jan. 2, 1902.)

Burlington County Traction Co., of Mt. Holy, N. J. Recently incorporated to build an electric line from Mt. Holly to Moorestown. Edward B. Jones, of Mt. Holly, is interested. (Bulletin, Feb. 13, 1902.)

New Jersey & Pennsylvania Traction Co. Recently incorporated to build an electric line in Trenton. J. J. Coleman, of Trenton, and Charles M. Bates, of Allentown, Pa., are interested. (Bulletin, Dec. 4, 1902.)

Las Vegas Electric Railway & Power Co. Has purchased site for new power house. Will build 40 miles of new track. George W. Baumhoff, Las Vegas, N. M. (Bulletin, Feb. 13, 1902.)

NEW YORK.

Buffalo, Attica & Arcade Railroad Co., Arcade, N. Y. Operates a steam road but has under construction a branch to be operated by electricity from Java Center to Buffalo. Electric line will also be extended 7 miles south of Arcade. Contemplates eventually installing electric traction over entire system, 65 miles. S. S. Bullis, president, Arcade, N. Y. Dec. 4, 1901.

Binghamton Railway Co. Will build 6 miles of new track; also new car house with capacity for storing 30 cars. The company has bought 4 new cars. J. P. E. Clark, manager, Binghamton, N. Y. Dec. 4, 1901.)

Buffalo, Springville & Cattaraugus Railway Co., Cattaraugus, N. Y. Will build 38 miles of new track; also a power house of 700-kw. capacity, and car house with capacity for storing 12 cars. The company will buy 6 passenger and 10 freight cars, 2 motor locomotives, and passenger car motors. U. L. Upson, Cattaraugus, N. Y. Feb. 8, 1902. (Bulletin, Nov. 21, 1901.)

Elmira & Waverly Railway Co., Elmira, N. Y. Will build 18 miles of new track, a power station of 500 kw. capacity, and a car house with a capacity for storing 15 cars. The company will buy 10 new cars and 8 car motors. H. B. Rhymer. Feb. 10, 1902. (Bulletin, Nov. 7, 1901.)

Jamestown Street Railway Co. Will rebuild 2½ miles of old track and increase capacity of power station 500 kw. Will buy 2½ miles 6-in., 60-lb. T rail and a 30-ft. baggage car on single truck. G. E. Malthy, manager, Jamestown, N. Y. Feb. 12, 1902.

Orange County Traction Co. Has recently bought 4 passenger and 1 freight cars. W. H. Pouch, purchasing agent, Newburgh, N. Y. Feb. 15, 1902.

Newark & Marion Railway Co., Newark, N. Y. Line under construction. Inquiries may be addressed to Syracuse Railway Construction Co., Syracuse, N. Y. F. D. Burgess, secretary, Newark, N. Y. Feb. 12, 1902. (Bulletin, Dec. 26, 1901.)

Mountain Lake Electric Railroad Co., Gloversville, N. Y. Will build 1½ miles of new track with extra turnouts, and increase capacity of power station 150 kw. Will buy 2 new cars. H. W. Shaw, president, 115 Broadway, New York City. Feb. 17, 1902.

Perry, Castile, Silver Springs & Pike Electric Railroad Co. No arrangements for building as yet. J. M. Duncas, Silver Springs, N. Y. Feb. 6, 1902.

Syracuse Rapid Transit Railway Co. Will build 3½ miles of new track. E. G. Connette, general manager, Syracuse, N. Y. Feb. 12, 1902.

Watertown & Carthage Traction Co., Watertown, N. Y. Will build 18 miles of new track. Mason M. Swan, Watertown, Feb. 6, 1902. (Bulletin, June 13, 1901.)

Whitehall & Granville Railroad Co., of Whitehall, N. Y. Sixty miles of new track projected, 22 miles of which is now under construction. Contracts to be awarded for power house equipment. C. B. Story, general manager, Whitehall, N. Y. Dec. 17, 1901.

Albion Electric Railway Co., Albion, N. Y. Recently incorporated to build local street railway system. George B. Church, Albion, may be addressed. (Bulletin, Jan. 16, 1902.)

Alexander Bay & Redwood Railway Co. Has line under construction between the cities named in the title. Construction contract has been awarded to W. F. Pascoe, of Easton, Pa. Jacob Amos, of Syracuse, is interested. (Bulletin, Feb. 6, 1902.)

Balston Terminal Railroad Co., Balston Spa, N. Y. Will build extensions to Amsterdam and Gloversville. J. H. Norris, superintendent, Balston Spa, N. Y. (Bulletin, Feb. 6, 1902.)

Binghamton Railroad Co. Will use proceeds of bond issue to the amount of \$1,500,000 to extend and improve system. Lines to be built to Vestal and Owego, N. Y., and Hallstead and Great Bend, Pa. J. P. E. Clark, Binghamton, N. Y. (Bulletin, Jan. 9, 1902.)

Beacon Mountain Railway Co., of Fishkill, N. Y. Projects a 5-mile line to summit of North Beacon mountain. Charles F. Mairs, of New York City, is interested. (Bulletin, Feb. 13, 1902.)

Newark & Marion Railway Co., of Newark, N. Y. Has secured funds for an extension of its lines to Williamson. F. D. Burgess, secretary, Newark. (Bulletin, Dec. 26, 1901.)

Rochester & Eastern Electric Ry., of Rochester, N. Y. Has applied for authority to proceed at once with the construction of its proposed line between Rochester and Syracuse. John Winter, Detroit, Mich. is interested. (Bulletin, Jan. 23, 1902.)

Troy Terminal Railway Co., Troy, N. Y. Recently incorporated to build a local line. Edward F. Murray, of Troy, is interested. (Bulletin, Feb. 13, 1902.)

Erie R R Contemplates converting its steam road between Dunkirk and Salamanca, N. Y., into an electric system. Plans call for a large power house at Salamanca. E. B. Sheffer, purchasing agent Erie R R., New York City. (Bulletin, Dec. 26, 1901.)

NORTH CAROLINA.

Durham Traction Co., of Durham, N. C. Ten miles of track under construction. Power house and car house in course of erection. Eight closed and 8 open cars will be operated. H. T. Brown, manager, Durham. Nov. 15, 1901.

OHIO.

Pennsylvania & Ohio Railway Co., Ashtabula, O. Will build 10 miles of new track; also a new car house with capacity for storing 6 cars. The company will buy 4 new cars and 4 car motors. Feb. 7, 1902.

Lake Erie, Bowling Green & Napoleon Railway Co., Bowling Green, O. Will build 11 miles of new track this year; also new car house with capacity for storing 8 cars. The capacity of the power station will be increased 800 kw.; 2 new cars will be purchased and 6 car motors. L. Black, president, Bowling Green. Feb. 5, 1902.

Cleveland City Railway Co., Cleveland, O. Will buy 35 new cars. Feb. 8, 1902.

Cincinnati, Georgetown & Portsmouth Railroad Co. Will build 60 miles of new track and rebuild 45 miles of present system. Will increase capacity of power station 1,200 kw and build new car house with capacity for storing 15 cars. Will buy 10 new cars

and 15 car motors. A. W. Comstock, president, Cincinnati, O., Feb. 14, 1902. (Plan to convert this steam road into an electric system noted in Bulletin Nov. 21, 1901.)

Urbana, Mechanicsburg & Columbus Electric Railway Co., Columbus, O. Will build 50 miles of new track; also a power house of 1,500 kw. capacity and a new car house with a capacity for storing 10 cars. The company will buy a full equipment of rolling stock. H. A. Axline, president, Columbus, O. Feb. 3, 1902. (Bulletin, June 28 and Nov. 22, 1901.)

Columbus, New Albany & Johnstown Traction Co., Columbus, O. Now operating 9 miles of track and will build 15 miles additional. Will build car house with capacity for storing 8 cars, and will buy 4 new cars. Daniel J. Ryan, president, Columbus, O. Feb. 6, 1902.

Dayton & Northern Traction Co. Will build 46 miles of new track; also new car house with capacity for storing 10 cars. Will buy 10 new cars and 40 car motors. J. E. Feight, secretary, Dayton, O. Feb. 11, 1902.

People's Railway Co., Dayton, O. Will build 8 miles of new track, and rebuild 3 miles of present system. H. S. Johnson, manager, Dayton. Feb. 11, 1902.

J. E. Lowes, Dayton, O. Will build 46 miles of new track, and erect power house, car houses, etc. J. E. Lowes, Dayton. Feb. 17, 1902.

Dayton & Xenia Transit Co. Contemplates extensions of its lines this summer, but details are undecided as yet. A. W. Anderson, superintendent, Dayton, O. Feb. 13, 1902.

United Electric Co., Dennison, O. Will build 1½ miles of new track; will buy 1 new car and motor equipment. O. B. Welch, manager, Dennison. Feb. 12, 1902.

Sandusky, Clyde, Tiffin & Southern Railway Co. Will build 28 miles of new track, a large power house, and a car house with capacity for storing 10 cars. The company will buy 10 new cars and equipment for same. J. C. Parker, president, Sandusky, O. Feb. 13, 1902. (Bulletin Nov. 28, 1901.)

Tiffin & Southern Railway Co. Will build about 46 miles of new track and rebuild entire present system. Will build new power station at Upper Sandusky, and car house with capacity for storing 8 or 10 cars. Will buy 10 or 12 new cars, and complete equipment of new car motors. Allen Smalley, Tiffin, O. Feb. 13, 1902.

Toledo & Indiana Railway Co., Toledo, O. Will build 30 miles of new track during 1902. Power station capacity will be increased, though to what extent is not yet determined. Company undecided as to purchases of rolling stock and equipment to be made. Charles P. Griffin, president, Toledo. Feb. 11, 1902.

Toledo, Columbus, Springfield & Cincinnati Railway Co., Toledo, O. Will build 250 miles of new track. Ellis Bartholomew, president, Toledo, O. Feb. 11, 1902. (Bulletin Aug. 22, and Sept. 19, 1901.)

New Castle & Lowell Railway Co. Projects 10½-mile interurban line between New Castle, Pa., and Lowell, O. Ten closed Brill cars will be operated. Power house at Edenburg, Pa. Three 280-h. p. Westinghouse engines; two 325-h. p. B. & W. boilers, and three 250-kw. G. E. generators. A. A. Anderson, general manager, Youngstown, O. Nov. 28, 1901.

Dayton & Kenton Railway Co., Dayton, O. Proposes to complete its 121-mile interurban line in 1903. B. H. Rannels, Dayton, general managers. (Bulletin, Feb. 13, 1902.)

Dayton & Xenia Traction Co., of Dayton, O. Contemplates extending its line 28 miles. M. J. Murphy, Dayton. (Bulletin, Feb. 6, 1902.)

Michigan & Ohio Belt Line Railway Co., of Defiance, O. Will expend the proceeds of bond issue of \$50,000 for construction of line which will eventually connect Hillsdale, Mich., and Defiance and Fostoria, O. J. W. Boynton, Defiance, president. (Bulletin, Feb. 6, 1902.)

Bucyrus, Upper Sandusky & Lima Railway Co., of Lima, O. Recently incorporated to build an electric line between the cities named in the title. Charles L. Schaber, of Lima, is interested. (Bulletin, Feb. 6, 1902.)

OKLAHOMA.

Oklahoma City & Canadian Railroad Co., of Oklahoma City, Okla. Recently incorporated to build a 5-mile local electric line, and a 27-mile interurban. Construction work to be begun this

spring. Guy E. Blackwelder, Oklahoma City, is interested. (Bulletin, Dec. 10, 1901.)

OREGON.

Ashland Electric Railway Co., Ashland, Ore. Will build 5 miles of new track; also new car house with capacity for storing 5 cars. Will increase capacity of power station 50 h. p. and purchase 5 new cars and 5 car motors. M. L. Hawley & Co. Feb. 20, 1902.

Astoria Electric Co. Will build 1½ miles of new track, and rebuild 1 mile of old track. Will increase capacity of power station 200 kw. and build new car house with capacity for storing 12 cars. C. A. Coolidge, Astoria, Ore. Feb. 7, 1902.

PENNSYLVANIA.

Berwick & Nanticoke Street Railway Co., Bloomsburg, Pa. Contemplates building 20 miles of new track. Not certain how soon work may be begun. C. W. Miller, president, Bloomsburg. Feb. 10, 1902.

Bloomsburg & Millville Street Railway Co. Expects to build and equip 10 miles of new street railways during the coming season. C. W. Miller, president, Bloomsburg, Pa. Feb. 10, 1902.

Harrisburg & Mechanicsburg Electric Railway Co. Will build 5 miles of new track. G. H. Bartle, superintendent, Harrisburg, Pa. Feb. 17, 1902.

Kutztown & Fleetwood Street Railway Co., Allentown, Pa. Will build 13 miles of new track also car house with capacity for storing 30 cars, and will increase power station capacity 400 kw. Will buy 10 new cars and 8 car motors. J. S. Ruth, superintendent, Allentown.

Latrobe Street Railway Co. Will build 5 miles of new track and rebuild, present system to be all new. Will buy 2 new cars and 4 car motors. J. B. Anderson, president, Latrobe, Pa. Feb. 13, 1902.

Lewistown & Reedsville Electric Railway Co. Will build 1 mile of new track, and install one 250-h. p. B. & W. boiler at power station. Will buy 1 or more Brill semi-convertible double truck cars fully equipped. W. G. Barlow, manager, Lewistown, Pa. Feb. 12, 1902.

Meyersdale & Salisbury Street Railway Co. Will build 9 miles of new track, erect new power station and car house and install new equipment. A. O. Lorentz, manager, Meyersdale, Pa. Feb. 12, 1902.

Wilkesbarre & Wyoming Valley Traction Co. Will build 3 miles of new track. F. L. Fuller, general manager, Wilkesbarre, Pa. Feb. 14, 1902.

Fairmount Park Transportation Co., Philadelphia, Pa. Will build annex to car house with capacity for storing 10 cars. Will buy ten 45-ft. Brill cars. A. E. Meixell, superintendent, Philadelphia. Feb. 26, 1902.

Lehigh Valley Traction Co., Allentown, Pa. Will erect power house of 4,000-h. p. capacity at Sellersburg. S. Harris, general manager, Allentown. (Bulletin Jan. 23, 1902.)

Elizabeth & Monongahela Street Railway Co. Has been granted a charter to build a 7-mile line in Pennsylvania. Charles F. Moore, McKeesport, is interested. (Bulletin, Feb. 6, 1902.)

Kittanning & Cowanshannock Valley Street Railway Co., of Kittanning, Pa. Recently organized to build a 14-mile electric line which is to be in operation within a year. George S. Caruthers, 421 Standard Bldg., Pittsburg. (Bulletin, Feb. 6, 1902.)

Meyersdale & Salisbury Street Railway Co. Will proceed at once with construction of proposed road between cities named in the title. A. O. Lorentz, general manager, Meyersdale, Pa. (Bulletin, Jan. 23, 1902.)

Youngstown-Sharon Railway & Light Co., of Sharon, Pa. Will expend part of proceeds of bond issue of \$1,000,000 for improvements of system. L. Calkins, 30 Broad St., New York City. (Bulletin, Feb. 6, 1902.)

RHODE ISLAND.

Union Railroad and Rhode Island Suburban Railway Cos. Will build 10 miles of new track, and rebuild 5 miles of present system. Will buy 40 new cars. A. T. Potter, general manager, Providence, R. I. Feb. 10, 1902.

SOUTH DAKOTA.

Sioux Falls Suburban Traction Railway Co. Will build an interurban electric line from Sioux Falls to Madison. J. E. Colton, manager, Sioux Falls, S. D. Date of information, Nov. 27, 1901.

Dakota Electric Railway Co., of Woonsocket, S. D. Recently

incorporated to build a 16-mile line. D. R. Brewster, of Woonsocket, may be addressed. (Bulletin, Feb. 13, 1902.)

TENNESSEE.

North Side Consolidated Street Railway Co., Chattanooga, Tenn. Will rebuild 4 miles of old track and increase capacity of power station 600 kw. N. H. Brown, general manager, Chattanooga, Feb. 8, 1902.

Rapid Transit Company of Chattanooga. Will build 3 miles of new track and rebuild 5 miles of present system. Will increase capacity of power station 600 kw and buy 4 new cars. N. H. Brown, general manager, Chattanooga. Feb. 8, 1902.

Nashville & Gallatin Electric Railway Co., of Nashville, Tenn. Application for charter has been filed. Electric line projected to connect Nashville, Gallatin and Mt. Pleasant. J. H. Conners, Wilcox Bldg., Nashville, represents the promoters. (Bulletin, Feb. 13, 1902.)

VERMONT.

Granville & Poultney Railroad Co., Poultney, Vt. Will build 10 miles of new track for which preliminary surveys have been completed. Will also build power house of 500-kw. capacity. C. B. Story, vice-president, Poultney, Feb. 11, 1902.

VIRGINIA.

Berkley Street Railway Co. Has completed 3½ miles of double track, and bought 8 new cars. Projects no new construction. H. C. Tunis, manager, Berkley, Va. Feb. 10, 1902.

Charlottesville City & Suburban Railway Co. Will extend lines less than a mile; also, increase capacity power station 150 kw. Expects to buy more new cars or car motors. R. P. Valentine, president and manager, Charlottesville. Feb. 8, 1902.

Lynchburg (Va.) Traction & Light Co. has just completed 3½ miles of new track and proposes to install a 550-kw. lighting generator. The company has bought 6 new Brill convertible cars, and 6 G. E. 67 double motor equipments, and will buy 6 Peckham 8 A extra strong trucks. R. D. Apperson, president and manager, Lynchburg. Feb. 8, 1902.

Hampton Roads Railway & Electric Co., of Newport News, Va. Has 32 miles of track under construction. Capital stock authorized, \$500,000. W. J. Nelms, president, Newport News, Va. Nov. 30, 1901.

WASHINGTON.

Seattle Electric Co. Will build 10 miles of new track and rebuild 4 miles of present system; also new car house with capacity for storing 40 cars. Will increase capacity of power station, and buy 48 new cars and 130 car motors. G. W. Dickinson, general manager, Seattle, Wash. Feb. 10, 1902.

Citizens' Electric Railway Co., Moundsville, W. Va. Will build about 4½ miles of new track; also new power house, new rolling stock and equipment. J. A. Ewing, Moundsville. Feb. 17, 1902.

WEST VIRGINIA.

Moundsville, Benwood & Wheeling Railway Co. Will rebuild 3 miles of old track. C. E. Flynn, general manager, Wheeling, W. Va. Feb. 7, 1902.

Wheeling Traction Co. Will increase capacity of power station 1,200 kw., and is building car house with capacity for storing 125 cars. Will buy ten 10-bench open cars and 20 motors of 35-h. p. C. E. Flynn, Wheeling, W. Va. Feb. 7, 1902.

Sheboygan Light, Power & Railway Co. Will build about 10 miles of new track, and increase capacity of power station from 300 to 350 kw. Expects to buy 3 double truck cars. H. J. Pagel, jr., general superintendent, Sheboygan, Wis. Feb. 7, 1902.

WISCONSIN.

Fond du Lac & Oshkosh Electric Railway Co. Contract for the construction of proposed line between cities named in the title awarded to the Columbia Construction Co., of Milwaukee. Line will be 12½ miles long including feeders, and 2 power houses will be built. Rails have been ordered. Date of information, Dec. 2, 1901.

The Sunbury (Pa.) & Northumberland Electric Railway Co. has not yet decided upon the equipment to be purchased for its proposed interurban line. W. L. Keplinger, of Sunbury, is general superintendent of the company.

MECHANICAL DEPARTMENT

MONOGRAMS.

BY LOUIS GRATON.

The monogram here presented stands for Ithaca Street Ry. but any combination of letters may occupy the center of the scroll. The cars of this company are painted a rich red (Willeg's Agostein red.

Fig. 1 is the chuck or body casting which is threaded at A to fit the spindle of the lathe on which it is mounted. Its internal diameter is made of sufficient size to contain the largest bushings to be handled. Fig. 2 shows an end view and explains the uses of the clamping screws which draw the two sides of the chuck, divided by a longitudinal slot, together, thus clamping the shell or bearing securely inside. Fig. 3 is an end view of a sleeve or bushing which



dark shade) and in the scroll and monogram herewith reproduced gold is used for the letters and silver for the scroll, all being outlined in black. This produces an excellent effect and, in fact, gold and silver ornaments make a good appearance on almost any background. In monogramic combinations of letters the important or principal letter should occupy the central position, the other letters intertwining with it in their original order, that is, from left to right. A good arrangement may be effected by placing the secondary letters from top to bottom, especially if the implied wording contains letters that would not permit of proper balancing, as for example, P and B or B and R or D. In case a given letter must be repeated it is allowable to reverse it in one case, making it read backwards for the symmetry of the combination. Where the abbreviation of company, "Co." is desired, it is best to give this third place in importance. While its position should be central, it need not have great prominence. In the twining of letters conformity to the rule of alternating over and under should be kept in view, although this cannot always be carried out. The panel scroll shown herewith comprises two designs, either of which will harmonize with the central scroll and with the monogram.

is cut through on one side to be used for small sized bearings. The length of the chuck as well as that of the bushing, Fig. 3, is made to suit the type of bearing used. Fig. 4 shows the end of the lathe spindle with bushing B inserted in place in the lathe spindle for

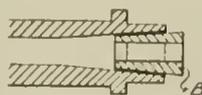


FIG. 4.

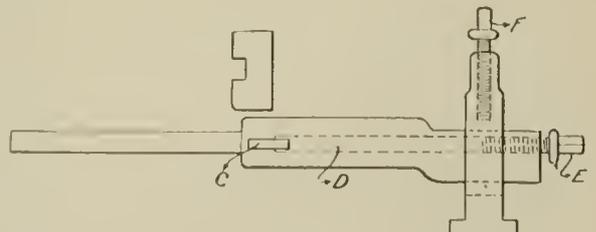


FIG. 5.

FIG. 6.

supporting the end of the boring bar shown in Fig. 6. One end of the bar is reduced to fit the bushing B, and the other end is supported in the tool post and is fed by the regular tool carriage feed.



FIG. 7.

Fig. 5 is a double end cutter which is fitted into the slot C of the boring bar, Fig. 6, and is held in place by the rod in hole D, which is forced against the cutter by the screw E which, for convenience, should be a duplicate of the tool post screw F. Fig. 7 is a mandrel for finishing the outside of the bearing shells before boring.

DEVICE FOR BORING MOTOR BEARINGS.

We have received through the courtesy of Mr. W. W. Annable, master mechanic of the Grand Rapids Railroad Co., the following

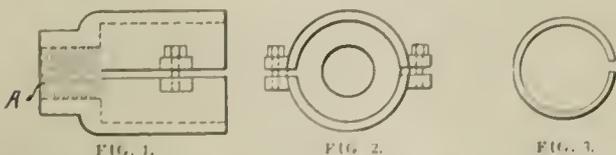


FIG. 1.

FIG. 2.

FIG. 3.

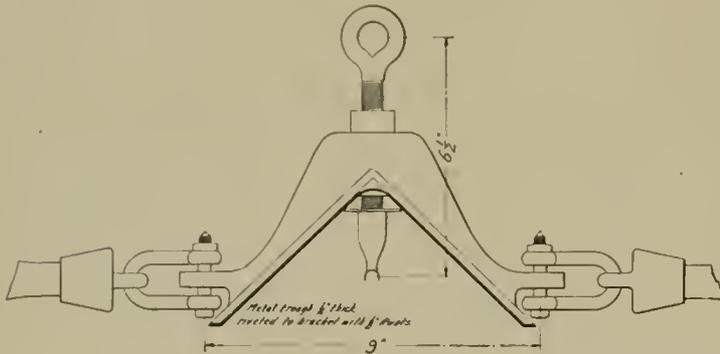
description of a device used in the shops of that company for the production and boring of motor bearings. The use of this device we are informed has proved very satisfactory

The Chattanooga Electric Railway Co. has erected a bridge over the Southern Ry. crossing, and has completed the grading of the proposed extension to East Avondale. The new line to Sherman Heights will soon be put in operation.

TROLLEY TROUGH OVER RAILROAD CROSSINGS.

Over all the steam railroad crossings on the lines controlled by the International Railway Co., of Buffalo, N. Y., there are suspended metal troughs which serve the purpose of catching the trolley wheel and preventing a car from becoming stalled on a crossing in the event of the wheel leaving the trolley wire.

The general features of the trough are illustrated in the drawings for which we are indebted to Mr. T. E. Mitten, general manager. The body of the device is a malleable iron casting held in place by the span wires with clevis and regulation strain insulators in the manner indicated. The inside of the casting is an inverted

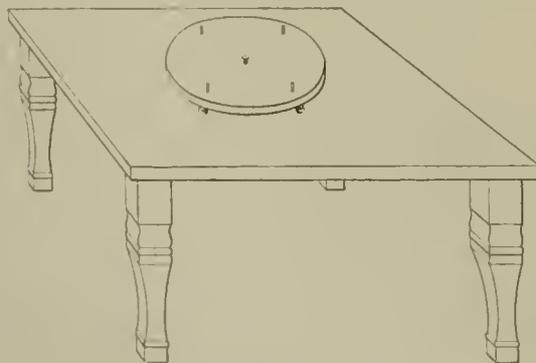


OVERHEAD CROSSING TROUGH.

V in section and is lined with sheet metal 1-16 in. thick which is insulated from, but riveted to, the body with 1/8-in. rivets. The trolley wire is carried by ordinary hanger ears which are held in place inside the trough by 5/8-in. eye-bolts screwed down through the top of the casting and into the hanger. The length of the trough varies according to the number of tracks over which it is suspended, and ranges from 10 ft. for a single track to 200 ft. for a complicated crossing. If deemed desirable guy wires can be strung from the eye-bolt to the side poles to further steady the trough.

VARNISHING CAR WINDOW SASH.

Mr. J. H. McMullin, former painter of the Worcester (Mass.) Consolidated Street Railway Co., has devised a clever arrangement for holding window sash while they are being varnished. It comprises a piece of 1/2-in. board circular in form and about 18 in. in diameter. To one side of this are fastened four small chair casters and in the other side are inserted four small wooden pegs projecting upward about an inch. This circular piece is mounted upon a common table by means of a bolt passing loosely through holes bored in the center of the circular board and the top of the table. The pieces rests upon the four casters and is free to revolve about



SASH VARNISHING TABLE.

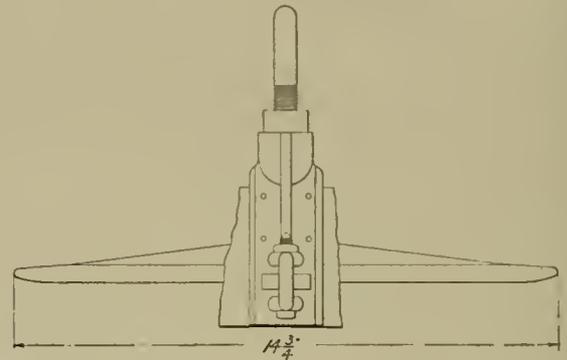
the bolt at the center. When a sash is to be varnished it is laid with the glass resting upon the four pegs. The painter stands at one side and as he varnishes each edge of the frame he turns the circular rest to bring the work immediately in front of him and

does not to have move from his first position. This not only saves time but is much more convenient for the painter and also assures better work with less risk of marring or scratching the side freshly painted.

MOTOR LIFT FOR CAR PITS.

A motor lift with which one man can, unaided, remove a motor from beneath a car and transport it to any point in the shop is made by Paul B. Patten, of Salem, Mass.

The machine is mounted on flat-tired wheels and does not require a set of tracks to travel on. The top platform is 3 ft. 5 1/2 in. x 24 in. The screw that supports the platform is of steel 2 1/2 in.



in diameter and is cut with a V-thread. The large gear has 56 teeth of 1/4-in. pitch and is fitted with a composition nut which engages the screw thread. The pinion at the end of the crank shaft which engages the large gear has 16 teeth, giving a ratio of 3 1/2 to 1. The large gear runs on hardened steel plates cut with 72 1/2-in. rack teeth. The leverage is ample and the lift is built to



PIT HOIST.

withstand any load that would be put upon it in ordinary pit work.

The machine illustrated is for use in pits measuring 4 ft. 6 in. from top of rail to bottom of pit, which is the usual depth found in car houses.

In service the necessary blocking is placed on the table or platform and the machine is run under the car. The table is elevated to engage the motor, the motor bolts are loosened, and the parts are lowered to clear the axle. The motor or amature can then be drawn to any part of the pit for inspection or repair without additional handling. The machine is in use by the Lynn & Boston system the Brooklyn Rapid Transit Co.; the Albany & Hudson Ry., and others.

SPECIAL CONSTRUCTION CARS IN DETROIT.

The accompanying illustrations represent two special work cars used on the Detroit United Railway, for which we are indebted to Mr. J. Kerwin, superintendent of tracks. One of these cuts represents a track spiker by means of which the tracks are spiked to the ties without the use of hand labor. This car is provided with a boiler, two steam hammers, and a pair of tongs opposite each hammer which are used for picking up the tie and holding it firmly against the rail to be spiked. The ties are held in position under the rail with a pressure of four tons and each hammer drives two spikes at the same time. The rail is held to the gage by a cross bar in front of each hammer with a roller in each end of it. This gage must be very accurate or the hammers will not hit the spikes. The two spikes at each end of the ties are driven home by two blows of the hammer when cedar ties are used. Two men with this machine can spike 1,200 ties per day, which amounts to a saving of \$15 per day over hand labor.

The other illustration represents a derrick car, which, Mr. Kerwin informs us, has given the most satisfactory results of any machine employed in the track department. It will be noticed that the boom swings all the way around so that this car can be run up alongside a steam railroad car and the derrick will lift the heaviest special work or girder rail and place it on the derrick car itself or on a car standing at the end or at the opposite side of it. The derrick car has no windlass or power of any kind of itself. The cable for hoisting runs down the post of the derrick and goes out under the draw head so that any motor car on the same track to which the cable can be attached can do the hoisting. As an example of what can be accomplished by the use of this car, the company had 70 tons of rails which were to be removed from one yard to another to clear a space for building a new car house. All of this rail was removed by two men, while the ordinary method of handling it would have

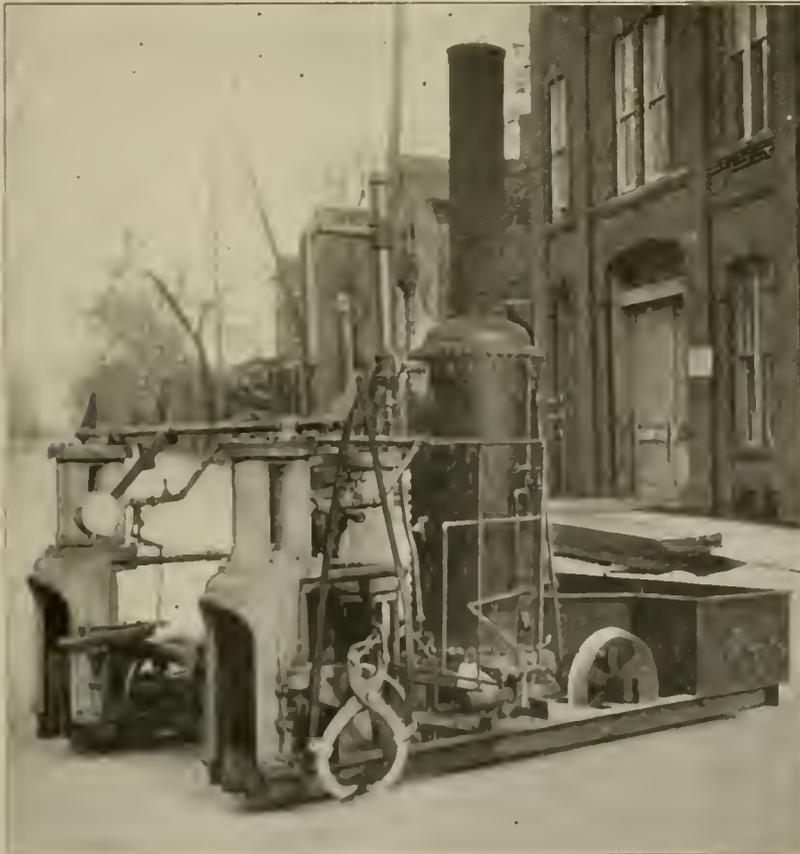
required a gang of not less than ten men and would have cost \$80 more than with the derrick car. This car has been found useful in so many ways that it has not been idle four hours a week since being put in service.



DERRICK CAR—DETROIT UNITED RY.

IMPROVED STREET CAR SERVICE FOR CINCINNATI.

At a meeting held by the board of public service of Cincinnati last month the question of improving the street railway service of that city was taken up and a bill was drawn up which, if passed, will undoubtedly improve the service. Mr. W. Kesley Schoepf, lately elected president and general manager of the traction company, was present in the interests of his company and stated his positive intention to do everything in his power to improve the service in the city and to give prompt attention to all complaints that are not anonymous. Mr. Schoepf stated that the only solution of the problem would be to pass a law authorizing a change of routes so that all the cars in the city would not have to run on 5th and Walnut Sts. The congestion of cars resulting from this, he stated, was to blame for delays, and if more cars were added to each route, the congestion would be only so much worse and the delays greater than before. The company has ordered larger cars, which will relieve the overcrowding somewhat, but the only method of securing uninterrupted street car traffic is to have a number of turning points down town instead of only one, as at present. At his suggestion, a bill authorizing the necessary change of routes was prepared and will be presented to the Legislature. The material for 50 new cars, which will be 10 ft. longer than those at present in use, has been ordered and the cars will be built at the company's shops in the immediate future.



TRACK SPIKER—DETROIT UNITED RY.

February 23d the first trip was made over the new interurban line of the Northern Texas Traction Co. between Fort Worth and Handley, a distance of six miles. The car carried a number of city officials and Manager Haines and Superintendent Renfro, of the company. The installation of machinery in the power house at Handley is nearly completed, and work is being rushed on the extension that will afford connections between Fort Worth and Dallas.

It is announced that a street railway mail service will be put in effect on the interurban line between Oshkosh and Omro, Wis., May 15th.

A. S. R. A. CONVENTION.

The executive committee of the American Street Railway Association met in Detroit on February 24th to decide upon plans for the 1902 convention. Those present were: H. H. Vreeland, New York, president; Charles W. Wason, Cleveland, E. C. Foster, Boston, and H. M. Sloan, Chicago, vice-presidents; T. C. Penington, Chicago, secretary and treasurer; Walter H. Holmes, Kansas City; David B. Dyer, Augusta, Ga.; T. J. Nicholl, Rochester, N. Y.; George W. Dickinson, Seattle, Wash. John A. Rigg, of Reading, Pa., was prevented from attending and was the only absentee.

The business transacted was as follows: The secretary and treasurer's report showing the finances to be in good condition, and the present membership of the association to be 187, was approved. There have been 25 new members admitted during the past year and 17 retired, leaving a net gain of 8.

It was decided to continue the old method of handling exhibits.

After inspection of the building, the Light Guard Armory in Detroit was chosen for the convention hall.

The convention was fixed for Wednesday, Thursday and Friday, Oct. 8, 9 and 10, 1902, the second day, Thursday, October 9th, being set apart at exhibitors' day, no meetings of the association being held on that day.

The Hotel Cadillac was chosen as the headquarters hotel and the banquet will be held there Friday evening.

It was decided that a standing committee on rules be appointed by the president.

It was also decided that hereafter subjects of reports should be assigned to companies, who are members of the association, and not to officers of the companies. The subjects assigned were as follows:

"Settlement of Damage Claims," Chicago City Railway Co., of Chicago.

"Benefit Associations," Metropolitan Street Railway Co., of New York.

"Discipline of Employes by the Merit System," Metropolitan Street Railway Co., of Kansas City, Mo.

"Transportation of Light Express and Parcels," Detroit United Railway Co., of Detroit, Mich.

"Registration of Transfers," Cincinnati Traction Co., of Cincinnati, Ohio.

"Steam Turbines and Rotary Engines," Boston Elevated Railway Co., of Boston, Mass.

"Signals for Urban and Interurban Railways," Old Colony Street Railway Co., Boston.

The first four of these assignments have already been accepted.

The secretary was instructed to write to the membership urging that the delegates be sent to the convention with instructions that their presence at the meetings is obligatory.

When the members of the executive committee reached Detroit they were met by J. C. Hutchins, president, A. H. Stanley, general superintendent, and Irwin Fullerton, auditor, of the Detroit United Ry., who discussed the plans for the convention with the committee. After the business meetings Mr. Hutchins entertained the committee and other visitors at the Detroit Club, and later in the evening the Vontodago Club. On Tuesday the Detroit United Railway Co. provided a special car to Mt. Clemens and the party enjoyed a delightful outing.

LOW FARE LEGISLATION IN BALTIMORE.

A bill has recently been introduced in the Maryland Legislature requiring the United Railways & Electric Co. to sell six tickets for 25 cents. A board of prominent financiers of Baltimore appeared before the city delegation to whom the bill was reported, in order to oppose its passage. The opposition came not only from the railway company, but from a number of bankers who opposed it on the ground that its passage would affect the securities which are largely held by banks and savings institutions. The most important testimony was given by Mr. House, general manager of the company, who showed that with tickets at six for 25 cents the company would have to carry over 50,000 additional passengers per day, or 10 per cent of the entire population of the city of Baltimore and its suburbs, in order to take in the same amount of cash as was received in 5-cent fares.

The company's present equipment is taxed to its full capacity and should it secure additional riders on the low fare basis it would be obliged to provide increased car equipment and power house capacities as well as additional force in the transportation department and clerical branch without additional revenue. The amount carried to the surplus account last year was but \$32,118, and it is feared that a reduction of fares such as proposed would considerably affect the company's securities.

W. D. RAY.

Mr. Wm. D. Ray, electrical and mechanical engineer, has opened an office in the Chamber of Commerce Bldg., Detroit, Mich., where



W. D. RAY.

he will carry on a general consulting business in electrical and mechanical engineering. Mr. Ray has had 15 years of professional experience, having occupied the position of electrical engineer of the Detroit Construction Co.; electrical engineer of the Motor Vehicle Co., Chicago; general manager of the Magann Air Brake Co., Detroit, general manager and superintendent of the Everett Railway & Electric Co., etc. He is a member of the American Institute of Electrical Engineers, the Chicago Electrical Association and the Detroit Engineering Society. His most recent engineering work has been in connection with the interurban railways of southern Michigan having been identified with the Grand Rapids, Holland & Lake Michigan Rapid Ry., the Detroit, Lake Orion & Flint Ry., the Detroit, Rochester, Romeo & Lake Orion Ry., the Orion Light & Power Co., and the Rochester Light & Power Co. He will maintain a competent and efficient corps of engineers and specialists for engineering work of any nature or magnitude.

He will maintain a competent and efficient corps of engineers and specialists for engineering work of any nature or magnitude.

HOUSE MOVING ACROSS ELECTRIC RAILWAYS.

An injunction was asked last month by a firm of house movers to restrain the Chicago City Railway Co. from interfering in moving a building across its railway track at Halsted and 29th Sts. The injunction was denied on the grounds that the house mover should pay the cost of cutting and splicing of electric wires when he desires to have them removed in order to allow the passage of the building. According to the permit granted to house movers by the city, they are held liable for all cutting and splicing of fire alarm and other wires and for all damage done to shade trees, curb stones and curb walls. The court held that inasmuch as the city permitted the railway company to string its wires in the streets it should afford them protection from unnecessary damage and that it was only reasonable that the house mover pay the cost of cutting and splicing wires. The counsel for the house movers state that the case will be appealed.

SALE OF THE LA SALLE-PERU LINE.

January 15th the power house of the City Electric Railway Co., operating in La Salle and Peru, Ill., was burned down and for five weeks the people of these cities have been without street railway facilities. On February 27th Mr. J. R. Borroughs, receiver of the company, sold the road to the Illinois Valley Traction Co., which started to work immediately to resume the service. The required repairs were completed in 11 days and the line was again put in operation. The appearance of the first car after the long shut down was greeted with great enthusiasm by inhabitants all along the line. For the present the cars are being operated without conductors and are supplied with fare boxes in which the passengers put their fare.

OFFICIAL BUREAU OF STANDARDS.

Mr. S. W. Stratton, director of the National Bureau of Standards, has issued a circular of information relative to the work of the government in bringing about more satisfying conditions in the matter of standard weights and measures in this country. About nine months ago the office of "Standard Weights and Measures of the Treasury Department" was superseded by the "National Bureau of Standards," whose functions are defined as follows: The custody of the standards; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the government; the construction when necessary of standards; the testing and calibration of standard measuring apparatus; the determination of physical constants and the properties of materials when such data are of sufficient value to scientific or manufacturing interests and are not obtainable with reliable accuracy elsewhere. It is to be the desire of the bureau to cooperate with manufacturers, scientists and others, in every way possible in the work of determining universal standards. The bureau has in its possession much valuable data which is at the disposal of those interests.

For all comparisons, calibrations, tests or investigations for private individuals or corporations, a reasonable fee will be charged.

Pending the completion of a well furnished laboratory and testing plant now in course of construction at Washington, the bureau will be somewhat hampered in the accomplishment of its aims and for the present must limit its scope to the fixing and comparing of standards of lengths from 1 to 10 ft. or from 1 decimeter to 5 meters; engineers' and surveyors' standards and tapes; measures of weight from 0.01 grain to 50 lb.; capacity measures from 1 fluid ounce to 5 gallons; thermometers; polariscopic apparatus; hydrometers; standard resistance coils from 1 to 100,000 ohms; low-resistance standards from 0.1 to 0.0001 ohm; coils of resistance boxes; potentiometers; ratio coils; standards of electro-motive force as Clark and other cells; direct current measuring apparatus as millivoltmeters and voltmeters up to 150 volts, and ammeters up to 50 amperes.

All communications and articles intended for the bureau should be addressed "National Bureau of Standards," Washington, D. C.

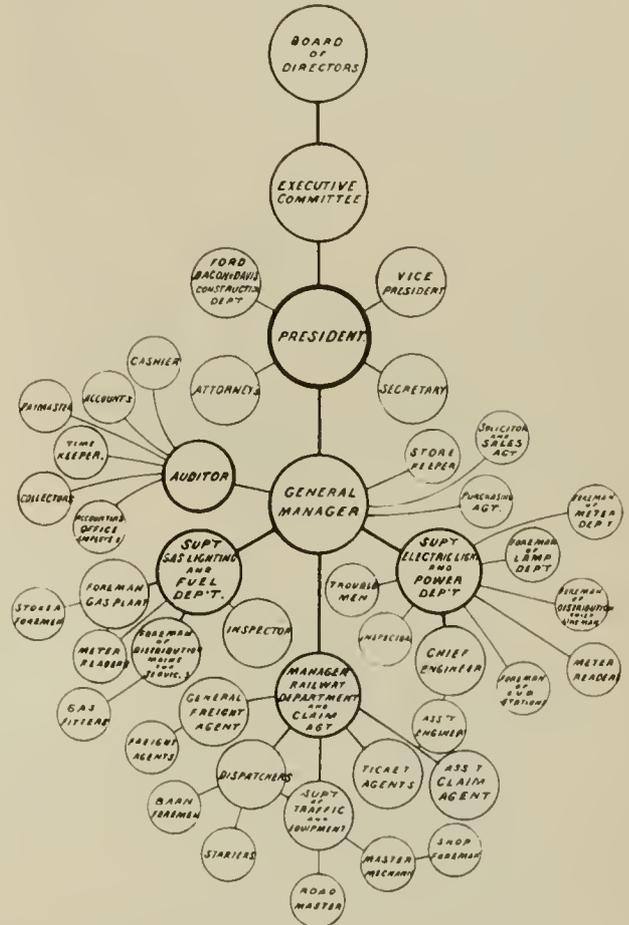
BIRMINGHAM (ALA.) NOTES.

The first installment of the 20 cars ordered by the Birmingham Railway, Light & Power Co. from the St. Louis Car Co. sometime ago has arrived and they are the finest cars that this company has ever had in point of equipment, design and finish. The cars are 41 ft. long over bumpers, painted the company's standard color, chrome yellow medium, and are finished in plain mahogany, with bronzed nickel-plated trimmings. They are equipped with four G. E. 57 motors and Christensen motor-driven air brakes. The seating capacity is 40; the seats are the latest pattern of Hale & Kilbourn walk-over type. The ceiling is bird's-eye maple. The cars are lighted with 20 incandescent lamps, and heated with the Consolidated Car Heating Co.'s electric heaters. The floors are made double and the windows are so arranged that both the large and small dash can be lowered into the side of the car, converting it into an almost open car, and offering an unobstructed view to the passenger of the surrounding scenery. They are provided with two trolleys and arc headlights for use in the suburbs. Inside the corporate limits the arc light is prohibited, and in its place a smaller incandescent headlight is set in the dash beneath the arc, which gives all the light necessary for use in the city. The route signs are the Hunter type, but are set in the upper part of vestibule window, and are so arranged that the motorman can change it to any desired route by lowering a trap and turning a crank. This obviates the necessity of getting down from the car and watching to see when the right sign comes up. Conductor's signal bells are placed by all the seats and on the platforms.

In the face of spirited opposition, the Birmingham Railway, Light & Power Co. has secured franchises on several important streets and avenues for extensions to existing lines. Other new franchises will permit connections that will change several routes to a small degree and relieve the heavy traffic on certain busy streets.

The company has under contemplation and plans are being sub-

mitted for a steam heating plant. The exhaust steam from the power plant will be utilized to this end. The cost of installing this system will be about \$100,000.



ORGANIZATION OF BIRMINGHAM COMPANY.

A diagram showing the organization of the company is herewith reproduced.

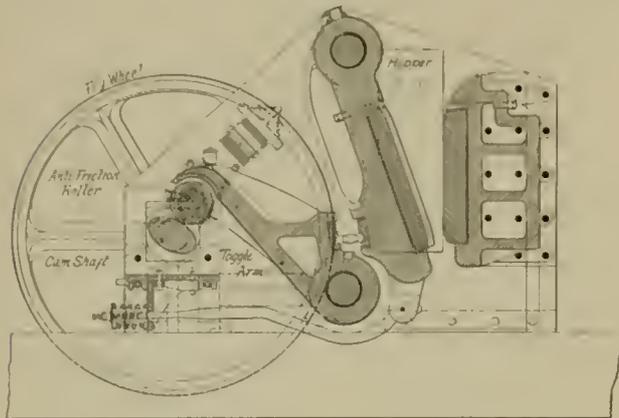
GLOBE HEADLIGHTS.

Mr. Albert F. Schroeder, formerly manager of the Multiplex Reflector Co., and more recently with the Globe Electric Manufacturing Co., has severed his connection with the latter company and has established a factory of his own at 970-972 Hamilton St., Cleveland, where he has installed a full equipment of modern machinery for manufacturing a complete line of street railway headlights, including both hood and dash headlights. He is also making two types of reflectors with which these headlights are equipped. One is the "Multiplex" reflector which has been on the market for about three years and which has met with much favor on account of its special adaptation for use with incandescent lamps. The multiplex reflector made by Mr. Schroeder is designed to correct the distortion which is found in the case of the parabolic reflectors designed for incandescent lamps for the reason that the light of an incandescent lamp cannot practically be reduced to a point in the focus of the parabola as is the case with an ordinary arc light. The general form of the multiplex reflector is that of a parabola but it is altered so as to form annular and concentric separate reflectors of convex form, each of these convex corrugations performing the functions of a separate and distinct reflector. This feature makes the globe headlight especially desirable for street railway purposes. Mr. Schroeder also manufactures special parabolic reflectors and he reports that he is doing a good business with his lines of headlights both in the United States and abroad.

The Milwaukee Electric Railway & Light Co. has been granted six additional franchises over the streets of Milwaukee.

CHAMPION STEEL ROCK CRUSHER.

As track standards in street railway work have approached heavier, more expensive, and more durable forms, there has been a corresponding call for heavier and improved road working tools and devices. The American Road Machine Co., of Kennett Square, Pa., which has for 25 years been prominent as a maker of road and street working machinery, contractors' tools and supplies, early recognized this demand for "practical" machinery and it has constantly endeavored to perfect its line of specialties accordingly. Its list includes road graders, road rollers, rock crush-



CROSS SECTION OF CRUSHER NO. 5.

ers, elevators, conveyors, dump carts and cars, road plows, culvert pipe, etc.

The Champion steel rock crusher made by this company is furnished in three sizes, known as No. 3, No. 4 and No. 5. Nos. 3 and 4 are portable machines that can be readily mounted on wheels and transported from place to place with the aid of horses, and No. 5 is intended for contractors and companies desiring a machine of large output for permanent location.

The maker especially emphasizes the statement that the main shaft of the "Champion" crusher is elliptical in shape and thus one revolution of the flywheels produces two movements of the jaw, permitting slower initial speed and therefore minimum wear resulting from friction and heating of bearings. The frame of the crusher is of the best rolled steel and braced to withstand the tensile or pulling stresses to which it is necessarily subjected. The swinging and stationary jaws are of cast iron, this material having been selected as better fitted to withstand compression stresses. The cam shaft, anti-friction roller, toggle seats, and all shafts from which castings are suspended are of steel forgings of high quality. The dies or crushing plates are special chilled rectangular castings and are reversible in four different positions, permitting their use until the corrugations are worn flat over the whole face of the die.

The frame of the crusher is thoroughly bolted with double nutted bolts, but as added security against shearing or hulging at joints, the frame plates are tongue and groove fitted. The stresses are all taken up by the metal and the office of the bolts is merely to hold the parts in position.

The accompanying table gives sizes, capacity and driving power required for the "Champion" crushers.

	No. 3.	No. 4.	No. 5.
Size or receiving capacity of jaws—inches	7 x 13	9 x 15	11 x 26
Product per hour in tons when machine is closed to 2 in.....	8 to 12	12 to 18	24 to 30
Weight approximated	6,000	8,500	19,000
Speed—Revolutions	170	155	140
Driving pulleys, diameter and face.....	44 x 8	50 x 8	60 x 10
Horse power required	12	15	25

Mayor Johnson, of Cleveland, in company with the officers of the Lehigh Valley Traction Co., of Allentown, Pa., recently made a tour of the proposed new routes in and about Trenton. Mr. Johnson is reported to be perfecting plans to join the interurban systems in which he is interested in the east, crossing the Delaware and running through to New York.

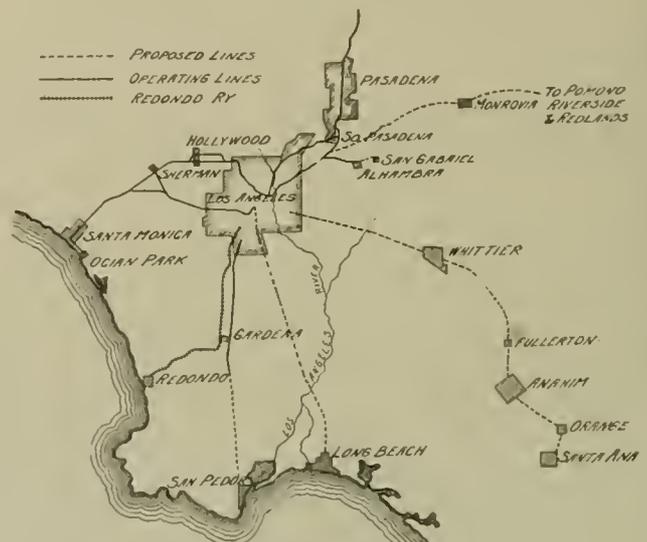
LOS ANGELES INTERURBAN LINES.

There are two great systems of electric railways which are operated inside the city limits of Los Angeles which pretty well grid-iron the entire surface of the city, but in addition to these, an extensive system of interurban lines is in operation which connect this city with a number of neighboring towns. The accompanying map shows the interurban lines both proposed, under construction and in operation, but not the urban lines. The Traction Co. has nearly completed the line from Los Angeles to San Pedro. The Los Angeles Railway Co., which operates the greater part of the lines in Los Angeles has an affiliated company known as the Pacific Electric Railway Co., which is now engaged in building a line to Long Beach and another to San Gabriel, Sierrre Madre and Monrovia. The same company has acquired the street car lines in Santa Ana and Orange and will, at an early date, build a line from this place to Whittier, Fullerton and Anaheim. Eventually, this company proposes to extend the Monrovia line eastward via Azuas to Pannonia and ultimately to Riverside, San Bernardino and Redlands.

Another contemplated line parallels the Southern Pacific Railroad running through Ventura to Santa Barbara. The length of these contemplated roads are respectively, 30, 60 and 90 miles.

The Los Angeles Railway Co. operates 250 cars on its lines within the city. The company is now awaiting new cars which were ordered long ago and are far over due. The additional cars are greatly needed as the present service is inadequate. The number of men regularly employed by this company is about 1,250 and the pay roll amounts to about \$80,000 per month. The two affiliated companies which are now building the interurban lines have a large force of men employed and the construction department pay roll amounts to about \$25,000 per month. The shops which are now being erected for this company are very extensive in size and are being elaborately equipped. The amount of street railway travel in and about Los Angeles is very large, even for a city of 120,000 inhabitants.

The Los Angeles & Pacific Railway Co. operates a line to Santa Monica with branches via 16th St., and the southwestern corner of the city, also the northwestern route, via Hollywood and Colgrove. The latter line operates 80 cars a day and 120 on Sundays. It employs 200 men and has a pay roll of about \$10,000 per month.



LOS ANGELES INTERURBAN SYSTEM.

The Los Angeles & Redondo Railway Co. is about to convert its system to electric traction. The line is 38 miles long and the cost of the electrical equipment will be \$500,000.

A contract has been secured by Mr. Robert Sherer for the grading of the Huntington-Hellman Long Beach electric railway. This work will extend over a line of 17 miles in length. The specifications provide that it shall be completed 60 days from February 1st. The entire road will be built upon a private right of way, and the contract for the bridge work has been let to Mr. J. D. Mercereau.

The most important bridge on the line will be the one over the San Gabriel River, three miles from Long Beach. The tracks will be laid as soon as the grading is completed and material is constantly arriving for the equipment of the road. It is expected the line will be ready for traffic about July 1, 1903, and when completed, the system will represent an outlay of about \$1,000,000. The road is to be laid with 60-lb. T rails, 60 ft. in length. Mr. Huntington and his associates are expending in the neighborhood of \$500,000 a month in the construction of interurban roads. The total expenditure in interurban roads since the Huntington-Hellman syndicate was organized has exceeded \$1,000,000. About 500 men are employed in addition to the regular operating force of the Los Angeles Railway Co., and the operation of the Long Beach line when completed will require the employment of about 100 more men. The road is to begin its service with 20 cars.

This syndicate expects to invest about \$10,000,000 in interurban railways during the next four years, which expenditure is already arranged for. In addition to this the Kern River Power Co. will provide a total of \$5,000,000 for developing power for the use of the railway lines and other purposes.

The Los Angeles Railroad Co. has just received 30 cars from the St. Louis Car Co. The accompanying illustration shows the general appearance of one of these cars. It is the typical California

makers have cited to us some 40 British tramway companies as customers.

"Socarbolate" is handled in this country by the Frank S. DeRonde Co., 46 Cliff St., New York City, sole agent for the United States and Canada. The DeRonde company says concerning this fluid: "We claim that 'Socarbolate' is the only soap of its kind worth using, that is now on the market. It is a strictly first-class washing fluid and if used according to directions will wash varnish or paint work for any length of time without injury to the surface. It has a very agreeable odor, which while not too pronounced, or suggestive of infection, is a very excellent disinfectant. Its use is absolutely harmless either to the individual who may be using it or to the article that it may come in contact with. It is very easily soluble especially in hot or tepid water. It is recognized throughout England and the Continent to be absolutely the best material of its kind that has ever been produced. This valuable product is manufactured in Scotland and is now in use by the principal street railways, and other transportation companies throughout Europe."

The DeRonde company carries a large stock of the goods prepared for immediate shipment and is willing to send to all those who may be interested, a sample one gallon drum free of charge, so that a careful trial may be made and thus demonstrate the value of this high grade product.



LOS ANGELES CAR-ST. LOUIS CAR CO.

combination design with open compartments at both ends and a 15-ft. closed compartment in the center. The car is of handsome design and is said to be one of the most elaborately finished cars which has been shipped west. It is 39 ft. over bumpers, its outside width 8 ft. 2 in. and its height, from under part of the sills to top of deck, 9 ft. 1 in.

The open compartments at each end each have six walk-over slat seats and the closed compartment has longitudinal seats which are upholstered. The ceiling and interior linings are of mahogany with solid bronze trimmings and the outside of the car has concave and convex panels covered with No. 12 sheet steel. The cars are fitted with four double tread Stanwood steel steps and there is one St. Louis Car Co.'s arc headlight in each car. The trucks on which these cars are mounted are made by the St. Louis Car Co., and are known as the Los Angeles type having a gage of 3 ft. 6 in. wheel base of 5 ft. 3 in. The axles are 4 1/2 in. in diameter and the wheels 33 in. These cars are for city service and are equipped with two Westinghouse No. 38 B motors.

CLEANING CARS.

Not the least among the troubles incident to the street railway business are those of the car cleaner and our readers will welcome information concerning "Socarbolate," otherwise known as the "perfect cleaner," for washing inside and outside of street cars, omnibuses and railroad cars. For outside use the recommended proportions of the washing mixture are one-half pint "Socarbolate" to three gallons of tepid water, and for inside spraying one-half pint of 1 1/2 gallon tepid water. The fluid is extensively used by European transportation companies and the

The DeRonde company makes the widely used "Lythite" fire-grade armature and shellac varnishes, P. & B. tape Ruberoid motor cloth and similar goods.

NO LARGE BUNDLES ON CARS.

In view of the crowded condition of its cars the Brooklyn Rapid Transit Co. has issued orders prohibiting the carrying by passengers of packages or bundles that can not be held in the lap or placed under the seat without inconvenience to other passengers. Persons with large bundles will not be permitted to board a car.

The order provides that a person with a cumbersome bundle and holding a transfer from another line must be accepted as a passenger but the conductor must turn the transfer into the office with a report of the matter and the conductor issuing the transfer will be discharged.

NO FUNERAL CARS IN SPRINGFIELD, MASS.

The Springfield (Mass.) Street Railway Co. denies the report published in several papers that funeral cars were to be instituted on that road. Mr. Geo. W. Cook, superintendent of the company, writes us that this is a business the road does not care for and has refused with very few exceptions.

McGovern and conductors in the employ of the Omaha & Council Bluffs Railway & Bridge Co. are now entitled to wear service bridges, one gold star on the coat label signifying five years' service, two stars ten years' service, etc.

PERSONAL.

MR. C. D. BROWN, formerly electrician of the Binghamton Railroad Co., has resigned to become wire chief for the Binghamton Telephone Co.

MR. WILLIAM H. SAVERY has been appointed superintendent of the Woronoco Street Railway Co., of Westfield, Mass., succeeding Mr. R. P. Lee, resigned.

GENERAL JOHN M. HOOD has been elected president of the United Railways & Electric Co. of Baltimore, succeeding Mr. George R. Webb.

MR. J. W. PATTERSON, who was for 17 years with the Adams & Westlake Co., has recently been appointed general sales agent of the Central Union Brass Co., of St. Louis.

MR. J. B. HICKS, who is favorably known in the street railway and steam railroad fields, has been appointed manager for H. M. Shaw & Co., with offices at 115 Broadway, New York City.

MR. F. G. L. HENDERSON has retired from the active management of the Newton (Mass.) Street Railway Co. to assume the position of superintendent of the Boston Suburban Electric Railway Co., which is a consolidation of all the Newton roads and the Lexington & Boston Street Railway Co. As the senior superintendent Mr. Henderson's duties will connect him directly with all the roads in the consolidation. Just before Mr. Henderson left his old office at Newton to take his new headquarters at Newtonville he was called from his house late one night on the pretext that a break had occurred at the power house. On the way to the power station he was intercepted and led into the principal restaurant of the town, where to his entire surprise he found all the employees of the company assembled around a banquet table. Amid cheers and enthusiasm he was presented with a handsome gold watch by the men as a token of their respect and esteem. Speeches and dinner followed the presentation.



F. G. L. HENDERSON.

MR. J. F. DUSMAN, who for the past year has been manager of the Edison Electric Light Co., of York, Pa., was last month appointed general manager of the York County Traction Co.

MR. P. T'SERSTEVENS has been appointed secretary general of the Permanent International Tramway Union to succeed Mr. Nonnenberg. The headquarters of this association are at No. 6 Impasse du Park, Brussels, Belgium.

MR. L. E. TROXLER, formerly connected with the Louisville (Ky.) Railway Co., has been appointed superintendent of equipment and construction of the Louisville, Anchorage & Pewee Valley Electric Railway Co., succeeding Mr. W. G. Hesser, resigned.

MR. E. A. CUNNINGHAM, formerly superintendent of the Fort Dodge Light & Power Co., has been appointed superintendent of the Des Moines (Ia.) City Railway Co. Mr. J. E. Welch has been appointed superintendent of road bed and track of the Des Moines company.

MR. JOHN MARKLE, president of the Sprague Electric Co., and Lieut. Frank J. Sprague, technical director of the same company, were included among the "Captains of Industry" who gave the luncheon in honor of Prince Henry at Sherry's, February 26th.

MR. S. W. GUNSALUS will succeed Mr. C. E. Baker as superintendent of transportation of the Southwest Missouri Electric Railway Co. at Webb City, Mo. Mr. Gunsalus was formerly chief dis-

patcher of the system. Mr. Baker will go to Beaumont, Tex., to take charge of the construction of a new electric line in that city.

MR. F. NONNENBERG, who for several years has been secretary general and treasurer of the Permanent International Tramway Union, has by reason of the pressure of his other work been obliged to resign the secretaryship of the association, but will continue to serve as treasurer.

MR. JULIAN L. YALE has been made vice-president of the American McKenna Process Co., with headquarters in the Rookery, Chicago. Mr. Yale will supervise for the company the purchase and sale of rails and other materials and make contracts for removing rails. This company has re-rolling plants at Joliet, Ill., Kansas City and Tremley Point, N. Y.

MR. THOMAS P. FOWLER, representing English capital in the project of extending the Metropolitan Street Ry. of New York City, has been elected president of the Metropolitan Securities Co. and the Interurban Street Railway Co. Mr. Fowler is also president of the New York, Ontario & Western Railway Co.

MR. JOHN SPEER, of the Speer Carbon Co., St. Mary's, Pa., was recently a caller at the office of the "Review." Mr. Speer represents a firm which has made remarkable progress in the business world since its establishment in 1899, and he reports that the prospects of the Speer company for the coming year are better than ever.

Mr. CASSIUS M. WICKER, president of the Zanesville & Ohio R. R.; vice president of the Brooklyn, Queens County & Suburban Railroad Co.; president of the North Shore Traction Co., and a director in several other corporations with headquarters in New York, has been elected president of the New York association of former Chicagoans which was recently organized in New York City by 50 prominent ex-Chicagoans.

MR. R. LANCASTER WILLIAMS, treasurer of the Richmond (Va.) Traction Co., who is also interested in several other street railways in the south, is about to go to England to investigate the electric traction systems in that country in the interest of the Great Britain Railway Development Co., which was recently incorporated at Trenton, N. J. It is stated that the future investments of the Great Britain company depend largely upon Mr. Williams' report.

MR. D. H. LAVENBERG, superintendent of the Norwalk, O., division of the Lake Shore Electric Ry., has accepted the superintendency of the Northern Texas Traction Co., which controls electric lines in Dallas and Fort Worth, as well as an interurban partly completed between those cities. Mr. Lavenberg was formerly chief dispatcher of the Wheeling & Lake Erie R. R. and has many years' experience with both the steam and electric roads. He is succeeded at Norwalk by Mr. Smith, superintendent of the Cleveland division of the Lake Shore railway.

MR. T. P. AGNEW, superintendent of the Citizens' Street Railway Co., of Vincennes, Ind., died at his home in that city recently, of paralysis. Mr. Agnew was born in Coshocton County, Ohio, in 1842. Much of his active and successful business career was in connection with the steam boat business on the Wabash, Ohio, Cumberland and Mississippi Rivers, but in 1896 he settled in Indiana, and became superintendent of the Vincennes electric lines. A wife and several children survive him.

MR. WILLARD A. SMITH, publisher of the Railway & Engineering Review, Chicago, has been appointed director of transportation exhibits at the Louisiana Purchase Exposition. Mr. Smith filled a similar position during the World's Fair at Chicago, in 1893, and in 1900 was head of the department of transportation and engineering exhibits for the United States government at the Paris Exposition. He was also the official representative of the State Department of the government at the International Railway Congress in Paris, and subsequently received the decoration of the Legion of Honor from the French government.

ELECTIONS.

THE LA CROSSE (WIS.) & EASTERN RAILWAY CO. has elected the following officers: Joseph Roschert, mayor of La Crosse, president; Dave Palmer, vice president; J. P. Reeve, secretary, and J. B. Taylor, treasurer. The company proposes to build an interurban railway between La Crosse and Viroqua.

THE GRAND RAPIDS (MICH.) RAILWAY CO. has elected the following officers: C. M. Clark, of Philadelphia, president; Lester J. Rindge, first vice president; G. Stewart Johnson, second vice president and general manager, and Benjamin S. Hanchett, jr., secretary and treasurer. Mr. Clark succeeds Mr. Anton G. Hodenpyl as president, the latter desiring to retire from the duties of the office owing to his recent removal to New York. He was re-elected as a director of the company.

MR. JOHN F. BEGGS was elected president and general manager of the Milwaukee Electric Railway & Light Co. at a meeting of the board of directors in New York City on February 20th. Other officers were elected as follows: William Nelson Cromwell, first vice president; Charles W. Wetmore, second vice president; George R. Sheldon, treasurer; Charles A. Spofford, secretary, and George O. Wheatcroft, assistant secretary and assistant treasurer at Milwaukee. The same gentlemen were elected to corresponding offices in the Milwaukee Light, Heat & Traction Co., which operates the interurban lines between Milwaukee, Racine, Kenosha and Waukesha. Mr. Beggs succeeds Mr. Cromwell as president of the Milwaukee Electric Railway & Light Co., and Mr. Cromwell as vice president, succeeds Mr. Payne in that capacity.

SALE OF THE CLEVELAND ELECTRIC CO.

The transfer of the Cleveland Electric Railway by the Everett-Moore syndicate to the syndicate organized by Mr. Horace E. Andrews, took place March 8th. A certificate for 43,000 shares of stock of the Cleveland Electric was transferred to Mr. Andrews for the sum of \$3,545,000, a check for this amount being signed by Mr. Andrews as syndicate manager. A special meeting of the directors of the company was held immediately after the sale, at which Mr. Andrews was elected president of the company. Mr. Henry J. Davies, who was formerly assistant secretary of this company, was elected secretary to succeed Mr. Fred Borton. No other changes were made in the officers of the company. The resignations of Messrs. Henry Everett and Charles W. Wason as directors, were accepted but their places have not yet been filled. President Andrews at once took charge of the company.

TRUSTEES FOR AMERICAN CAR CO.

The American Car Co., of St. Louis, on February 19th transferred all its property to William B. Thompson and Henry B. Denker, trustees for the company's creditors. The company is not insolvent, but has been seriously hampered by want of sufficient working capital, and the trust has been created to better secure the creditors, while the business is continued as heretofore. An examination of the books made recently by Jones, Caesar & Co. shows assets in excess of \$500,000 and liabilities less than \$400,000; a conservative estimate places the value of the property at about \$125,000 over all liabilities.

NEW ENGLAND STREET RAILWAY CLUB.

The regular meeting of the New England Street Railway Club was held at Wesleyan Hall, Boston, February 27th. The paper of the evening was "Four-Motor Equipments and the Possibilities of Alternating Currents for Street Railway Service," by Albert H. Armstrong, consulting engineer of the Railway Department of the General Electric Co.

The Mono-Rail Co., which was recently organized in Baltimore with William T. Levering as president to introduce the mono-rail traction system invented by Howard Tunis of that city, will erect an experimental track about one half mile in length at Windsor Hills, Walbrook, in order that the merits claimed for the new invention may be demonstrated by a practical test.

FAST SERVICE TESTS ON THE LAKE SHORE.

As a preliminary to choosing the car equipment for the fast through electric service between Cleveland and Toledo experiments will be made with four-motor equipments of the General Electric, Westinghouse and Lorain Steel companies. Early this month some trial tests were made with a 51-ft. car mounted on Barney & Smith M. C. B. trucks and equipped with four G. E. 66 motors. The time from Norwalk to the city limits of Toledo, a distance of 62 miles, was 2 h. 16 min. Deducting 25 minutes for stops made on sidings the average speed was about 33½ miles per hour, the maximum being about 60 miles per hour.

SLEET, SNOW AND FLOODS.

According to statements made public by the official weather bureau the winter just past has been an unusual one in the number and severity of its rain, sleet and snow storms. The storm area has extended very generally over the country east of the Mississippi, but New York, New Jersey and Pennsylvania have received seemingly more than their share of unpleasant weather or at least have been the greatest sufferers from the effects of rain and snow. The comparatively high temperatures that have accompanied most of the recent storms has been exceptionally disastrous to all forms of overhead wires in that the rain has speedily turned to sleet, which is always more to be dreaded by the street railway manager than snow. From all parts of the East come dire tales of woe of wires down and feeder systems crippled through the overweight of sleet. Added to this, all the watersheds in this part of the country have been swollen to a degree almost unprecedented. During the latter part of February over a dozen street railway companies within 200 miles of New York had to suspend business utterly for from one to three days owing to the presence of flood water in their power stations and some of the boiler furnaces were two feet under water.

On an interurban line running out of Philadelphia the sleet and high water together brought the cars to a standstill late one afternoon and not a car was moved for over 48 hours. The motormen and conductors were instructed to remain with their cars to prevent boys or vandals from breaking the windows or doing other injury, and oil cooking stoves, food, playing cards and cigars were distributed to the men by the company and by kindly neighbors. The men slept on the slats and took the matter as considerable of a lark, as they were drawing double pay for very little work.

The lines at Albany, Rochester, Harrisburg, Wilkesbarre and other leading cities report heavy damages. Mr. E. G. Conette, general manager of the Syracuse Rapid Transit Co., writes that while the floods did considerable injury in Syracuse and the suburbs, his lines fortunately escaped any great damage, although the company was put to much extra expense to keep the routes open. While referring to this subject too much credit can not be given to employees and employers alike all over the afflicted sections, many of whom worked uncomplainingly for days at a stretch with but little rest and sleep, in the efforts to keep the cars moving at a time when the public most needed transportation conveniences.

It might be added that those street railway companies who were forced to shut down for a brief period may take consolation from the fact that the Empire State Express on the New York Central for the first time in its history had to be temporarily abandoned and reached Buffalo two days behind its schedule time. The telephone and telegraph companies also suffered severely and for many hours the only telegraphic communication between New York and Philadelphia, Baltimore and Washington was by way of New Orleans and Chicago. One bunch of important telegrams was sent to Philadelphia by messenger by train as the surest method of getting the dispatches through.

Benson and Charles F. Bidwell, whose tests of their method of telephoning from moving street cars have been previously mentioned in the "Review," are reported to have performed another thorough and entirely satisfactory test on the Grand Rapids Ry., March 6th. Three cars were equipped with long distance telephones, the state line was brought into service, and connections were successfully made and communication held with several distant cities.

THE MALTBY LUMBER CO.

The Maltby Lumber Co., of Bay City, Mich., is mailing to its customers and friends a small pamphlet containing the rules of the northwestern cedarmen in regard to poles for electric railway, telephone and telegraph purposes, which contains some interesting information in regard to the selection and inspection of this class of lumber. This company, which deals in Michigan white cedar both for poles and ties, has a number of large yards for sorting poles, the principal ones being located at Boyne Falls on the Grand Rapids & Indiana Railroad; at Pinconning where there are two connecting railroads to furnish cars; and at River Rouge, a suburb of Detroit reached by a number of trunk lines. The company maintains a corps of competent and trained inspectors who select and count every car of stock shipped and the inspection as well as the tally as invoiced, is guaranteed to be in accordance with the rules laid down. Michigan white cedar has been in use in Michigan and Wisconsin for ties on steam roads for the last 20 years and as it is becoming better known its use is constantly increasing. For straight line work it is said to be unsurpassed but on very heavy curves trouble with them is said to have occurred on account of spikes pulling. On sharp curves many roads now use harder timbers such as chestnut and oak. The chief value of Michigan white cedar ties however is for very heavy traffic where it is undesirable to disturb the road bed more than is absolutely necessary. With the use of tie plates, cedar ties can claim records of 12 to 15 years. The saving in the labor of replacing alone amounts to a large sum and at the same time the price of cedar is still below that of oak.

LONDON STREET RAILWAY EMPLOYEES' ANNUAL BALL.

The first annual ball of the employees of the London (Ont.) Street Railway Co. was held on the evening of February 21st, and proved a most enjoyable occasion. The dance was held in the employes' hall at the car barns, and the number of people participating approached close upon 300. The ceremony began at 9:30 o'clock with the grand march, led by Mr. Thomas H. Smallman, vice-president of the company, and Mrs. Thomas Reycraft. Other guests of honor were Mr. and Mrs. J. Smallman, Mr. and Mrs. P. W. Broderick and General Manager and Mrs. Carr. Letters of regret were received from Mr. Henry A. Everett, president, and Messrs. Wason and Holt, directors of the company. Special cars were used to transport the numerous company of guests to a downtown cafe. All branches of the service were represented at the gathering, and every man who could be spared from the operation of the road was present at the occasion. The party dispersed at 3:30 o'clock in the morning, and special cars were run in all directions to convey the guests home.

THREE-CENT FARE ROADS IN CLEVELAND.

The Peoples Railway Co., of Cleveland, was incorporated last month with \$1,000,000 capital stock, the incorporators being E. J. Blandin, W. L. Bice, John M. Garfield, A. E. Green and E. G. Harte. This enterprise, which is popularly known as Mayor Johnson's 3-cent fare road, has been organized to build a system of street railways in the city of Cleveland on all the streets not at present occupied by other companies, according to an ordinance recently passed in that city. Seventeen routes were specified in this ordinance and franchises for six of these have been asked by Mr. John B. Hoefgen on behalf of the new company. The six routes designated include the best ones of the 17 mentioned in the original ordinances. The request for franchises was referred to the board of control, the committees on judiciary and railways and the corporation council.

The attempt to secure franchises brought about considerable trouble in regard to the consents of property owners and culminated in an injunction granted February 28th restraining the two old street railway companies in the city from interfering in any way with the efforts of the new company to establish its 3-cent fare line. Mr. Hoefgen received the necessary consent of property owners for his franchise, but later some of the property owners withdrew their consents, and it was claimed that the old street railways

had been instrumental in having these consents withdrawn. Two suits were filed to enjoin the old companies from interfering with the efforts of the new company to procure consents, one of the suits being filed on behalf of the city and the other on behalf of Mr. Hoefgen. The two suits were practically identical.

BROOKLYN EXTENSION OF THE NEW YORK SUBWAY.

The detailed plans for the Brooklyn extension of the New York subway are now so far completed that it is thought that it will be possible to advertise for proposals for its construction and operation in about two months. The special contract committee of the Rapid Transit Commission has been studying the problem and drawing up a satisfactory form of contract and the question involves difficulties which may make a satisfactory solution troublesome.

The Brooklyn extension is not a system by itself but a very necessary link in the whole system included in the boroughs of Manhattan, the Bronx, Brooklyn and Queens. Public sentiment strongly favors a single fare for the entire route and this is the most difficult question the commission has had to meet. Mr. McDonald, the contractor, who is building the Manhattan and Bronx portions of the system, has contract with the city permitting him, when the road is completed, to charge a 5-cent fare down to the city hall terminal. This contract can only be modified with Mr. McDonald's consent, and is binding for 50 years. Holding this contract, Mr. McDonald is by far the likeliest competitor for the extension to Brooklyn, but it is not expected that he will care to build and operate three miles additional road and receive no extra fare for the increased haul. No other contractor can take the Brooklyn extension under agreement to carry passengers from Brooklyn to any point in Manhattan or the Bronx because in order to do so a traffic agreement with Mr. McDonald would be necessary and it is thought unlikely that Mr. McDonald would cut down his revenues from operation by giving up part of his receipts to a rival contractor. If the Brooklyn extension should be operated in connection with the Long Island road thus extending the continuous route to Jamaica, a still more difficult problem is presented in connection with the single fare.

In a recent report of Chief Engineer Parsons to the Rapid Transit Commission, he disapproves the four-track tunnel to Brooklyn which has been urged in some quarters. The cost of the four-track road would exceed the appropriations for this work. Bridge Commissioner Lindenthal also favors the double track tunnel to Brooklyn at present and believes that the congestion of traffic would be better relieved by ultimately building other connecting tunnels to the different parts of Brooklyn Borough.

The proposition for a two-track extension to Brooklyn, however, is meeting with considerable opposition. Mr. John De Witt Warner and President Swanstrom, of Brooklyn, have strongly advocated a four-track road, and the latter in a recent communication to the Rapid Transit Commission states that this is the only plan which will be approved by the people of the borough of Brooklyn. He states that for many reasons the proposed plans do not satisfy the existing conditions and that if carried into effect they will not remedy the congestion which is now a feature of the Brooklyn Bridge during the rush hours. In elaborating his argument President Swanstrom states that Brooklyn is bound to grow faster than any of the other boroughs and that its building up will solve the tenement house problem. He claims that Mr. Parsons has made an error in his calculations that from four to five times as many people will use the Manhattan underground road as will use the Brooklyn extension. He asserts that while 100,000,000 people cross the Brooklyn Bridge every year only 50,000,000 passengers are carried yearly by the railroads in Manhattan and the Bronx.

While the court has already approved of the two track plans of the Rapid Transit Commission this body is authorized by statute to present such modifications of the plans as it may deem advisable, and such amendments, it is stated, will not invalidate the approval already given by the court.

The electric line in Gainesville, Tex., has been abandoned and its franchise forfeited. Local traffic is accommodated only by a mule line, and it is said that there is a desirable opening in Gainesville for prospective street railway investors.

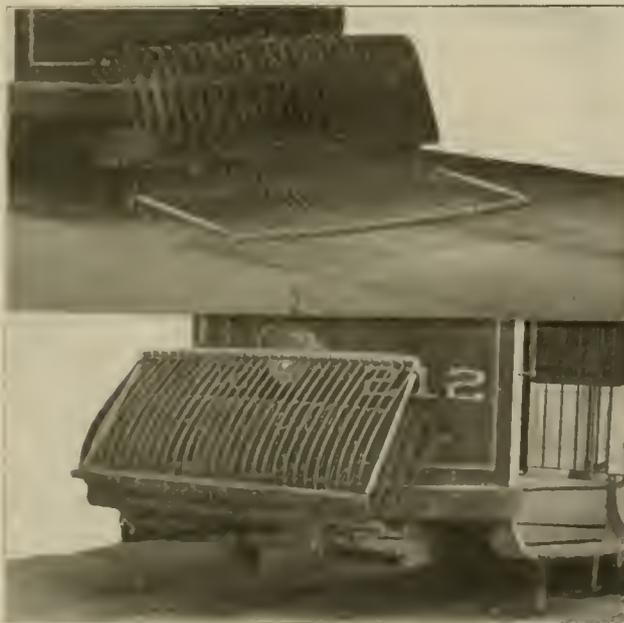
NEW ROLLING STOCK FOR BROOKLYN RAPID TRANSIT.

The Brooklyn Rapid Transit Co. has been making extensive additions to its rolling stock in order to better handle the enormous increase in its traffic, especially during the morning and evening rush hours. The new closed cars are the semi-convertible type described by the company's master mechanic, Mr. Eugene Chamberlain, at the New York meeting of the American Street Railway Association last October, and published in the "Review Daily" at that time. Of these cars 200 were built by the Laclede Car Co., of St. Louis, and 50 by the Stephenson Company, of Elizabethport, N. J. The Stephenson Company is also building a number of open cars for Brooklyn.

The seats in the closed cars are the Chamberlain individual revolving seat, made by the Heywood Brothers & Wakefield Co., of Wakefield, Mass., and also described in the "Review Daily." Mr. Chamberlain has recently devised a heater to be placed on the cross arm of this type of seat and which it is believed will affect a considerable saving in the cost of electric heating.

NEW MODEL PROVIDENCE FENDERS.

The Consolidated Car Fender Co., of 39 Cortlandt St., New York City, has added a new model to its well known line of life-saving car fenders. This is named style "C" and embodies all improvements made by the company in life-saving devices up to the present time. The shape of the fender proper, or basket, is such that when it picks up a person it holds the body without



PROVIDENCE FENDER MODEL C.

injury until the car can be stopped. When not in use on the back end of the car it can be turned up and fastened to the dash board, taking up less than 12 in. of space.

This fender has been approved and specified for all cars on some of the largest electric roads in the United States. Col. Woodworth reports business in fine condition.

CONSOLIDATION IN PHILADELPHIA.

February 28th it was announced that the terms of the lease of the property of the Union Traction Co., of Philadelphia, to the Consolidated Traction Co. had been agreed upon. The new company guaranteed Union Traction stockholders 3 per cent for the first two years, 4 per cent for the third and fourth years, 5 per cent for the fifth and sixth years, and 6 per cent for the remainder of the term of 99 years.

The Consolidated Traction Co., will be capitalized at \$30,000,000 in 600,000 shares of a par value of \$50. The Union Traction Co. stockholders will have the right to subscribe to one share of new stock for each four of present holdings. It is stated that the control of the Union Traction Co. will remain in the hands of those who exercise it at the present time.

FIRE AT INDIANAPOLIS SWITCH & FROG CO'S. WORKS.

A fire occurred at the East St. plant of the Indianapolis Switch & Frog Co., at Springfield, O., on February 10th, and it was at first reported that the works had been destroyed. We are glad to announce, however, that the company's loss was confined to a portion of its offices, and new quarters have been established at 76 Eastern Ave., where its business is being conducted as heretofore, and all orders can be promptly attended to. The company states that its file of manufacturers' catalogs was entirely destroyed and it would be pleased to receive catalogs from the various manufacturers of materials and supplies in its line in order to renew its files.

PACIFIC ELECTRIC RAILWAY CO.

Official announcement was made under date of Feb. 25, 1902, that the Pacific Electric Railway Co., organized under the laws of California, had acquired the railroads and property of the Los Angeles & Pasadena Electric Railway Co., the Pasadena & Mt. Lowe Railway Co., and the Pacific Electric Railway Co., of Arizona. Possession of these properties was taken by the new company Feb. 24th, on which day all officers and employes of the several companies were ordered to report to and be governed by orders issued by the officials of the Pacific Electric Railway Co.

The officers of this company are: H. E. Huntington, president; Epes Randolph, vice-president and general manager; W. H. Smith, manager; George E. Pillsbury, chief engineer; S. C. Baxter, auditor; C. E. Donnatin, superintendent of mechanical department; J. R. Atchison, superintendent of power department; and S. H. Anderson, chief electrician.

INTERURBANS TO ENTER CINCINNATI.

An agreement has been reached between the Cincinnati Traction Co. and the Cincinnati & Eastern Electric Ry., whereby the cars of the latter company will enter the heart of the city. The details of the plans for the entrance of the interurbans into the city have not been worked out but the negotiations have been brought to a satisfactory conclusion. As an agreement has been reached in Cincinnati on this subject the bill recently introduced into the Legislature, providing the privilege of entrance into the cities by interurban cars is now of little value and it is thought it will probably be withdrawn.

NEW PUBLICATIONS

CORNELL UNIVERSITY REGISTER, for 1901-1902, has been issued. The Register contains a calendar of the courses for the ensuing year and historical account of the foundation and endowment of the university together with complete information as to the various courses of instruction which it includes.

THE WORKINGMAN'S COLLEGE, Melbourne, Australia, has issued its prospectus for 1902. This is a technical college and school of mines as well as an elementary school for the working men and the classes are conducted in the evening. The courses are designed for carpenters, joiners, masons, brick layers, machinists, cabinet makers, carriage builders, plumbers, painters and decorators, electricians, lithographers, photographers, etc. The various courses cover two and three years of instruction and are thoroughly practical in methods of teaching.

Five burglars raided the office of the Northampton (Mass.) Street Railway Co. on the night of February 16th, blew open two safes with dynamite, and secured \$750 in cash and a check for \$300.

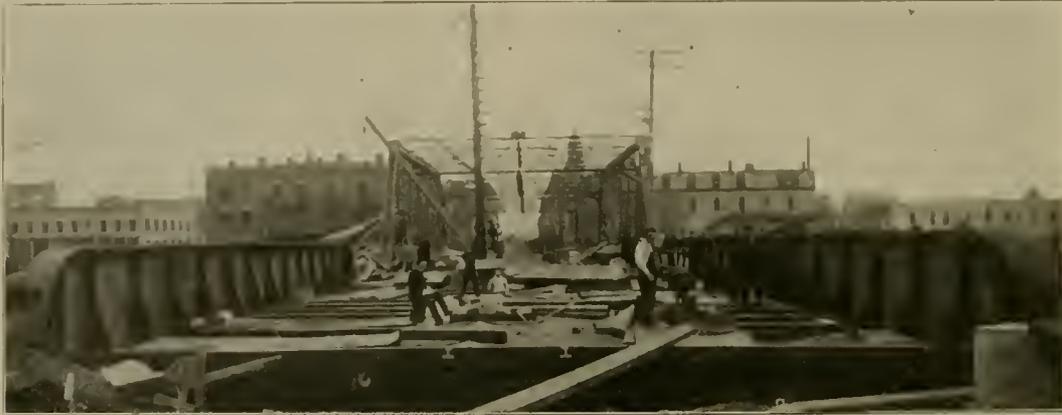
JOLIET BRIDGE & IRON CO.

The Joliet Bridge & Iron Co., of Joliet, Ill., makes a specialty of building railway and highway bridges, but is also equipped to do all kinds of structural iron work on power houses, car barns and factories. The company was organized in 1896 with a capital of \$10,000 and since its start has had a steady growth, its capital being now \$100,000. It has a large amount of business on hand which makes it necessary to keep in stock all sorts of bar and structural iron, enclosed beams, etc., and thus enables it to turn out work on short notice. Its location on the outer belt railroad line enables it to make direct connections with all railroads running into Chicago, ensuring prompt shipments and low rates. The company's work at present covers bridge and structural work extending over a large

blocks. Its length is 76 ft. and the roadway is 42 ft. wide with a 12 ft. sidewalk on each side.

This company also builds steel culvert pipes, many of which have been placed on street railways and highways and have been found very satisfactory. In many places these pipes save the building of bridges and as they can be put in place more readily than other culverts, their use has been found very desirable for street railway work. The accompanying cut shows one of these culverts the diameter of which is 16 ft. and length 140 ft. This culvert was erected in 1898 in the Illinois-Michigan canal at Marseilles, Ill. The company is prepared to build these culverts in any sizes from 18 in. in diameter up.

The president of the Joliet Bridge & Iron Co. is Mr. Robert C. Morrison.



BRIDGE OVER DES PLAINES RIVER—JOLIET BRIDGE & IRON CO.

territory including the states of California, Montana, Dakota, Michigan, Wisconsin, Oklahoma, Illinois, Minnesota, Iowa and Nebraska.

While this company's annual capacity at starting was but 10,000 tons of product its growth has reached a present capacity of 50,000 tons of finished product per year. Among its contracts which are now being filled may be mentioned the public market sheds of St. Paul, Minn.; the postoffice at Los Angeles, Cal.; the postoffice at Helena, Mont.; the factory of the Peerless Portland Cement Co., of Union City, Mich., the buildings of the Economy Light & Power Co., of Joliet, and the three-span bridge over the Fox River at

UNIFORMS.

There can be no doubt as to the benefits which have followed the practice of uniforming street railway employees. In the early horse car days the question of uniforms was not appreciated, but with the introduction of electric cars of handsome design and finish the roads of today are generally prescribing neat and attractive looking uniforms for their operating forces which are in harmony with the general improvements in the service which have taken place in late years. The subject is aptly presented in a recent publication of the Pettibone Brothers Manufacturing Co., of Cincinnati, makers of uniforms.

"While street railway managers are devoting a great deal of attention to equipping their lines with large, handsome cars containing the latest appliances for speed and for the comfort of passengers, the matter of uniforms is not always given the attention it deserves. No matter how elaborate and comfortable a car may be a conductor with a soiled or patched coat or worn trousers destroys the general good effect. There is no excuse for this, as these employes receive salaries that justify the purchase of at least one suit of clothes a year, and with proper care a summer and a winter suit would last two seasons, if they are of a good material and make.

"If the earnings of a road will not justify a uniform inspector, this duty should be added to those of the stable superintendent or other official, and he should see that both conductors and motormen keep their clothes looking fresh and clean. It is no hardship to compel the men to do this. It will give them more self respect and will materially improve their conduct toward passengers. A suit to wear and look well for two seasons must be made of strong cloth, and pure indigo dyed. The coat must be well made and properly stiffened so as not to break down in front. With a suit of this kind and a cap to correspond the employe presents a well dressed appearance in every way suitable to his surroundings."



16-FT. CULVERT AT MARSEILLES, ILL.

Oswego, Ill., for the Aurora, Elgin & Chicago railway. It is also building a bridge over the Illinois-Michigan Canal at the Des Plaines River, a view of which is shown herewith. Several bridges built by this company for the Chicago & Joliet Electric Ry. were illustrated in the "Review" for January last. This bridge which is nearly completed, is built of plate girder spanned across, it has a buckle plate floor, cemented on top and paved with 5-in. oak

The Lake Shore Traction Co. of Westfield, N. Y., was recently organized to build a 28-mile electric line from Westfield to Silver Creek. Among the principal stockholders are: Arthur C. Wade and A. N. Broadhead, of Jamestown, N.Y., and F. R. Green and Harry D. Kirkover, jr., of Fredonia.

FINANCIAL.

METROPOLITAN STREET RAILWAY.

The Metropolitan Street Railway Co., of New York, on Feb. 28th made public its report for the quarter ending December 31st. The report shows net earnings of \$2,010,000 as compared with \$1,939,290 for the corresponding period of the previous year. The surplus after deducting all charges was \$902,823, an increase of \$44,910.

The Third Avenue road for the quarter ending December 31st reported net earnings of \$187,830 which was a decrease of \$36,300 compared with the last quarter of 1900, due to the increase of \$68,023 in expenses. The gross earnings increased \$31,633. The deficit for the quarter after paying all charges was \$217,837. The accompanying table shows the income account for these roads for the last quarter and the changes over the corresponding quarter for the previous year.

METROPOLITAN STREET RAILWAY CO.		
	1901.	Changes.
Gross earnings	\$3,754,400	Inc. \$98,460
Operating expenses	1,723,972	Inc. 24,323
Net earnings	\$2,010,428	Inc. \$74,137
Other income	133,536	Dec. 16,554
Total income	\$2,143,964	Inc. \$57,573
Charges	1,151,140	Inc. 12,973
Surplus	\$992,824	Inc. \$44,910
Cash on hand \$4,595,763; profit and loss surplus \$5,452,525.		

THIRD AVENUE RAILROAD CO.		
	1901.	Changes.
Gross earnings	\$583,368	Inc. \$31,633
Operating expenses	395,531	Inc. 68,023
Net earnings	\$187,837	Dec. \$36,390
Other income	35,477	Inc. 29,584
Total income	\$223,314	Dec. \$6,866
Charges	441,152	Inc. 328
Deficit	\$217,838	Inc. \$7,134

THE METROPOLITAN SECURITIES CO.

The Metropolitan Securities Co., which, it was announced in our last issue is to control the Metropolitan Street Railway system has been incorporated and its list of directors is a strong one and represents large financial interests. It consists of W. H. Baldwin, jr., representing subway affiliations, G. G. Haven, A. D. Guilliard and James H. Hyde, representing Mutual and Equitable Life Company affiliations, Mortimer L. Schiff of Kuhn, Loeb & Co., the banking firm with which the new plan originated; Thomas P. Fowler of the Ontario & Western and Atchison railroads, probably representing English capital, and E. J. Berwind and Paul D. Cravath. These are all new interests in the Metropolitan company and the reason for their connection with the company remains to be seen. It is generally considered that they have acquired control of a very large property on very easy terms as they subscribe at par for the remaining issue of Metropolitan Securities Co. shares not offered to the old Metropolitan interest. The suggestion that the old stockholders will remain in control of the properties carries but little weight as the new company is a close corporation in which the Metropolitan share holders will have no active voice. The plans now formulated provide for the lease of the Metropolitan company by the Interurban Street Ry. Co. on the basis of 7 per cent on the present outstanding \$2,000,000 stock. The Interurban Street Ry. has practically no property aside from franchises in the Bronx district. Its capital is \$20,000,000 and the company can issue more. The guarantee of this company naturally adds nothing to the value of Metropolitan securities. The Interurban Street Ry. is in turn controlled by the Metropolitan Securities Co.

MARKET STREET RY.

February 21st a syndicate of eastern capitalists consisting of Brown Bros. of New York and a number of Baltimore people obtained an extension of 30 days on an option previously held on the

Market Street Railway Co., of San Francisco, Cal., for \$13,500,000. The sale of the property to the syndicate was subsequently concluded. Since the extension of time was granted the Market Street Railway Co. resumed operations on a number of improvements which had been suspended since the negotiations began. It is now preparing to construct and equip a large power house on North Beach. The new power house will be equipped with boilers and engines of 3,000 h. p. capacity. The boilers will utilize oil for fuel, and will be of the Babcock & Wilcox type. These have already been ordered. The electrical machinery throughout is to be supplied by the General Electric Co. and will include two 1,250 kw. generators and three 750 kw. rotary transformers.

March 5th the United Railroads of San Francisco was incorporated with a capital of \$4,000,000 of which \$200,000 was subscribed by the incorporators who are merely agents. The properties to be taken over by the new company are the Market St. Ry., the San Francisco & San Mateo, the Sutter and the Sutro companies. The lines on California, Geary and Union Sts. are not included. It is stated that the issue of securities at present contemplated will be \$20,000,000 in 4 per cent 20 year bonds, \$15,000,000 in preferred stock and \$10,000,000 in common stock. The Baltimore syndicate is represented by Mr. J. M. Duane, of New York, and the transfer will be made March 28th.

BROOKLYN RAPID TRANSIT CO.

The announcement of the Brooklyn Rapid Transit Co., of the contemplated issue of \$150,000,000 of bonds for refunding, additions, betterments, etc., has been explained by Mr. Greatsinger, president of the company, who states that while the plan of mortgaging the property for \$150,000,000 has been determined upon, it is not contemplated to issue bonds for the whole amount, but instead to issue them for amounts of \$5,000,000 or \$7,000,000 from time to time as needed. The company has not planned to spend the money in any particular manner nor has it decided to absorb any other street railway line, however, it is probable that it may do so in the future. The new bonds will bear interest at 4 per cent. There has been considerable speculation as to what new interests will be acquired as the result of the new bond issue, but all information on this point has been withheld. It has been denied, however, that the issue was in connection with the pending changes in the Metropolitan Street Ry., in Manhattan.

Over \$60,000,000 of the total will not be issued for a number of years to come, as this will be required to refund or take up bonds that will not fall due for from 10 to 50 years. The remaining \$90,000,000 will only be issued as needed. These bonds will be used for paying off additions and improvements to the property the money for which for some time past has been paid out of the earnings. The company is steadily increasing its gross earnings and the net earnings have been decreasing simply because the surplus has been used for improving the property.

METROPOLITAN ELEVATED, CHICAGO.

The Metropolitan Elevated of Chicago completed its fiscal year on February 28th and the traffic statistics show a decided gain over the previous year. The daily average traffic for the year was 92,006 passengers compared with 86,731 for the previous year, an increase of 7.12 per cent. The total number of passengers carried for the year was 33,910,799, which was a gain of 2,253,818 over the previous year, which would make a gain in passenger earnings of about \$112,000. The traffic increase for the fiscal year, in comparison with those of the previous year is shown in the following table:

	1901 02.	1900 01.	Inc.
March	98,338	94,568	3,830
April	97,018	90,130	6,588
May	92,572	86,288	6,284
June	86,178	82,206	3,973
July	70,310	73,790	5,512
August	81,256	78,468	2,788
September	88,226	82,000	6,266
October	96,020	86,786	9,234
November	97,337	80,822	7,515
December	100,770	90,100	10,670
January	98,020	89,699	8,330
February	100,466	97,659	2,807

NORTHWESTERN ELEVATED, CHICAGO.

The Northwestern Elevated Railroad Co., of Chicago, continues to keep up its remarkable increase in the number of passengers carried. In February it handled the largest daily average number of passengers that it ever carried; the daily average was 64,760, the best preceding average being 63,375, which was reached in December. The increase of the past month over February last year was 9,504 or 17.2 per cent.

CHICAGO CITY RAILWAY CO.

The report of the Chicago City Railway Co. for the year 1901, which has just been issued, shows a good gain in gross receipts and a small increase in net profits, resulting from the large increase in operating expenses. President Hamilton stated that to improve the present service and to add to its efficiency, 150 large electric cars have been purchased and are now being put in commission. Negotiations for 150 more are also in progress. A new car house is nearly completed and extensive additions are being made to the present boiler plants and generating machinery and a storage battery has been installed to supply current at the time and place of greatest need. Every effort has been made by the management to furnish the public with the best service possible under existing conditions but the lack of proper terminal facilities on the Clark St. line and the breakages of the Wabash Ave. and State St. cables which are greatly overtaxed have prevented a strictly reliable and satisfactory service. Large expenditures have been made during the year in reconstructions and maintenance of the property and its physical condition is good.

The entire bonded indebtedness of the company which matured July, 1901, was paid at maturity. The following tables embody the financial statements to the stockholders.

TOTAL GROSS EARNINGS.

	Year 1901.	Increase over 1900.
Passenger Receipts	\$5,856,386	\$350,072
Receipts from other sources.....	43,884	7,018
Gross earnings	\$5,900,271	\$357,091

TOTAL EXPENSES.

Operating expenses, taxes, reserves for replacements and renewals and damages.....	\$3,869,173	\$214,171
Interest on bonded indebtedness.....	103,938	*103,938
Depreciation	180,000	180,000
Net income	1,747,159	66,858
Dividends	1,620,000	45,000
(12 per cent on \$13,500,000 for 6 months of 1901, and 9 per cent on \$18,000,000 for 6 months of 1901.)		
Surplus for the year.....	127,159	21,858

*Decrease.

1901, per cent. Increase.

Ratio of operating expenses, taxes, and reserves to total gross earnings.....	.6558	*.0036
Ratio of operating expenses, taxes, and reserves to passenger receipts.....	.6607	*.0031
Passenger receipts per day.....	\$16,044.89	\$959

*Decrease.

The miles of single track operated by each class of motive power is as follows:

	1901.	1900.
Electric (82.95 per cent of total).....	178.14	173.20
Cable (16.18 per cent of total).....	34.75	34.75
Horse (.87 per cent of total)	1.87	1.87
All	214.77	209.82

CAR MILES RUN.

	1901.	Increase.
Electric (54.59 per cent of total).....	16,727,540	1,025,160
Cable (45.07 per cent of total).....	13,809,620	384,600
Horse (.34 per cent of total).....	106,000	1,130
All	30,643,250	1,410,890

PASSENGERS CARRIED.

Fare passengers	117,863,000	7,020,788
Transfer passengers	49,415,733	3,207,720
Fare and transfer passengers.....	167,278,723	10,318,571
Percentage of transfer passengers to fare passengers.....		41.93

EVERETT-MOORE PROPERTIES.

The earnings of the several railroad properties controlled by the Everett-Moore syndicate for the month of January show decidedly satisfactory gains. In each case the gain over the corresponding month of last year has been considerable.

The Detroit United Ry. made an increase in its gross earnings of \$35,479 and in its net earnings of \$13,175. The increase of surplus for stock was \$6,302. A quarterly dividend of one per cent was declared last month.

The Detroit & Port Huron Shore Line showed an increase in gross earnings of \$4,364, while the increase in net earnings is \$3,551. The net earnings in January this year were \$1,122 greater than the fixed charges, while for January, 1900, the fixed charges were \$1,700 greater than the net earnings.

The Northern Ohio Traction Co. made an increase of gross receipts for the month of \$2,656, while the expense and taxes showed a reduction of \$2,547, giving a net increase in earnings of \$5,203. The net increase of surplus for stock was \$3,120.

The Toledo Railway & Light Co. made a gain of \$12,981 in gross earnings and the gain of \$5,832 in net earnings. The fixed charges showed an increase of \$13,557, making the surplus available for stock \$7,725 less than in January, 1901.

The London (Ont.) Street Railway Co. had gross earnings increased by \$861 and an increase in surplus for stock of \$171. The ratio of operation to the gross income was reduced 1.25 per cent.

The Cleveland, Painesville & Eastern Ry. shows the gross earnings for the month to have gained \$1,560, while the gain in the net earnings is \$5,542. The deficit after the fixed charges are provided for is \$2,553, a decrease of \$252.

The controlling interest in the Cleveland Electric Ry. has been sold to the syndicate represented by Horace E. Andrews, as mentioned on another page.

The bankers' committee in charge of the Everett-Moore properties has given a 20-day option on the Toledo property to parties whose names are withheld, and it is believed will soon be able to offer for sale a controlling interest in the Detroit United Ry.

A plan for financing the Lake Shore Electric Ry. is under consideration and it is probable that the receiver can be discharged within 60 days.

The Canton-Massillon and the Canton-Akron roads, as mentioned last month, have reverted to their former owners and have been reorganized. The officers of the Canton-Massillon Electric Ry. are: President, P. L. Saltonstall, Boston; general manager and treasurer, Chauncey Eldredge, Boston; secretary, Charles A. Kolp, Canton. The officers of the Canton-Akron Ry. are: President, Charles A. Kolp, Canton; secretary, A. M. Synder, Cleveland.

LOUISVILLE RAILWAY CO.

The annual report of the Louisville Railway Co., Louisville, Ky., for the year ending Dec. 31, 1901, showed the property to be in a prosperous condition. The gross receipts of the company for the year were \$1,617,050. The operating expenses, including taxes, were \$1,024,036, and fixed charges \$445,934, total deductions from earnings \$1,469,970, leaving net earnings of \$147,088. A dividend of 4 per cent on the common stock was declared, which leaves a net surplus of \$7,088.

The directors of the company have arranged to improve the equipments of the road during the coming year by the purchase of 75 large cars containing all modern improvements at a cost of about \$300,000, and also to add vestibules and heaters to a sufficient number of present cars to provide for the regular winter schedule. In April last the directors sold \$200,000 out of the 4½ per cent second mortgage bonds, the proceeds of which were used, together with the surplus available, in betterments and improvements, the total cost of the same being \$338,914.

CINCINNATI, NEWPORT & COVINGTON RAILWAY CO.

The annual meeting of the stockholders of the Cincinnati, Newport & Covington Railway Co. was held February 19th, at which the directors and officers of the previous year were re-elected. The financial reports showed the operation of the system for the year 1901 to have been highly satisfactory to the stockholders and the comparison with previous years made an excellent showing. The business of the year was as follows: Gross earnings \$819,206, operating expenses \$485,263, net earnings \$333,924, fixed charges \$188,362, the net profits \$145,580. The net profit was almost 5 per cent on the total outstanding stock. The total number of passengers carried during the year was 16,681,60, an increase of 901,837 over the previous year. The car-miles for the year were 3,310,345. This statement shows the car-mileage to have decreased, and there was an increase in the cash receipts and in the number of passengers carried. The operating expenses show a material decrease while the average earnings show a good increase.

The Newburgh Electric Railway Co., of Newburgh, New York, reports that during the year ending June 30, 1901, it carried 1,723,386 passengers and 5,739 tons of freight. Its earnings were \$76,927, of which \$9,976 was for freight and \$600 for mail, \$1,013 for express and the balance for passengers. The surplus for stock was \$7,264.

The Union Traction Co. of Indiana, operating about 110 miles, reports gross earnings for the year 1901 as \$743,403 for earnings, \$320,726 other income, \$9,116 interest charges, \$224,429 taxes and licenses, \$15,645. The company has \$5,000,000 of 5 per cent bonds, \$4,500,000 of common stock and about \$500,000 of preferred stock. The net surplus for paying interest on the bonds or 5 per cent on the preferred stock was \$24,604.

The Cohoes City Ry. has filed its report for the quarter ending Dec. 31, 1901, and the following table shows its financial statement for the comparison of the same period in 1900:

	1900	1901.
Gross earnings	\$6,141	\$6,018
Operating expenses	4,756	5,641
Net from operation.....	1,385	376
Fixed charges	1,650	1,800
Net deficiency	264	1,423
Cash on hand.....		1,360
Profit and loss (deficiency).....		34,481

The Rome (N. Y.) City Railway Co. has filed its report for the quarter ending Dec. 31, 1901, which shows as follows: Gross earnings, 2,584; operating expenses, \$4,725; net loss, \$2,141; other income, \$187; gross loss, \$1,953; fixed charges, \$1,628; net loss, \$3,572.

United Traction Co., of Albany, N. Y., made large gains in its earnings for the month of February, the aggregate receipts for that period being \$166,645, as compared with \$96,256 for the same month last year. This shows a gain of \$10,388, and is thought to be mainly due to the fact that owing to the completion of the Waterford bridge the company's cars now run through in both directions from Troy to Waterford.

The Twin City Rapid Transit Co. has issued its report for January as follows:

	1902	1901	Increase
Gross	\$272,158	\$236,274	\$35,884
Operating expenses ..	132,419	115,223	17,196
Net	139,739	121,051	18,688
Surplus	63,723	50,222	13,501

Mr. S. Bamberger, president of the Salt Lake & Ogden, and the Nevada Midland Railway Co., has just returned to Salt Lake City from New York. He states that the Salt Lake & Ogden road will at once be changed into an electric line, will be immediately completed to Ogden, and eventually to Brigham City, Utah. Mr. Bamberger states that work will begin as soon as the necessary franchises are obtained.

KANSAS CITY NOTES.

Mr. E. E. Grebill, who has been appointed superintendent of the 12th St. division of the Metropolitan Street Ry. has been in the employ of the company for 14 years and his promotion is a result of the policy of the company to advance the men who have served it faithfully. Mr. Grebill is a very energetic worker and has already made several improvements in the service on his division.

February 26th the Metropolitan company let a contract for \$100,000 worth of No. 0 and No. 00 triple conductor, lead-covered underground cable. This will be used to carry the 6,600 volt alternating, three-phase current to the various transforming sub-stations where it will be converted into continuous current at 575 volts. The contract was awarded to the Standard Underground Cable Co.

Mr. Walter Simmons, formerly assistant electrician for the company, has been appointed chief electrician on the U. S. S. Rainbow, now on its way to the Philippine Islands.

Kansas City has been especially favored this winter, as up to the present time not a single had storm has visited it. It is as unusual as it is agreeable for the city to pass a whole winter without a delay to a single car from snow or sleet storms.

The street railway mail cars have all been repainted white, which has added greatly to their appearance. They are painted pure white.

Mr. E. Lefler, the oldest conductor on the 12th St. division in point of service, has been appointed secretary to the assistant superintendent, Mr. J. W. Carter. Mr. Lefler made an enviable reputation as conductor and was one of the most popular men on the road, but continued service on the cars was impairing his health, hence his promotion.

The contract for an addition to the 18th and Olive Sts. car barn was let March 1st. The building will be of brick 80 ft. wide by 50 ft. long and will cost in the neighborhood of \$5,000. It is to be used for a car storage house. Mr. Becker, master mechanic of the company, is very busy preparing to occupy the new shops at 19th and Lyster Sts., on May 1st. The cramped condition of the present shops seriously interferes with needed repairs. The new shops have every modern convenience for doing all classes of work expeditiously and at minimum cost. They will contain a brass factory where all the brass work of the company will be done, a blacksmith shop, paint shop, machine shop, woodworking shop and electrical shop. In order to do away with much of the manual labor in the shops they are so designed that electrical traveling cranes will carry parts of cars, machinery, etc., from one department to any other.

NEW TERRITORIAL AGENTS FOR CHRISTENSEN CO.

The Christensen Engineering Co., of Milwaukee, makers of air brakes for electric cars, has increased its staff of selling agents and traveling erecting engineers with the view of perfecting a selling organization thoroughly competent to attend to the growing demand for high class air brakes. Mr. F. C. Randall who has heretofore been manager of the eastern department, will assume charge of all sales matters of the company, including the oversight of all agents, the quoting of estimates, etc. Mr. Randall will continue to have his headquarters at 135 Broadway, New York City, but will probably increase his suite by taking in adjoining rooms in order to properly handle the increased business of the New York office. The staff of territorial representatives acting under Mr. Randall will include the following: For New England and Canada, J. T. Cunningham, with headquarters in Boston; for Eastern Pennsylvania and the South, W. W. Power, with headquarters in Philadelphia, but both Mr. Cunningham and Mr. Power may be addressed at the New York office, 135 Broadway; for Western New York, Western Pennsylvania and Ohio, Harry Ransom, with offices in the Markeen Building, 1391 Main St., Buffalo; for Illinois, Indiana and the Middle West, William A. Grauten, with headquarters in St. Louis. A representative for the extreme West will soon be appointed, with offices in San Francisco.

The foreign agents will remain as heretofore, namely: W. A. Parker, 59 City Road, London; R. W. Blackwell & Co., London, Brussels and Paris; Henry Pels & Co., Berlin; Edge & Edge, Sydney.

THE STRIKE SITUATION.

The strike of the employees of the Kansas City, Leavenworth Electric Railway Co. took an original turn, February 17th, when Manager Wolcott and Superintendent de Coursey were arrested and arraigned in the city court on complaints sworn out by leaders of the strike. The charge trumped up against Mr. Wolcott was that of having violated a state law by allowing street cars to be operated without vestibules and that against Mr. de Coursey, that of unlawfully discriminating against labor organizations in the dismissal of one of his employees. The strikers have withdrawn a number of the demands originally made, and state that their terms of settlement will be the reinstatement of all striking employees and the granting of a dinner hour.

The Terre Haute Electric Co. continues to operate its cars despite occasional riots. The strikers have on several occasions stoned cars filled with passengers, and made other ineffective efforts to interrupt the service. A speedy settlement of the labor difficulties at Terre Haute is, however, expected.

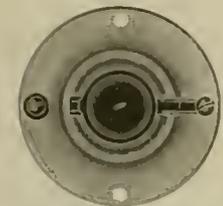
One hundred and fifty employees of the Norfolk (Va.) Railway & Light Co. went out on strike March 1st, exception being taken to a rule of the company requiring conductors and motormen to give bonds. A mob gathered in the streets to prevent the operation of cars, and obstructions of various kinds were placed at frequent intervals upon the tracks. An attempt was made to cut the trolley wires, but this was promptly frustrated by turning on a 10,000 volt current. The police being entirely unable to preserve order, an attachment of militia was procured, March 3d, to guard the company's cars, and irregular runs were thus made. Hand to hand conflicts between the soldiers and the strikers were of such frequent occurrence that there was some discussion as to the advisability of calling for a battery of artillery to assist in securing order.

Dispatches from Ponce, Porto Rico, February 21st, reported a serious riot of the striking laborers on the electric line in that city. The trouble is said to have been caused by the employment of 17 Italian tracklayers, whose presence aroused the animosity of the native laborers.

CAR-BARN AND OTHER FIRES AND THEIR PREVENTION.

The importance of discovering a fire before it has had a chance to do any serious damage cannot possibly be overestimated; an ounce of prevention always has been and always will be worth many pounds of cure.

The large number of serious car barn fires which have occurred recently will incline our readers to note with interest the fire warning device illustrated in the accompanying engraving and known as the "Copenhagen" thermostat. It consists of a copper disk and a concave silver plate, or diaphragm, the two, when hermetically sealed, forming a capsule about the size of a dime, mounted on a small porcelain base with necessary electrical connections.



"COPENHAGEN" THERMOSTAT, 1/2 SIZE.

In the capsule is enclosed a volatile liquid, which at a certain temperature forces the diaphragm with a positive snap from concave to convex, thereby closing the electric circuit and causing one or more bells to ring an alarm, at the same indicating on an annunciator the exact location of the trouble. As soon as cooled off, the diaphragm snaps back to concave, and is in readiness to be snapped out again as soon and as often as the necessary degree of heat is applied. This construction enables any person to test the thermostat as often as may be desired. The simplicity of the device gives it a long life. In connection with the "Copenhagen" is usually installed a circuit tester, by means of which any break in the wires may be readily detected.

A few of these instruments placed on the ceiling or under the roof of car-barns and other buildings will unfailingly give an alarm the moment a predetermined degree of heat is reached, thereby enabling one to nip the fire in the bud. The "Copenhagen" is also used to give notice of overheated journals, and it is reported that thousands of them are in use in the large terminal grain elevators of the country. The "Copenhagen" thermostat is manufactured by the Copenhagen Automatic Fire Alarm Co., of Sheboygan, Wis.

CANADIAN NOTES.

The bill to incorporate the Ontario Electric Railway Co., with power to build a line from Cornwall to Toronto, passing through or touching at any or all of the incorporated cities, towns or villages lying on its route, with a line also from Ottawa to Brockville, and power to build branches not exceeding 30 miles in length, has been passed by the railway committee. The promoters of this company include Sir Richard Cartwright, Ottawa; G. C. Smith, Boston; A. A. Jewell, of Boston.

The annual statement of the Halifax Electric Tramway Co. shows the earnings for the year 1901 to have been \$79,232, as compared with \$74,632 for the previous year. There have been four quarterly dividends of 1 1/4 per cent, amounting in all to \$40,000, leaving a surplus of \$39,232.

The bill to incorporate the Toronto & Hamilton Electric Ry., over which there has been a very stubborn fight in the railway committee of the Legislature, has been disapproved by the subcommittee to which it had been referred.

The Toronto Railway Co. will appeal from the decision of the county judge in the application of the company to have the assessment of cars and other rolling stock classed as personalty and not realty, as the city assessment rules them. The amount involved is something like \$450,000.

The Cataract Power & Conduit Co. has awarded to the Westinghouse company the contract for transformers for its station. There will be seven of these, each of 2,500 h. p., oil insulated and water cooled. These transformers will be wound for 2,200 volts two-phase to 1,100 or 2,200 volts three-phase, and will duplicate the present equipment in the transformer house at Niagara Falls.

The appeal of the Hull Electric Co., which claimed a 35-year monopoly for lighting and power supply in Hull, against the decision of the Supreme Court has been dismissed by the Privy Council.

The Lachine Rapids Hydraulic & Landy Co., Montreal, is preparing plans for a large sub-station, including an auxiliary steam plant of about 3,000 h. p. Mr. R. S. Kelsch, chief engineer, has the matter in hand.

The earnings of the Toronto Railway Co. continue to show a satisfactory increase. The January earnings were \$137,135, being \$15,478 more than in January, 1901.

Application has been made for incorporation by the Petrolia Rapid Railway Co., with power to construct an electric railway from Sarnia to Corunna, Courtwright, Petrolia, Dresden, Florence and Thamesville, where connections will be made with the Canadian Pacific Railway. At Courtwright connections will be made with the Detroit boats, and with the Rapid Railway of Detroit, and at Sarnia connection will be made with Port Huron. The plan is to handle freight and express, and if possible secure mail contracts. The districts through which this road proposes to run is now practically devoid of transportation. If incorporation is granted the intention is to construct the line between Corunna and Petrolia this spring, together with power house and sub-stations. Mr. S. A. Armstrong, of Sarnia, is one of the promoters of the subject.

The Ontario Legislature has authorized the incorporation of the Morrisburgh Electric Railway Company, with power to build an electric railway from Morrisburgh to Winchester. The application of the company for permission to generate and sell electricity for lighting and power purposes was refused.

The Hamilton & Caledonia Electric Railway Co. is trying to arrange with the various municipalities for right of way.

The Halifax Tramway expended a considerable amount during the past year on its plant and equipment, and is contemplating extensive improvements during the coming season.

Premier Ross has introduced in the Legislature a bill entitled "An Act Respecting Electric Railways," which provides for a railway committee, consisting of the Commissioner of Public Works, the Attorney-General, and the Commissioner of Crown Lands, to whom shall be delegated certain powers in regulating the powers and privileges of railways on public highways, and constituting an appeal court for the settlement of disputes between companies and municipalities.

The corporation of Port Arthur, Ont., expects to build about two miles of new road during the coming spring. It will also be in the market for open and closed cars, motors and transformers.

The Berlin & Bridgeport Electric Railway Co. has elected Mr.

W. H. Breithaupt (president of the Berlin & Waterloo St. Ry. Co.) as president of the new company. The company proposes building an electric railway to connect Berlin and Bridgeport, the line to be completed this year.

It is stated that the bankers' committee having charge of the Moore-Everett interests are considering the question of disposing of the London Street Railway, which is one of the syndicate properties, in order to provide funds for the Federal Telephone Co. Two months ago an offer of \$180 per share was made to the syndicate for the London Street Railway Company's property. This was refused at the time, but it is said that the committee are now willing to accept this figure. The road has a capital stock of \$400,000, and is bonded for a similar amount, and is 28 miles in length.

At a meeting of the board of directors of the Montreal Street Railway Company it was decided that in pursuance of a resolution adopted at the special meeting of shareholders held in July last the company issue \$1,500,000 of 4½ per cent bonds, for the purpose of providing for the purchase of the Montreal Park & Island Railway securities, the same to be offered to shareholders at par pro rata to their holding of stock.

Mr. J. Butzen, manager of the British Columbia Electric Ry. has returned from California where he has been inspecting various water powers, with a view of adopting the most advantageous methods for the development of power at Coquitlam Falls for the Vancouver Power Co.

NEW STUART-HOWLAND CATALOG.

The Stuart-Howland Co., of Boston, reports a remarkable growth in all departments of its business. The company's sales in the last year show an increase of 120 per cent over the previous year. The street railway department has been particularly prosperous, having furnished in the season of 1901, in addition to the general supply business, the entire overhead and pole equipment (excepting wire) for over 500 miles of new road. The company now makes this complete line and has several large orders booked for delivery the coming spring. It also carries a very complete stock of all kinds of electrical supplies, except heavy machinery, and has now 10 salesmen on the road.

The Stuart-Howland Co. has recently issued a 332-page, 6x8 in. general electrical supply catalog, handsomely bound in cloth, in which everything is listed alphabetically, and very generally illustrated. It is printed on 70-lb. coated natural tint paper. Both print and illustrations are unusually distinct, and as practically everything is shown which contractors, supply dealers, street railways, telephone companies, central stations and isolated plants have to purchase, it must prove decidedly popular in the purchasing departments of the various branches of the electrical trade.

MERGER OF NIAGARA FALLS FRONTIER LINES.

The merger of all the lines on the Niagara frontier with the exception of two roads has just been completed. The name of the new company is the International Railway Co., of Buffalo, of which a certificate of incorporation was filed February 19th. The companies included in this consolidation are as follows: The Buffalo Railway Co., the Buffalo & Niagara Falls Electric Ry., the Buffalo, Tonawanda & Niagara Falls Electric Ry., the Niagara Falls & Suspension Bridge Ry., the Buffalo & Lockport Ry., the Lockport & Olcott Ry., the Niagara Falls & Suspension Bridge Railway Co., and the Niagara Falls Suspension Bridge Co.

The capital stock of the company is \$10,120,500. The directors include Francis Lynde Stetson, James P. Ord, Daniel S. Lamont, W. Caryl Ely, Burt Van Horn, William B. Rankine, and Thomas De Witt Cuyler. Mr. Ely is president, and T. E. Mitten, general manager. The company's main offices will be in Buffalo. It is stated that the company has formulated plans for the betterment of the service throughout the entire system which will be put into effect this spring.

April 1st the Wheeling Traction Co. will put a new wage scale in effect, increasing the wages of its employes from 19 to 20 cents an hour.

PENSIONS FOR THE METROPOLITAN OF NEW YORK.

The announcement was made March 6th that the Metropolitan Street Railway Co., of New York, had adopted the policy of pensioning its superannuated employes, making it the second street railway company to do so, the first having been the United Traction & Electric Co., of Providence, R. I., whose pension plan was described in our issue for January, page 14.

The Metropolitan plan is applicable to all employes who have not received more than \$1,200 per year from the company. The scheme provides for voluntary and involuntary retirement of all employes so included, between the ages of 65 and 70, after 25 years' service in the Metropolitan Street Railway Co. or any of its constituent companies. Employes benefited by the system will be of two classes:

First—All employes who have attained the age of 70 years who have been continuously in such service for 25 years or more preceding such date of maturity, and,

Second—All employes from 65 to 69 years of age who have been 25 years or more in such service, who, in the opinion of the trustees of the pension, have become physically disqualified.

The pension allowance to such retired employes is upon the following basis:

A—If the service has been continuous for 35 years or more 40 per cent of the average annual wages for the ten previous years.

B—If service has been continuous for 30 years, 30 per cent of the average annual wages for the ten previous years.

C—If service has been continuous for 25 years, 25 per cent of the average annual wages for the ten previous years.

It will be remarked that the pension proposed under the Metropolitan scheme are considerably less for long service men than was provided for by the Providence road. Thus the Metropolitan pension is 1 per cent of the average annual wages during the last 10 years for each year of continuous service between 25 and 40 years, while in Providence the pension is 1 per cent of the average wage for 10 years for each year of service up to 20 years, and for longer terms of service increases till for 35 years or over the rate is 2 per cent for each year of service.

ACCIDENTS OF THE MONTH.

A cave-in on the new electric line between Beloit, Wis., and Rockford, Ill., February 20th, resulted in fatal injuries to two persons.

A heavy fog caused two collisions between street cars, in Pittston and Wilkesbarre, Pa., February 24th. In the first instance the cars were wrecked, while passengers and crew escaped injury. At Wilkesbarre the damage to the cars was light, but the motorman and one passenger were slightly injured.

An unusual accident occurred on the Hawks-Angus line between Ann Arbor, Mich., and Jackson, just within the limits of the latter city, February 24th. The car was making a sharp curve when the car body left the trucks, and with 20 passengers inside, rolled over several times before stopping. Only two of the passengers were seriously injured.

INDIAN TERRITORY TRACTION CO.

The Indian Territory Traction Co., of South McAlester, I. T., has been organized to build an interurban road connecting that city with a number of the adjoining towns. The officers of the company are: President, Luke W. Bryan, president State National Bank, South McAlester; vice-president, Lawrence P. Boyle, 804 Tacoma Bldg., Chicago; secretary, M. M. Lindley, and treasurer, A. M. Thomas, of South McAlester. The present line is 16 miles in length and runs from South McAlester to McAlester, Krebs, Anderson, Batch, Dow, Buck, Cherryville, Hartshorn and Haleyville. The total population to be served by this road numbers about 35,000. Mr. Smith, city engineer of South McAlester, is making the surveys for the new road. The line is to be operated on the overhead trolley system, and there are coal mines along the route whose pay rolls for miners average \$150,000 per month.

The Knoxville (Tenn.) Traction Co. has donated \$250 to the fund for building an auditorium in that city.

“ALL WIRE” RAIL BOND.

The “All Wire” rail bond, which is shown in Fig. 1, is made entirely from one piece of flexible copper cable, and is presented as one of the most perfect types of a “one-piece” bond now on the market. The conducting strands and terminals are made from a single piece of cable and there are no cast or welded joints in the bond to become loose or interpose additional internal resistance,



FIG. 1.

due to imperfectly cast or welded joints. The conductivity of the “All Wire” bond is given as that of commercially pure copper, and it is claimed that this conductivity is maintained throughout the entire length, including the terminals, and that when compared with other types of bonds having terminals connected to strands by either cast or welded joints, the “All Wire” bond shows superior conductivity.

The bond is intended for use under the fish plate, in which position it is perfectly protected from injury from outside causes, as well as from theft, and a variety of styles are manufactured for

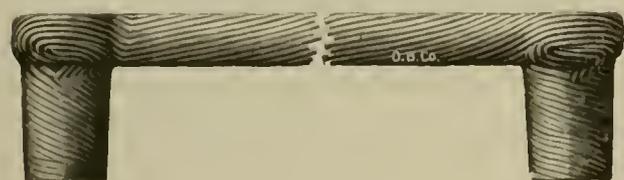


FIG. 2.

such use. It may also be used around the fish plate or under the base of the rail, if desired, special types of bonds are furnished for this purpose, as well as for cross-connecting and underground bonding.

This bond is applied by means of a compressor, designed to insure a perfect contact between the terminals of the bond and the rail ends. The terminals are so shaped that a large contact surface is presented to the rail, a contact of extremely low resistance is secured. The rails may be bonded to their full carrying capacity.

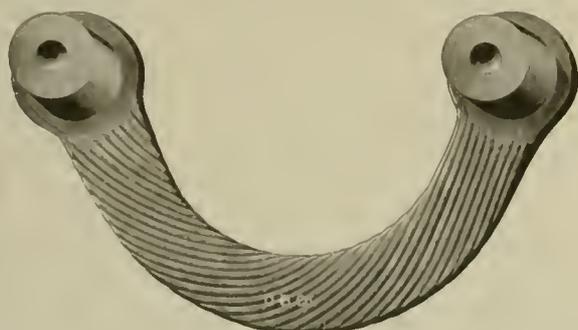


FIG. 3.

Being made from stranded cable, the bond is very flexible, and can successfully withstand the jar and vibration of the rails, as well as their expansion and contraction.

This bond is made entirely from one piece of flexible copper cable, which is cut to length and placed in a forming machine, in which the ends of the cable are cold pressed into shape for the terminals, as illustrated in Fig. 2, the size of the terminals, however, being considerably larger than in the finished bond. The ends are then heated almost to the melting point and forged accurately to size in a steel die. In the latter process the size of the terminals is considerably reduced, the strands of wire composing them being perfectly welded together, and forming a mass of solid copper. Fig. 3 shows the appearance of the finished bond and illustrates the man-

ner in which the strands of cable are gradually merged into the solid copper terminal.

The “All Wire” rail bond is made by the Ohio Brass Co. of Mansfield, O.

NEW CONTRACTING FIRM IN INDIANAPOLIS.

A partnership has recently been effected between Messrs. J. J. Brennan and I. R. Nelson, Franklin Block, Indianapolis, contractors for street railway, electric light, telephone and telegraph lines. Both members of the firm have had extensive experience in electrical construction. Mr. Brennan has been engaged in line work both in telephone, telegraph and street railway construction and has worked his way up through the business to superintendent of overhead construction which position he has held with the Indianapolis Street Ry. Mr. Nelson worked as a boy with the Brush Electric Co., of Cleveland, and afterwards spent a number of years in the west setting up and operating electric lighting plants. He started into street railway work with the Cleveland Street Ry., at the time that company changed from horse to electric power. He has filled a number of positions in street railway work including that of electrician to the Indianapolis Street Ry. The new concern starts out with the best wishes of its many friends and acquaintances and is already bidding on about 40 miles of interurban road which is to be built this summer as well as on a number of smaller jobs.

CHANGES IN THE WORKS OF THE HOOVEN, OWENS, RENTSCHLER CO.

We are informed by an official of the company that the Hooven, Owens, Rentschler Co. of Hamilton, O., builders of Hamilton corliss engines, will soon bring out a complete new line of vertical engines in sizes up to 7000 and 8000 h. p. for all grades of service in which vertical engines can be utilized. Heavy vertical engines for direct connected street railway work will form an important branch of the company's business.

To give facilities for turning out this large work the company has made plans for a new foundry and shops that will treble the output capacity of the present plant. The foundry will occupy an entire new building, 100 x 400 ft. with two long bays to be utilized as machine shops. The present building will also be remodeled and rebuilt. The execution of these plans will commence this spring as soon as frost is out of the ground.

Mr. W. B. Mayo, of 30 Cortlandt St., New York City, eastern manager of the company, reports a satisfying condition of business. The New York office has closed orders for Hamilton engines in the new Perth Amboy plant of the American Smelting Co.; large electrolytic works at Quincy, Mass.; air-compressing plants and several electric railway stations in the east.

REORGANIZATION ON STATEN ISLAND.

A receiver has been appointed for the New York & Staten Island Electric Co., the Staten Island Electric Railroad Co., and the New Jersey & Staten Island Ferry Co. All three companies have physical interests in common but heretofore have been under separate managements. It is officially stated that the receivership is a preliminary step toward a consolidation of the three properties. The New York & Staten Island Electric Co. furnishes power for electric lighting and owns the stock of the Staten Island Electric Railroad Co. The Staten Island Electric Railroad Co. owns 31 miles of track forming a belt line around the island and also owns one-half the stock of the Rapid Transit Ferry Co., whose line of ferry boats plies between the northern end of the island and the southern end of New York City. The stockholders in the railroad company and the lighting company have the controlling interest in the New Jersey & Staten Island Ferry Co. Mr. J. H. Swinarton is president of the electric railway and the ferry company, and vice-president of the lighting company. Mr. John Greenough was named as receiver.

There is one other electric railway company on Staten Island called the Staten Island Midland Railway Co., of which Robert Wetherill, of Chester, Pa., is president. It owns 28 miles of track.

HALF FARES.

The promoters of the proposed electric line between Aberdeen and Hoquiam, Wash., announce that the road will be in running order by June 1st.

The Homestead (Pa.) & Mifflin Street Railway Co. has decided to increase its capital stock by \$25,000 and employ the proceeds in building an extension to Lincoln Place.

The Michigan Suburban R. R., "the Lansing, St. Johns and St. Louis line," has issued its time table No. 1, effective Sunday, February 16th, over its lines between Lansing and St. Johns.

Among the promoters of the Chicago & Indiana Air Line R. R., a projected electric line to connect South Bend, Michigan City and Chicago, is Russell B. Harrison. Mr. Harrison is reported to have recently become financially interested in the project.

A plan for doubling the capacity of the Union Elevated loop in Chicago by constructing a second superstructure above the one at present used, has been evolved by a member of the Board of Local Improvements, and is said to have been endorsed by local engineers.

The St. Louis Transit Co. has issued orders to conductors to accept without question bent or worn small coins tendered for fare; nickels or coppers that have been clipped or punched will be rejected, and gold coins will be not accepted unless in good condition.

The Richmond (Va.) & Petersburg Electric Ry., connecting the cities named in the title, was opened for traffic between Petersburg and Manchester, February 9th. The wife of Superintendent Felt of the company acted as motoneer of the first car that was run over the road.

A bill has been introduced in the Maryland Legislature to incorporate the Frederick & Jefferson Electric Railroad, Light & Power Co. of Jefferson, Md., which projects a new interurban line over the route indicated in the title. L. O. Whip will be president of the company.

The Chicago Union Traction Co. has made a regular 5-cent fare between Austin and the city on all surface cars west of 48th Ave., connections being made with the Lake St. Elevated. Formerly, a 5-cent fare was granted only on one car which ran on a 40-minute schedule.

The Butte (Mont.) Electric Railway Co. projects a number of improvements at Columbia Garden this season, which will include a large base ball ground with grand stand, and hand ball and tennis courts. Ten thousand dollars will be expended in equipping this park with facilities for games and sports.

General Manager Mitten, of the International Traction Co., Buffalo, has agreed to transport free all the fish fry obtained by the Niagara County Anglers' Club from the state hatcheries. Four million white fish fry and lake trout will be carried from Lockport to Olcott on trolley freight cars, for planting in Lake Ontario.

The Youngstown Sharon Railway & Light Co. has purchased a site for a passenger and freight depot in Sharon, Pa. It is announced that a five-story brick building will be erected by the company, the upper floors of which will be used as offices. The company is also preparing to push work on its extension to New Castle and expects to have the branch open for traffic by June 1st. The route includes New Bedford and other thriving towns.

The chief of the Chicago fire department favors motor cars equipped with a truck and hose apparatus to be used, in emergency, as the superstructure of the elevated railways. The plan would entail a device for shutting off the current of the trolley in any block desired, and a general system of fire mains and standpipes with high pressure which would be an expensive but commendable innovation.

NEW TERMINAL FOR METROPOLITAN "L" ROAD.

The Metropolitan West Side Elevated Railroad Co., of Chicago, announces that it has acquired a strip of property to provide extra terminal facilities in the down town district. The property has been purchased with the object of handling the increasing traffic of this road and to avoid in a measure the overcrowded condition of the Union Loop. The property acquired extends from the east side of Market St. about 100 ft. south of Jackson boulevard to the west side of Fifth Ave. An extension of the road will be built on this strip giving an independent line to the junction with the Union Loop on Fifth Avenue in addition to the privileges which the road now has on the loop. The aggregate cost of the property was \$771,000. The work on the extension will be commenced as soon as the company can take possession of the property which the officers of the company state will be very soon. It is understood that one of the principal objects of the new terminal will be to provide accommodations for express trains on the several divisions of the road, especially during the morning and evening rush hours.

THE GENERAL ELECTRIC RAILBOND.

The General Electric Co. is now manufacturing a bond which was brought out last year by the American Railbond Co., of Chicago. The head of this bond is made of a solid piece of copper in which is cast a steel spool having hardened heads and a soft shank. This bond was illustrated and described at length in the issue of the "Review" for March 15, 1901. In applying the bond to the rail the heads of the spool, which extend about $\frac{1}{8}$ in. above the surface of the surrounding copper of the head of the bond, are compressed causing the softened shank to bulge out and a consequent flow of the copper which completely fills the hole in the rail forming a joint which is entirely impervious to moisture.

OBSERVATION CARS.

A company, named the American Sightseeing Car & Coach Co., was formed sometime ago for the purpose of instituting in a number of cities a special observation car service. The company is now running these observation trips in Washington, D. C., Charleston, S. C., and other southern cities. In these cases the street railway companies merely rent the necessary rolling stock to the "Seeing" company which furnishes the guides and assumes all the responsibility in connection with the trips. The arrangement of distance covered, time and fare is practically the same in each city. The special cars are termed "Seeing Washington" or "Seeing Charleston" cars and make daily and Sunday tours, affording visitors a comfortable, inexpensive and quick means of seeing the principal points of interest in and about each city, including the public buildings, the boulevards and parks, residences of prominent men, the monuments and other historic spots. These trips are run daily, cars in Washington for example leaving the centre of the city at 10:00 a. m., 12 noon, and 2:00 p. m., the round trip requiring about two hours. The total distance covered is about 25 miles.

Each "seeing" car has an expert guide in attendance who points out the places of interest along the route and gives a sketch of their history. Tickets are sold at 50 cents per person for the round trip. These special cars do not stop to take on passengers except at a few prominent points, but passengers may leave the car at any time upon request to the conductor. Observation cars may be secured by parties numbering 40 or more to meet them at any depot or hotel, the price for this special service, including expert guide, being the regular charge of 50 cents for each person.

For the observation tours long open cars are assigned in summer and comfortable, well-heated closed cars in winter.

It is announced that the electric railway which the Boland syndicate is building from Detroit to Chicago will be open for traffic from the former city to Kalamazoo, by July 1st. The promoters contemplate an extension from Kalamazoo to Benton Harbor, which is to be completed in time to accommodate Chicagoans going East for the summer.

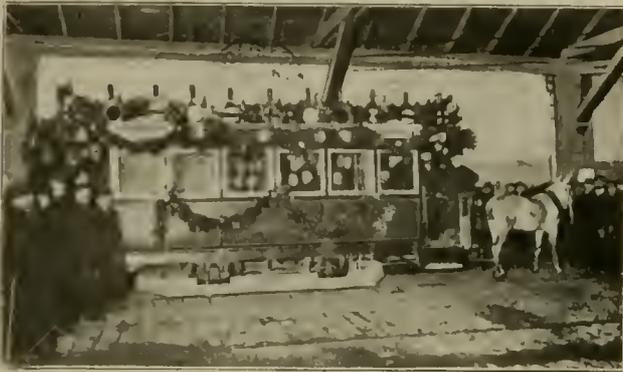
WAGES INCREASED AT CAMDEN, N. J.

Editor "Review": We beg to advise you that we have decided to increase the wages of our conductors and motormen from 15 cents an hour to 17 cents an hour, to begin March 6, 1902. This rate of wage, with a premium of 10 per cent paid monthly for freedom from accidents and general good deportment, will make the wages of these men participating 18.7 cents per hour, and the men who have been in our employ for over five years will receive their uniforms as usual, which will make the rate somewhat in excess of that paid by other roads in this vicinity. Yours truly,

The Camden & Suburban Railway Co.,
W. E. HARRINGTON, V. P. & G. M.

LAST VIENNA HORSE CAR.

The accompanying engraving is from a souvenir postal card mailed us by the Wiener Tramway Gesellschaft, of Vienna, Austria, and shows the last horse car operated in Vienna, which made the



final trip Jan. 28, 1902. This company formerly had 600 horse cars and is now operating 825 electric cars.

PROPOSED BALTIMORE INTERURBAN.

Messrs. Carswell & Sons, of Baltimore, Md., have secured from the Legislature of that state a charter for an interurban line running from Baltimore through five of the neighboring villages having from one to three thousand population each. This charter is the only one in Baltimore that is not owned by the United Railways & Electric Co. and the promoters of the new road have secured rights of way through sections where there are at present no railway facilities. The lines pass a large steel works where nearly 3,000 men travel back and forth night and morning. Several summer resorts are located on the bay near by which will undoubtedly add greatly to the business of this road. The work of construction has been delayed by the withdrawal of two members of the syndicate on account of not getting the legislation desired, but as soon as these vacancies have been filled the work on this road will be put under way.

MAYOR'S CERTIFICATE PROPOSED IN ALBANY.

The United Traction Co. of Albany has refused to honor certificates issued by the mayor of that city to the city employes which were tendered in lieu of car fare. Two employes of the city police and fire department carrying these certificates were ejected from one of the company's cars upon their refusal to pay their fare. It is the purpose of the mayor to test the constitutionality of the law of 1895 giving permission to the mayor of any city of the state or president of any village "to issue with the seal of his office, a certificate of appointment of police and firemen; and it shall be the duty of any surface or elevated road to furnish free transportation to police and firemen while traveling on the cars in the performance of duties."

MUNCIE, HARTFORD, CITY & FT. WAYNE INTERURBAN.

The Muncie, Hartford City & Ft. Wayne Electric Railroad Co., which is to build an interurban line between the places named, has ordered a large amount of its material and equipment and expects to commence the construction of the road immediately. The new company has placed an order for over 50 miles of copper wire and has also ordered several thousand poles and 25,000 ties. The ties are now being received and distributed along the right of way. Eight new passenger cars and one construction car have been ordered from the John Stephenson Co. which will cost about \$6,000 each. The cars will be 44 ft. in length, of handsome appearance and, according to the contract, must be delivered not later than July next.

IMPROVEMENTS AT MINNEAPOLIS.

The Twin City Rapid Transit Co., Minneapolis, has awarded contracts aggregating \$350,000 for the equipment of its new power stations. The Allis-Chalmers Co., Milwaukee, has been awarded the contract for engines; the Babcock & Wilcox Co. will furnish boilers; the General Electric Co., the electric generators; the George F. Blake Co., the condensers and pumps, and the Jones Underfeed Stoker Co., the mechanical stokers. At latest reports contracts for the coal handling machinery, feed water heaters, purifiers, traveling cranes, etc., which may aggregate an equal amount, had not been awarded.

"WONDERLAND" FOR 1902.

This is the title of a publication presented by the passenger department of the Northern Pacific Railway Co., a most artistically decorated book of some 110 pages containing descriptive articles of all the western country tributary to the Northern Pacific lines. The publishers have surpassed their previous efforts in making the annual "Wonderland" both instructive and beautiful. The cover designs and chapter headings, by Alfred Lenz, are engraved from modeled designs in plastique, appropriate to the text. The other illustrations comprise views of the scenery and cities en route, and the important industrial institutions in the flourishing towns of the West. The leading feature of this number is a chapter on mining in Montana from the early days to the present, and other chapters describe the northern Cheyenne Indians, Yellowstone Park and the Puget Sound country. Wonderland, from its genuine literary and artistic merit, is now generally welcomed in the library, school room and home. The book will, as heretofore, be sent to any address upon receipt of six cents, the price of postage. Inquiries may be addressed to Charles S. Fee, general passenger and ticket agent, St. Paul.

The Ripley, Georgetown, Hillsboro & Columbus Railway Co., of Hillsboro, O., has not yet begun the construction of its projected line between the cities named in the title.

The Austin (Tex.) Rapid Transit Railway Co. projects a considerable amount of construction work this season.

The Rapid Transit Co. of Chattanooga, Tenn., has completed its line to Lookout Mountain. The company's system now embraces all the suburbs of Chattanooga.

The Philadelphia Co., which controls the Pittsburg Railways Co., has acquired the charters for elevated roads in Pittsburg which have been granted during the past year.

The Cumberland (Md.) Electric Railway Co. expects to increase the capacity of its power station by 200 kw. The generator will be installed by the Edison Electric Illuminating Co.

THE SHADE OF THE PALM.

Music of this beautiful piece as sung by the Florodora Opera Co. will be mailed on receipt of 15 cents in silver or stamps. Address "Music," Advertising Department, C. H. & D. Ry., Cincinnati, O.

ECHOES FROM THE TRADE

ARTHUR W. FIELD, 53 State St., Boston, dealer in street railway specialties, is presenting friends and patrons with an artistic calendar of convenient size for office use.

THE MORDEN FROG & CROSSING WORKS, Chicago, Ill., has just let contracts for an addition to its plant, the building to be 120 x 120 ft. The new plant will be equipped and operated by electricity. The additional machinery has been contracted for.

HARTSHORN'S ROLLER, published by the Stewart Hartshorn Co., East Newark, N. J., in the interest of the company's shades, for February contained an announcement of Hartshorn's annual banquet, and the usual quota of humorous articles, stories, jokes and pictures.

THE ALLIS-CHALMERS CO., of Milwaukee, has received an order for six additional engines of a maximum 12,000 h. p. each, to be furnished the New York Underground Railway Co. The contract with this company now calls for 12 engines, and aggregates \$1,305,000.

THE J. G. BRILL CO., of Philadelphia, has received an order for 50 cars of a type which originated with the president of the Union Traction Co., of Philadelphia, Mr. John B. Parsons, and has proved very popular. They will be mounted on the Chicago Truck Co.'s type "D" trucks.

THE C. H. WORCESTER CO., of Marinette, Wis., dealer in white cedar products, has published a code by means of which the buyer can order any kind of cedar supplies by the use of a few words. The pamphlet also contains inspection comments from the Northwestern Cedar Men's specifications and information as to the method of shipping its materials.

THE J. T. SCHAFFER MANUFACTURING CO., of Rochester, N. Y., has moved to a new factory which is much larger than the one which it has operated for the past few years. The new factory is at the corner of Circle & East Main Sts., and contains ample room for machine shops and foundry. The business of the company has recently far outgrown the facilities of its old factory.

FRED M. LOCKE, of Victor, N. Y., maker of porcelain insulators for high tension service, now has his new factory in full operation. The old shop burned down on January 5th and on March 1st the new plant was completed and started working on orders. This factory contains all the latest clayworking machinery for the manufacture of porcelain insulators and has about three times the capacity of the old plant.

THE OHIO BRASS CO., Mansfield, O., has issued bulletin No. 8, entitled "Third-rail Insulator." The pamphlet is a highly creditable production from a typographical standpoint and contains numerous illustrations of various types of third-rail insulators, a sketch of the development of these appliances and a brief description of the insulator being installed for the system of the Aurora, Elgin & Chicago Ry., now in course of construction.

THE FIRM of Alfred M. Lamar & Co., of 60 Broadway, New York City, dealers in investment securities, makes a specialty of interurban traction securities. The members of the firm have been well known in New York financial circles for some years and the new traction department starts with a select clientele. Mr. H. D. Reynolds, who has charge of this department is well qualified to conduct it and has surrounded himself with a staff of capable and experienced aids.

THE FRANK S. DE RONDE CO., of 46 Cliff St., New York City, sells a cold water paint for application to wood, stone or brick surfaces and which is said to be an excellent substitute for oil paints at about one-half the cost. It is sold under the trade name of "Lythite" and comes in dry powder form. By the addition of cold water it is all ready for use. The paint is furnished in many colors for inside or outside application. This company also makes a red brick stain for permanently coloring brick a rich red hue.

P. W. CHAMBERLAIN, an American engineer, has closed a contract with the Nicaraguan government for 300 tons of steel rails and other fixtures to be used for the Atlantic Railroad which is now under construction. It is stipulated in the contract that the material is to be purchased in the United States. Mr. Chamberlain is now pushing the completion of work on that part of the road connecting the Indio River with the San Juan River at San Francisco, from which point there is steamboat navigation.

THE H. W. JOHNS-MANVILLE Co. has been formed by the consolidation of the H. W. Johns Manufacturing Co., of New York and the Manville Covering Co., of Milwaukee, which was effective January 1st. The new company is prepared to furnish a complete line of all grades of steam pipe and boiler coverings, and asbestos goods of all descriptions. Offices will be located in New York, Milwaukee, Chicago, St. Louis, Boston, Philadelphia, Pittsburg, Columbus, New Orleans, and London, England. The company's factories are at Brooklyn and Milwaukee.

THE GOULD STORAGE BATTERY CO., of New York City, has just completed the installation of a plant at Easton, Pa., for the Easton Power Co., which is subsidiary to the Light, Heat & Power Corporation, of Boston. The new plant consists of 255 cells of the Gould company's type S 011, in lead-lined tanks, having a capacity of 408 kw. hours, and a Gould patented C. E. M. F. regulating booster. This equipment is to be used in regulating the fluctuations of the street railway load and replaces a plant of half its size.

THE LUDLOW SUPPLY CO., of Cleveland, agent for the Gore track drill, which was illustrated and described in the February issue of the "Review," reports that it is having good success with this machine and is receiving almost daily inquiries regarding the working of this drill. Since the rail mills have been charging \$1.00 per ton for drilling bond holes in the rails, there has been an increased demand for track drills, by the use of which, not only a great saving can be made, but the bond holes, being drilled on the ground, do not require reaming as they do when drilled at the mill.

THE GENERAL ELECTRIC CO. has recently issued the following: Bulletin No. 4271, "Isolated Plant Switchboards." Bulletin No. 4272, "Small Direct Coupled Generating Sets." Bulletin No. 4273, "The GE-66 Railway Motor." Bulletin No. 4274, "Magnetic Separators." Catalog and Price List No. 7552 (superseding No. 7549), "Parts of U. S. Trolleys." Flyer No. 2090 (superseding No. 2060), "Pendant Push Button Switches." Price List No. 5090, "Parts of Form 2 Direct Current Multiple Arc Lamps for 220 Volt Circuits."

THE AMERICAN BLOWER CO., Detroit, Mich., has issued its illustrated sectional catalog No. 134, descriptive of "A. B. C." steel plate fans for heating, ventilating and drying plants, forced and induced draft apparatus, etc. Thorough descriptions, diagrams and illustrations of the various types of full housed and three-quarter housed fans are given, together with statistical tables, price list and other useful data. Attention is called to the importance, in ordering fans, of distinguishing the hand of the fan so as to designate on which side the pulley desired, as they are built either right or left hand.

THE WABASH RAILROAD CO. and the WHEELING & LAKE ERIE R. R., anticipating the early completion of the connections of the Wabash line into Pittsburg, which will bring that city into close touch with Wheeling, Cleveland, Toledo, Detroit, Chicago, St. Louis, Kansas City, Omaha and Des Moines, have issued a handsomely illustrated booklet containing announcements apropos of the event. The passenger station will be located at Ferry and Liberty Sts., and will be a commodious structure, modern in its appointments. It will be reached by elevated road leading from the bridge, which is to cross the Monongahela River.

THE FALK CO., of Milwaukee, Wis., is engaged in making a large amount of special work and its 400 employes are being kept very busy. The sales in the gear and pinion department are extremely brisk and the outlook for business during the coming season is exceptionally good. The fact that this company makes its own steel for the manufacture of gears and pinions appeals very strongly to street railway managers for the reason that they get metal of the desired analysis. A number of contracts for welding tracks have been closed already this season which is considerably ahead of the record in point of time.

O. D. TRANSFORMERS, is the title of an illustrated catalog published by the Westinghouse Electric & Manufacturing Co., in which this type of transformer is illustrated and described in detail. The pamphlet also illustrates the method of grouping single phase transformers for polyphase work and contains curves showing the efficiencies of these transformers under various loads. Aside from the descriptive features the catalog contains much useful information in regard to transformers which will prove of service to engineers in connection with alternating current work.

THE CHASE-SHAWMUT CO., of Boston, Mass., has published a small pamphlet of convenient size to be carried in the pocket, which is entitled "Electrical Data." It is designed for the use of electrical workers and contains wire tables and formulae for determining the size of wire, tables of equivalent sections of different gages, the ampere per generator and per motor of machines of various horse power capacities, definitions of electrical units and much other useful information. It also contains descriptions of a number of this company's specialties including fuse wire, enclosed fuses, switches, switch boards, motors and generators, conduit, rail bonds, etc.

BULLETIN NO. 69, of the Electric Storage Battery Co., of Philadelphia, contains an article on "The Distribution of Electrical Energy in Large Cities," by Louis A. Ferguson, which was read at a recent meeting of the American Society of Electrical Engineers. The article contains a description of the installation of chloride accumulators in the service of the Chicago Edison Co., and points out the saving in operating expenses which is secured by means of properly installed accumulator plants. Aside from the economy gained in operating expenses, perhaps the greatest value of the storage battery lies in its ability to carry a plant through an emergency which as a rule, comes with but little warning and at the time of heavy load. A fully charged battery floating on the system responds automatically to every call, keeping the pressure constant, despite breakdowns in machinery or on sub-station transmission lines.

THE SARGENT CO., of Chicago, heretofore operating an open hearth steel plant at 59th St. for the manufacture of draw bars, knuckles, coupler parts for repairs, and a plant at Chicago Heights, Ill., for the manufacture of "Tropenas" steel castings and steel and iron brake shoes, has transferred the plant at Chicago Heights, together with the classes of business done there, to the American Brake Shoe & Foundry Co., which company will hereafter conduct the business of this department from its offices at Chicago Heights. The Sargent Co. will continue the operation of the open hearth steel plant at 59th St., where its general offices will be located. Plans are being made for enlarging the Sargent Co.'s works to three times their present capacity.

THE TAUNTON LOCOMOTIVE MANUFACTURING CO., which makes the Wainwright even-flow feed water heater, has pub-

lished a small folder describing its apparatus and also a reprint from Power on "The Transfer of Heat from Steam to Water Through a Partition." The efficiency of the feed water depends upon the readiness with which heat may be transferred to the feed water through the walls of the tubes. The tubes in these heaters are of pure copper and are corrugated in order that the water passing through them may be agitated in its flow so as to bring every part of it into contact with the walls of the tubes. The reprint gives a report of tests made on these heaters which show an excellent efficiency.

THE NICHOLS-LINTEN pneumatic track sander is in use or is specified upon cars being built for the following roads: Cleveland, Elyria & Western Railway Co., Elyria, Crafon & Southern Railway Co., Cleveland & Chagrin Falls Electric Railway Co., Cleveland, Medina & Southern Railway Co., Cleveland & Eastern Railway Co., Toledo & Western Railway Co., Western Ohio Railway Co., Union Traction Co. of Indiana, Indianapolis, Greenwood & Franklin R. R. Co., Indianapolis & Martinsville Rapid Transit Co., Omaha & Council Bluffs Railway & Bridge Co., Toledo, Fremont & Norwalk Railway Co., Canton & Akron Railway Co., Hamilton, Glendale & Cincinnati Traction Co., Lorain Street Railway Co., Aurora, Elgin & Chicago Co., Chicago, Harvard & Geneva Lake Railway Co., Little Miami Traction Co., Muncie, Hartford & Ft. Wayne Railway Co., Louisville, Anchorage & Pewee Valley Railway Co., Ft. Wayne & Southwestern Traction Co., Brooklyn Heights Railroad Co.

THE STERLING-MEAKER CO., on another page of this issue, shows working drawings of the Sterling brake and invites attention to some salient points of the mechanism. The steady progress made by this brake in the favor of railway men for five or six years constitutes a really remarkable history. The market has been invaded by scores of inventions of great apparent merit, but the Sterling has kept right on broadening its field and doing satisfactory work day after day and year after year under all the most trying and danger-breeding conditions known to street railroading. Clearly this brake must have the solid qualities claimed for it—quickness, power, smooth operation and economy—or it could not have held its own so sturdily, to say nothing of making new friends constantly.

THE LIBERTY MANUFACTURING CO., Pittsburg, Pa., reports the following recent sales of the well-known "Famous" oil filter and refiner: New York Athletic Club Building, New York City; Onondago Lake Railway Co., Syracuse, N. Y.; L. M. Ramsey Manufacturing Co., St. Louis, Mo.; Berliner & Son, New York City; Southern Elevator, East St. Louis, Ill.; The Grand Leader, St. Louis, Mo.; Iron River Water, Light & Power Co., Iron River, Wis.; The Arcade Building, East St. Louis, Ill.; Ashburn Mining Co., Folsom, Cal.; City of North Vernon, Water & Light Department, North Vernon, Ind.; Commercial Building, St. Louis, Mo.; Cannonsburg Electric Light, Heat & Power Co., Cannonsburg, Pa.; Colorado Ice & Cold Storage Co., Kansas City, Kas.; Pitcher Lead Co., Joplin, Mo.; Peper Tobacco Co., St. Louis, Mo.; Firth Carpet Co., Firth Cliffe, N. Y.; John Schroder Lumber Co., Milwaukee, Wis.; Armour & Co., Sioux City, Ia.; George I. Roberts & Bros., New York.

THE WESTERN ELECTRICAL SUPPLY CO., of St. Louis, reports that it is receiving some very good orders for the "Lawton Peerless" fender, and that it has equipped a number of roads throughout the south and west with this fender. The company claims to have a fender which will absolutely do its work, and do it every time; that it is strong and durable and can be furnished in either wood or steel. It is so made that it can be put either under the platform or on the front end of the car, and will not interfere in dash signs. It has no bolts to hother with and can be removed instantly and is easily adjusted to any height from the rail. It is instantaneous in its action, and can be dropped by either hand or foot. This fender appears to possess unusual merit and those contemplating purchasing equipment of this kind would do well to examine thoroughly into this fender before placing their orders. The company issues a pamphlet fully describing same, which will be mailed on application.

THE STANDARD UNDERGROUND CABLE CO. announces that on and after Mar. 1, 1902, its Boston office will be at No. 101 Milk St., the Converse Building. This removal has been made to secure larger quarters and a more central location.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, has issued its automobile circular No. 5 in the interests of Dixon's automobile graphites. "Graphite", published monthly in the interests of Dixon's graphite productions, contains for March a number of interesting articles.

THE CHASE SHAWMUT CO., Boston, Mass., announces that it has secured commodious quarters and is now making a full line of fuse wire, fuse links and enclosed fuses, rail bonds, junction boxes, nipples, couplings and cable clips. The company is in a position to make prompt deliveries of all of the above lines of goods.

WM. B. M'VICKER, eastern manager for the Dearborn Drug & Chemical Works, reports business in excellent condition. Mr. M'Vicker has offices at 120 Liberty St., New York City, where he will be pleased to hear from any one in the East who is having trouble with boiler scale or deterioration of boiler tubes through the action of injurious ingredients in the feed water. His company does not sell a cure-all compound for preventing scale but makes a business of analyzing the troublesome feed water in each individual case and prescribing those chemicals that will neutralize the scale forming properties.

THE HEIL RAIL JOINT WELDING CO., of Milwaukee, Wis., has issued a descriptive pamphlet on the Heil improved cast welded rail joint and complete welding outfits. This company has perfected the cast welded joint to a degree that will bear the most minute scrutiny of engineers. The company claims that rails connected with these joints will have a life at least 50 per cent longer than with the ordinary fish plate joint, also, that by using these cast welded joints a 66-lb. rail may be used which will save the cost of the joint in first construction. The results have proved that a uniform and durable fusion of the two metals can only be obtained by an accurate temperature in heating the rail ends while the pouring is in operation.

PAWLING & HARNISCHFEGGER, of Milwaukee, Wis., have issued a bulletin No. 5, dated January, 1902, descriptive of the hand traveling cranes built by them. While their electric traveling cranes and electric hoists constitute the principal features of their business, the making of hand traveling cranes has recently attained great prominence. The latter are made of the best material and are well built in every respect. These are made in two types, called type A and type C, the former being built in capacities from 3 to 10 tons and the latter in capacities varying from 10 to 40 tons. The bulletin contains many illustrations of these hand cranes and a list of prominent manufacturers and other companies for whom they have been installed.

THE KELLOGG SWITCHBOARD & SUPPLY CO. is in receipt of a great many inquiries relative to cedar poles, and the indications are that the business will be very brisk and even greater than last year. This company entered the field about January, 1901, and secured from the producers in the vicinity of Escanaba, Mich. a large stock of white cedar poles, with the idea of furnishing them to telephone companies in connection with its switchboard and telephone business. It supplied a large number of poles for the independent plants at Jackson and Detroit, Mich.; Columbus, Alliance and Canton, O.; Iowa, Indiana, Illinois and the southwestern states also purchased a large portion of the stock. It was, of course, an experiment for a telephone manufacturing company to take up a distinct branch, such as the pole business, but the results were so satisfactory, and worked in so well with its general business that the company has decided to continue for another year. It is stated that poles have advanced this year, but the company is said to have quite a number of poles that were bought last year, and is able to make very attractive prices on them. The company has a very complete assortment of poles and in yards the shipping facilities of which can not be equalled. It had several large yards on the C

& N. W. Ry., the Escanaba & Lake Superior Ry., and the same on the D. S. S. & A. Ry., also a large yard at Ontonagon, Mich. on the C., M. & St. P. Ry.

C. J. HARRINGTON, formerly with the Morris Electric Co., F. H. Lovell & Co., and H. M. Shaw & Co. has established a new supply business at 15 Cortlandt St., New York City, under the style of C. J. Harrington where he will be pleased to meet all his former friends. This is a new concern but is thoroughly equipped to transact business in electric railway, electric lighting and telephone material; also machinery and general supplies for the trade. Mr. H. J. Newkirk, formerly with Wendell & MacDuffie, is associated with Mr. Harrington. The firm has secured a number of good agencies, among which are the Heil Rail Joint Welding Co., of Milwaukee; the General Equipment Co., of Camden, N. J.; the United States Fender Co., of Camden, N. J.; and the New Century Car Heater Co., of Jersey City.

THE W. T. VAN DORN CO., Chicago, reports that the new year has started out with excellent prospects for new business. The company has recently booked the following orders: 220 couplings for the J. G. Brill Co., for the Baltimore Traction Co.; 30 couplings for the same company for the Colorado Springs Rapid Transit Co., Colorado Springs, Colo.; 20 car equipments for the Boston Elevated and also equipments for all of the rolling stock of the Asheville & Craggy Mountain Railway Co. The Brill company has also ordered 11 car equipments for the Providence, Warren & Bristol branch of the New York, New Haven & Hartford road and the Cincinnati Traction Co., has given a large order for No. 11 couplers. An order received through the Peckham Truck Co., calls for 20 car equipments of the ball joint, No. 5 couplings for Yokohama, Japan. The company has also booked recently a large number of smaller orders.

THE CROCKER-WHEELER CO., of Amper, N. J., has recently received a large number of new orders for its engine-type generators which gives assurance of the high regard in which the machines are held throughout the country. It has been the company's aim to reduce its generators to standard sizes that will give a wide range of outputs and still maintain speeds corresponding to those chosen by most prominent engine builders. Among others the following companies have recently placed orders for Crocker-Wheeler generators: Pittsburg Reduction Co., New Kensington, Pa.; National Mining Co., Sagan, Pa.; Lake Shore & Michigan Southern Railroad, Collinwood Shops, O.; Federal Lead Co., Alton, Ill.; Farrand Organ Co., Detroit, Mich.; Snellenberg & Co., Philadelphia, Pa.; Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.; American Bridge Co., New York; Allis-Chalmers Co., Milwaukee, Wis.; Hawley & Hoops, New York; Hall of Records, New York.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, Pa., is engaged in building and installing a large number of railway and lighting battery plants that will be put into operation within the next few months. In addition to three large batteries for the Twin City Rapid Transit Co., the following orders may also be mentioned: West Hampton Park Ry., Richmond, Va., 250 cells of 480 ampere hours capacity; St. Albans Street Railway Co., St. Albans, Vt., 316 cells; Indianapolis & Eastern Traction Co., Indianapolis, Ind., 230 cells for regulation and emergency work; San Juan & Santa Clara Railway Co., San Jose, Cal., 264 cells which will furnish power during periods of light loads when the generator plants will be shut down; Trenton Street Railway Co., Trenton, N. J., 264 cells of 200 ampere capacity; Chippewa Valley Electric Railroad Co., Eau Claire, Wis., 264 cells of 200 ampere capacity; The Virginia Electric Railway & Development Co., Richmond, Va., a battery of 1,440 ampere hours capacity of which the 280 cells comprise tanks of sufficient size to allow of an increase of 25 per cent in capacity. This battery is divided into two sections of 140 cells each to operate on each side of the three wire system. The company also has under construction a battery of 134 elements for the Washington Arcade building, in Detroit, to regulate the fluctuations caused by elevator service and for night lighting. Another plant is being installed for the Pennsylvania Epileptic Hospital, at Oakbourne, Pa. for lighting purposes. An-

other battery of 160 ampere hours is being placed in the private yacht *Helenita*, owned by Mr. Frank J. Gould, and five new yachts now in course of construction are each being equipped with batteries of chloride accumulators.

THE ELECTRICAL INSTALLATION CO., of Chicago, has been awarded the contract for the entire construction of the inter-urban line between Cambridge, O., and Byesville. Work has been commenced and material is arriving daily.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has recently issued the following publications: Bulletin No. 4275, "The C E Motor." Bulletin No. 4276, "Small Continuous Current Stationary Motors, Type C A." Bulletin No. 4277, "Automatic Circuit Breakers, Type C, Form D." Bulletin No. 4278, "Horizontal Edgewise Instruments." Supply Department Flyers Nos. 2001, 2002, 2003, "Radial Fan Motor," "Snap Switches," "Blue Printing with Enclosed Arc Lamps." Price Lists Nos. 5091, 5092, 5094, 5096, "Porcelain Cut-outs for 125 and 150 Volts," "Principal Parts of Power Circuit Enclosed Arc Lamps Form 2," "Principal Parts of Form 5. Direct Constant Current Series. Enclosed Arc Lamps," "High Tension, Quick Break Form B. Switches."

PAWLING & HARNISCHFEGER, of Milwaukee, Wis., publish a general description of their products in catalog L, which is a large book containing 131 pages of illustrations and descriptions of numerous styles of cranes made by this firm. This concern has made many improvements in both standard and special cranes during the past 12 years and it devotes its entire shop equipment to this line of work exclusively. Its shops are equipped with the finest tools and every facility for turning out work of a thoroughly high grade and no expense is spared in securing the best results in the design and operating qualities of every part of the apparatus. The catalog contains an excellent series of photographs of the Pawling & Harnischfeger shops as well as a very large number of views of the cranes installed by this company in numerous manufacturing plants, central stations, etc. Besides its standard cranes, this company builds many of a special character for handling material in situations where a crane of the usual type would be out of the question.

THE UNDER-FEED STOKER CO., of America, which manufactures the Jones under-feed stokers, has recently closed a number of excellent contracts among which the following may be mentioned: Twin City Rapid Transit Co., Minneapolis, Minn.; Amoskeag Manufacturing Co., Manchester, N. H.; Gund Brewing Co., Cleveland, O.; Van Camp Packing Co., Indianapolis, Ind.; Theodore Hamm Brewing Co., St. Paul, Minn.; Reed House, Chattanooga, Tenn.; Stepiens Bldg., Detroit, Mich. The contract with the Twin City company calls for the equipment of boilers in its new power house now in the course of erection which is among the numerous improvements now being undertaken by that company at an outlay of \$1,250,000. The plant of the Amoskeag Manufacturing Co., is operated by a battery of Manning boilers under which these stokers will be used. Mr. W. H. Van Sickle, formerly connected with the Chicago office of this company has recently assumed charge of the company's New York office, 1011 Singer Bldg., Broadway, New York. The growth of the company's business has recently necessitated an increase in its office space and on March 1st, rooms 837 and 838 were added to the suite formerly occupied by the company in the Marquette Bldg., Chicago.

MR. ELMER P. MORRIS, treasurer of the Morris Electric Co., of 15 Cortlandt St., New York City, reports some good shipments of material to foreign countries, including a lot of wire to Lisbon, Mexico, etc. His company has just shipped 50 additional Monarch fare registers to the tramway company in the city of Mexico, this making a total of 100 registers recently sold to that company.

Rapid progress is being made in the construction of the inter-urban electric line between Jackson, Mich., and Battle Creek. It is said that cars will be running between these cities this summer.

STREET RAILWAY PATENTS.

This list of patents furnished by T. Reed Clift, Patent Attorney, Washington, D. C.

No. 692,271, Feb. 4. Dee T. Granbery, Memphis, Tenn. Railway switch and mechanism for operating it.

No. 692,271, Feb. 4. Dee T. Granbery, Memphis, Tenn. Railway switch and mechanism for operating it.

No. 692,272, Feb. 4. Gideon Grazier, Tyrone, Pa. Combined spike puller and car mover.

No. 692,422, Feb. 4. Seth J. Buckland, Springfield, Mass. Water shed or deflector for trolley poles or ropes.

No. 692,423, Feb. 4. Conrad Budhe, Jr., St. Louis, Mo. Electric signal.

No. 692,499, Feb. 4. Wm. S. G. Baker, Baltimore, Md. Car truck.

No. 692,513, Feb. 4. Charles E. Gierding, Westhaven, Conn. Fare register.

No. 692,691, Feb. 4. Clifton M. Moore, Monroe, Me. Car fender.

No. 692,747, Feb. 4. Wm. H. R. Welton, Akron, O. Switch throwing device.

No. 692,259, Feb. 4. Lester H. Bayne, Washington, Pa. Tramway switch.

No. 692,817, Feb. 11. Daniel S. Bergin, Chicago, Ill. Electric system for railways.

No. 692,938, Feb. 11. Abraham L. Sprague, Milton, Mass. Car track sanding device.

No. 692,974, Feb. 11. Daniel S. Bergin, Chicago, Ill. Combined underground and overhead trolley railway.

No. 692,985, Feb. 11. Nicholas H. Colwell, Pawtucket, R. I. Folding car gate.

No. 693,185, Feb. 11. Peter I. Swank, Conemaugh, Pa. Switch throwing device.

No. 693,351, Feb. 11. Bert D. Gibson, Alexandria, Ind. Overhead trolley electric railway.

No. 693,384, Feb. 18. Matthew S. Farmer, Washington, D. C. Railroad switch.

No. 693,603, Feb. 18. Chas. M. Hobbs, Baltimore, Md. Third rail insulator for electric railways.

No. 693,611, Feb. 18. Peter M. Kling, Elizabeth, N. J. Car.

No. 693,762, Feb. 18. Wm. J. Ward, Pittsburg Pa. Car fender.

No. 693,786, Feb. 18. Nicholas H. Colwell, Pawtucket, R. I. Folding gate for electric railway cars.

No. 693,935, Feb. 25. Chas. A. Willard, St. Louis, Mo. Switch attachment for cars.

No. 693,944, Feb. 25. Walter J. Bell, Los Angeles, Cal. Street railway switch.

No. 693,960, Feb. 25. Albert Fisher, Detroit, Mich. Car fender.

No. 693,988, Feb. 25. Eugene W. Taylor, Spokane, Wash. Trolley for electric cars.

No. 694,020, Feb. 25. Foshier H. Lippincott, Philadelphia, Pa. Trolley pole support.

No. 694,058, Feb. 25. David J. Griffiths, McKeesport, Pa. Railway switch.

No. 694,114, Feb. 25. Wm. T. Shryock, Allegheny, Pa. Car track

The Louisville (Ky.) Street Railway Co. and the Louisville, Anchorage & Pewee Valley company have effected an arrangement whereby the cars of the latter will enter the city over the tracks of the Louisville company.

Owing to the blizzard which swept over New Jersey on February 17th, cars on the lines of the North Jersey Street Railway Co. out of Jersey City were operated irregularly, and the entire force of snowsweepers was in demand.

February 17th the board of supervisors of San Francisco passed the following resolution: "Resolved, That the board of supervisors hereby declares its determination to commence and complete, as soon as the law will permit, the necessary proceedings to construct and operate a modern municipal electric railway system on Geary street and Point Lobos Ave. covering the present Geary Street, Park and Ocean Railroad franchise, the terminal of the completed system to be the ferry, foot of Market street and Golden Gate Park."



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DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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NO. 4

The decision in the Detroit 3-cent fare case rendered by the United States Supreme Court last month affirmed the decision of the United States Circuit Court rendered a year ago, and is a victory for the street railway. The Detroit case is, we believe, the only one of the 3-cent fare cases which has been carried to the Federal Supreme Court, but the result was no surprise to those who have followed the course of similar litigation in the lower courts.

It may now be taken as settled that an ordinance fixing a maximum rate of fare which was as an inducement for the company to build its street railway, constitutes a contract that cannot be impaired by the council under a power to "regulate" which may have been reserved.

We notice that in the assignment of papers to be read at the coming meeting of the American Street Railway Association that a change has been made by giving the subjects to the railway companies instead of to individuals as has formerly been done. We believe this change will be a beneficial one to the association as well as to those who prepare the reports. Most all of the men holding active positions on street railways are very busy men and would naturally hesitate to devote many of their business hours to work not directly concerning the company by which they are employed. By assigning the papers to a certain company, however, the officers of that company are obliged to put the preparation of the papers into the hands of one of its employees best qualified to handle it and such employee will feel far more at liberty to take the time required for the preparation of the paper when authorized by his own company to do so than he would at the request of the organization without the direct sanction of his employers. The officers of the road accepting assignments of papers will also take a greater interest in their preparation and to a certain extent they will feel a greater responsibility in their preparation than if they were simply the expression of the personal opinion of the single employe.

In this issue is presented a description of the chief physical characteristics and some of the operating details of the Hudson Valley Railway Co. To one who finds interest in studying "possibilities" in transportation enterprises this Hudson Valley property affords rare opportunities for conjecture. Here is an instance of an electric road, having a tributary territory 100 miles long and 50 miles wide, and a resident population of 100,000 along its lines with 250,000 more within 10 miles of its southern terminal, which proposes, in competition with a steam road and a canal, to do for the section served all that a steam railroad could do, and moreover it proposes to do it at far less cost to itself and to its patrons.

While the growth of the trolley freight and express business is generally welcomed as an advantageous addition to the transportation facilities of suburban communities we occasionally find people who can only see disaster to country merchants as a result of the trolley invasion.

An editor in Jersey City, N. J., where a bill authorizing the carrying of freight and express by trolley has been introduced, states that the trolley freight bill may be a good thing for rural and suburban sections but it will not be a good thing for country stores because all manner of goods will be ordered from the large cities and shipped by trolley freight. He believes it will also be a bad thing in large cities because there is no more room on the streets for any more cars. This same complaint has been heard repeatedly in nearly every place where improved transportation facilities have been proposed, but we believe the place still remains to be found where the establishment of trolley lines or trolley freight has proved anything but a benefit to the country stores which it reaches. The trolley has proved to be in every instance a most important factor in building up suburban communities, and in spite of the fact that some few orders may be transferred from the country stores to the larger cities, the country merchant within a short time will have several customers where he previously had one, owing to the colonizing effect of the trolley. There is also no reason why the country merchant should be less wide awake and progressive than his city competitor and with the natural increase in his business which follows the increase in population he is placed in a position to buy more extensively and consequently at better prices. His rent is proportionately much smaller than that of the city merchants as are also his running expenses, and in addition there is the cost of delivery from a larger city, so that there seems to be no reason why he cannot compete with his city rivals with entire success. In looking over the communities where the trolley has been introduced we find that in almost every case he has done so. We have yet to hear of a single case of business failure due to the introduction of trolleys or trolley freight lines.

Elsewhere we print an article by Mr. H. M. Sloan, general manager of the Calumet Electric Street Ry., on "Municipal Ownership and Operation of Street Railways." The subject is a live one in Chicago at the present time owing to the attitude of many of the city officials who are advocating the purchase by the city of the Chicago street railways as soon as their franchises shall have expired. While the arguments for and against municipal ownership are almost inexhaustible and the subject has been thrashed out many times over, Mr. Sloan presents a number of facts which are practical rather than theoretical and which should appeal to every one who seriously considers this question.

One point alone which he brings out is in reality, sufficient to dispose of the question of municipal ownership, that is, what advantage can there be to the municipality in owning or operating the street railways when the city is already in a position to make any terms and to exact any compensation it deems adequate from the lines owned by private parties? In either case the city is really the master of the situation and by granting franchises to the private concerns it cannot only demand whatever compensation for the same it sees fit but it avoids all the details and political machinery which would be involved in municipal ownership or operation.

One of the methods mentioned in this paper is to grant the franchise on a percentage basis, and provide that all net earnings over and above a certain percentage on the capital made by the lessee to revert to the city. This method of securing compensation to the city has been tried in various places and while it has

generally proved a failure as far as cash returns are concerned, it is indirectly a most beneficial arrangement for both parties to the contract. Under these conditions the company is pretty sure to take care that its net earnings do not exceed the maximum above which it pays a portion to the city, but in keeping its net earnings down to this figure its surplus is spent in betterments of the system and improvements in the service, so that while the city treasury benefits but little if any in cash receipts, the traveling public who patronize the car lines is considerably benefited by the improvements both in the service and the equipment of the road.

These considerations apply of course only to where the city's compensation is fixed as an amount over and above certain net earnings. If a certain percentage of the gross earnings of the road revert to the city a considerable cash income may result, but such a percentage must be conservatively estimated or it may result in gross injustice to the stockholders if the compensation demanded be excessive.

Appropos of municipal ownership and operation the recent action of the Montreal Street Railway Co. in asking that it be permitted to remove the snow from the streets now occupied by it, deserves attention. The work is now done by the city the street railway company paying a share of the cost, and the company claims it can do the work in one-fourth the time and at one-half the cost as compared with city supervision. Here is an object lesson as to the relative efficiency of public and private employes and the relative cost of public and private administration.

At the municipal election held in Chicago April 1st the electors were invited to give an expression of opinion on the desirability of the city acquiring ownership of the street railways. The total votes cast for aldermen was 204,379, this number being less than 57 per cent of the votes cast in the city at the presidential election in 1900, 364,545. On the street railway referendum the total of votes was 150,581; of these 124,594 were for and 25,987 against municipal ownership, a majority in favor of the proposition of 98,607. Only 73 per cent of those who voted at the election voted on the municipal ownership question, and those in favor of the city owning the street railway constituted but 34 per cent of the number voting in 1900.

The question submitted was purely an academic one, because the city has not power to acquire street railways nor is it at all probable that the legislature will ever grant the necessary power to the municipality. The only effect of the vote on this question has been to lead the mayor of Chicago to take the position that discussion of the terms on which the existing street railway franchises are to be extended should be postponed until the Illinois Legislature has had another chance to refuse to give the city the right to own the railways.

The Chicago Tribune takes the position that the city of Chicago is utterly unfit to operate a street railway. The city has been extremely slow in repairing some of its bridges and the Tribune says: "If it takes a municipal corporation fifteen days or more to make bridge repairs which ought to be made in three days, how long would it take a municipal corporation operating a street railroad to make repairs which a traction company rushes through in from one to three hours." And in conclusion: "A municipal corporation which never is able to make bridge repairs promptly is not to be trusted with the operation of an electric street railway."

We believe that the conditions which would make the city unsatisfactory as an operator also would limit the efficiency of the service were the lines owned by the city. A public corporation is always slow to install new devices, and is wasteful in its administration.

Elsewhere we print an abstract of a paper recently read before the Western Railway Club on "Vision, Color Sense and Hearing" which describes the tests of these senses to which applicants and employes of the best managed steam railroads are submitted. The subject is one, however, which will be of interest to street railway managers and more especially to those operating long distance high speed roads.

While few of the electric companies have as thoroughly organized operating department as the older steam roads, the tendency to improve the operating departments is distinctly marked at the present time, and on a number of the more thoroughly organized electric railways cars or trains are run according to the dispatcher's orders and are governed by semaphore or other visual methods

of signalling. This requires that motormen should be as thoroughly tested for vision, color blindness and hearing as are locomotive engineers, and the necessity for this is perhaps more pronounced in the former than in the latter case as the motorman operates his car or train at speeds often approximating those of the steam railroad trains and upon public highways and other streets often thronged with pedestrians. On a number of street railways the motormen are now tested for defects of this nature, and we believe the time will come when such tests will be generally required for the operating departments of street railways.

Several years ago, the employes of the Twin City Rapid Transit Co. were submitted to similar tests and quite a number of men were found who possessed various ocular defects which totally disqualified them for operating cars. These men were subsequently given employment in other departments of the company and their places filled by men who could pass the required tests.

Another point which may be mentioned in connection with this subject is the favorable impression which is created by such examinations in case of an accident involving litigation of questions where hearing or color sense are in issue. The court, the jury and the public will be far more favorably impressed by the knowledge that the company had been sufficiently thoughtful of the public welfare to compel examinations for sight and hearing than were no such records on file. There are many well authenticated cases of accident caused by nearsightedness of motormen which have cost street railway companies many thousands of dollars.

The committee which has in charge the preliminary organization of the "Street Railway Manufacturers' Association" is much gratified by the keen interest shown in the proposed association by the firms and individuals which exhibit at the A. S. R. A. conventions. Replies have already been received from a large percentage of those to whom announcements were sent by the committee, and these are practically unanimous in regard to the advantages of a plan such as proposed. Some express a desire to know definitely what will be the cost of membership and the scheme of organization; these questions it is of course impossible to answer at this time because no action will be taken until the meeting of supply men to be held in Detroit on October 8th next.

The development of manufacturing industries in America to their present state, where there is in all foreign lands a well defined fear of "peril" of American competition, has been very largely due to the adoption of certain fundamental principles on the part of shop and mill owners. These are first, the use of special and automatic machinery whenever possible; second, the immediate adoption of improvements, even at the cost of scrapping the older equipment; third, the use of every means to encourage workmen to push the output up to the limit of the existing tools, and to suggest improvements in machinery and methods whereby a saving either in time or labor can be effected.

The most effective method of securing the efficiency of the manufacturing plant is recognized to be a system wherein the compensation of the workmen is based upon the amount of work turned out, and not solely upon the time. The various plans which have been adopted are sufficiently well known to our readers under the names, piece work, premium system, differential rates, etc. The principal difficulty in applying these scales of wages has been that too often not sufficient care was exercised in establishing the rates for piece work in the first place. If amicable relations are to exist between employer and employe there cannot be continual cutting of piece work rates, unless the cut is justified by the introduction of improved machinery; consequently, the rates should be determined in the first place only after the most careful consideration and experiment.

While the advantages of piece work for manufacturing plants are recognized, it has not generally been considered that the system could be successfully applied in shops devoted to repair work, and therefore the article on the "Repair Shops of the North Jersey Street Railway Co.," on page 223 of this issue will be particularly interesting to master mechanics. In these shops all repair work is done by the piece with most satisfactory results, and the scale of prices which is given on page 228 will be of the greatest assistance to others who are desirous of adopting a similar system.

Interesting data on the economy of painting cars by piece work were given in the "Review" for November, 1900, page 649.

The Hudson Valley Railway.

Articles of Incorporation—Territory Traversed—Track and Line Construction—Bridges and Masonry—Power Generation and Distribution—Car Houses—Freight and Express Business—Park System—Personnel.

By an act of incorporation passed in 1901 there were merged into a single corporation six street railway companies owning lines in eastern New York and there was formed thereby the longest interurban electric road in New York, and one of the longest in the United States. The companies consolidated were: The Glens Falls, Sandy Hill & Fort Edward Street Railroad Co., the Warren County Railway Co., the Greenwich & Schuylerville Electric Railroad Co., the Saratoga Traction Co., and the Saratoga Northern Railway Co. These properties were first individually acquired by what is known as the Powers-Colvin syndicate and were then transferred to the new operating company.

The corporate title of the company has been fittingly chosen for the consolidated lines with such extensions as have been added under the new management form a continuous electric railway system through the upper valley of the Hudson River from the head of navigation at Troy and Albany to Lake George and into the foot hills of the Adirondacks, 70 miles to the north—a territory unusual in its historic, scenic, agricultural and commercial aspects. For most of the distance the road parallels the Delaware & Hudson R. R. by a route some nine miles shorter and the Champlain Canal.

Topographically the Hudson Valley forms a natural aisle from the sea to Lake George and Champlain, and into this aisle opens the natural outlet to the western country—the valley of the Mohawk River which joins the Hudson near Cohoes. In colonial and pre colonial times the valley was the hunting ground as well as the trail path for the white trader and Indian alike, and later became the battlefield and war path for the Five Indian Nations, the French from Canada, the Dutch at Albany and Ft. Orange and the English from New England. Still later the strategic situation of the tract made it famous as the stage for many of the most stirring

actions of the Revolutionary war. It is said that this valley has been debatable ground in no less than nine important wars. As can be easily imagined these strenuous deeds and incidents have left almost innumerable landmarks, battlefields, and points famous in history and tradition, which have become places of pilgrimage for tourists and sightseers and will have an appreciable influence on the earning power of the electric railway.

Added to this pleasure travel the new consolidated system will enjoy a large part of the excursion and tourist travel to Lake George and Saratoga and still in addition to these attractions the company has established three important parks of its own.

Commercially the Hudson valley is the site of hundreds of mills and factories attracted by the abundant water power afforded by the upper Hudson and its tributaries. The products are chiefly paper, wood pulp, lumber, wall paper, collars and cuffs, machinery, farming utensils, cement and cotton cloth. Some of the largest mills in the world in these lines are located in this valley. As stated at greater length elsewhere, the Hudson Valley Ry. is already hauling much of this outgoing freight in carload lots.

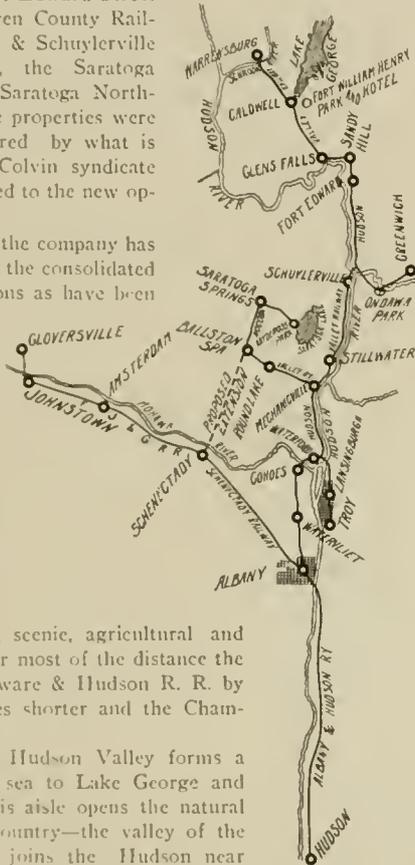
The territory covered is rich in productive farms and the freight business will include the transporting of all kinds of garden truck, dairy products and farm produce to Albany and by railroad and steamboat connections from there to New York.

A considerable source of revenue will be the carrying of the employes of the mills and factories to and from their work, and for this class of patrons the company provides workingpeoples' tickets at 33 rides for \$1.00 for certain local fares and half-fare for longer distances. Upon the city lines of Glens Falls which form part of the Hudson Valley property these tickets are especially in demand.

At Albany connection is made over the lines of the United Traction Co., with the Albany & Hudson Ry. running down the Hudson River to the town of Hudson; with the Schenectady Ry. running to Schenectady and there connecting with the electric division of the Fonda, Johnstown & Gloversville R. R. With the exception of the Albany & Hudson road there is a community of interests among all the systems just mentioned.

TRACK AND OVERHEAD DEPARTMENT AND SAFETY SIGNALS.

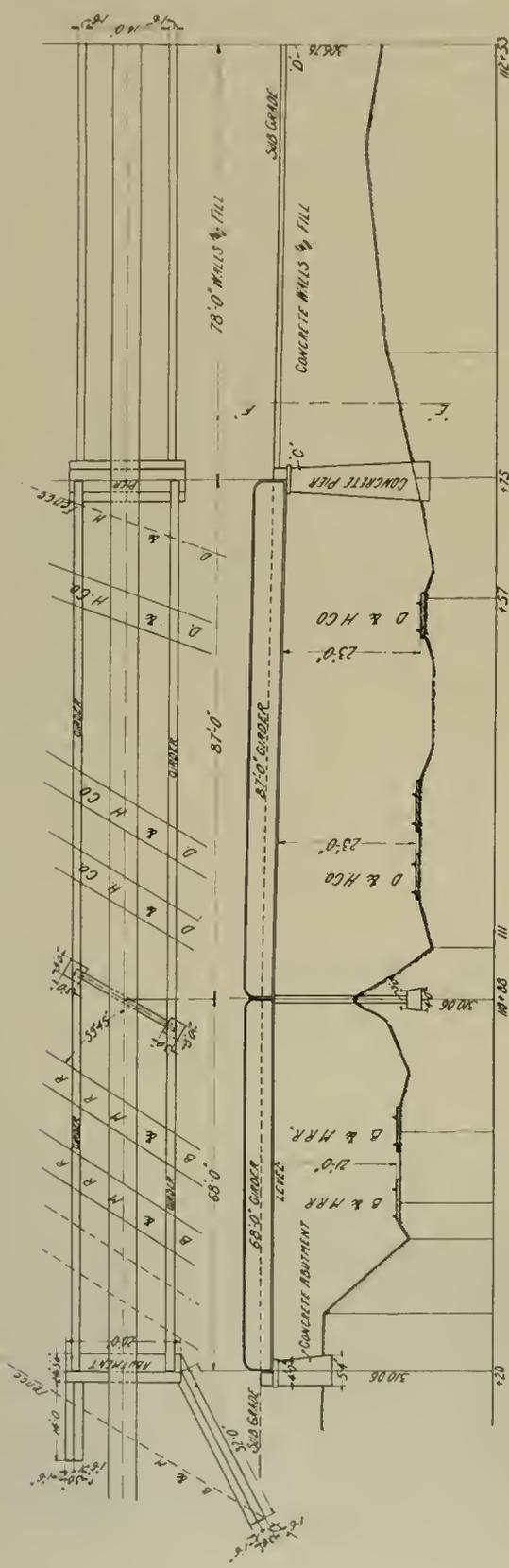
The total main track owned by the company including the branch to Greenwich and the branch to Saratoga Lake is 103 miles. With the exceptions of short stretches of girder rails in Glens Falls and Saratoga, the track is laid with 60 or 70-lb. T-rails on ties 6 x 6 in. x 8 ft. The road bed is gravel ballasted and in all new work grades are limited to 2 per cent, and no curves are to exceed 5 degrees. The roadbed is 14 ft. wide and in heavy fills is 16 ft.



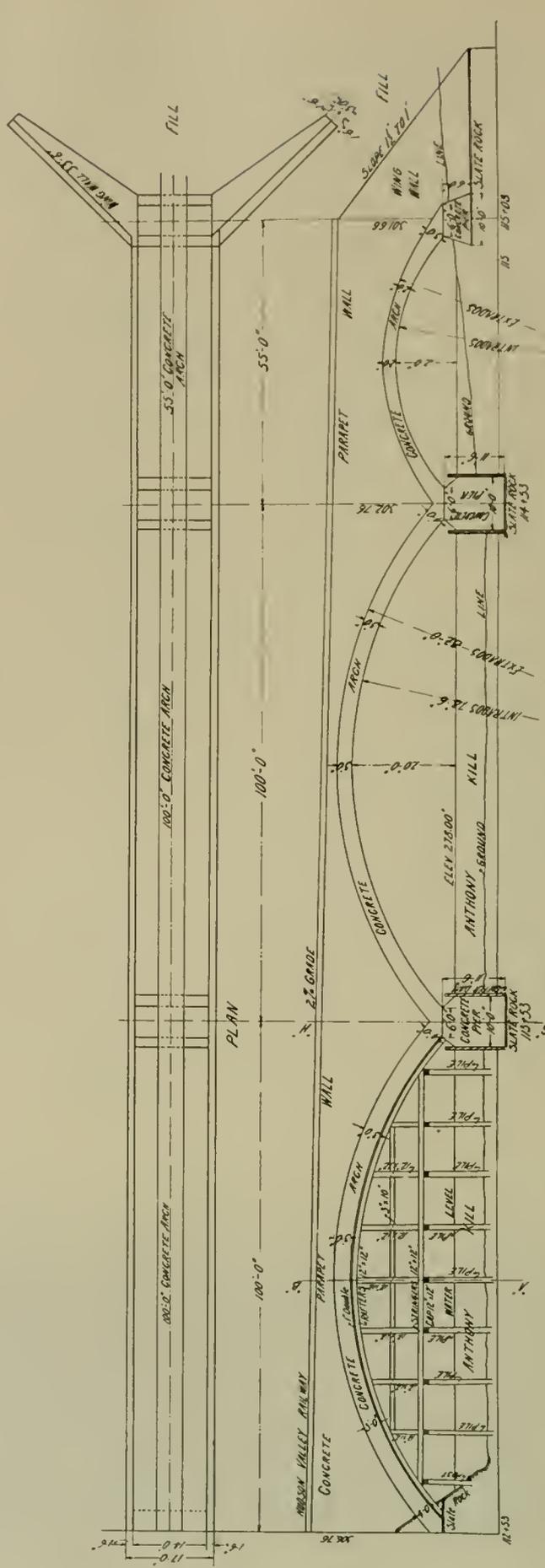
VALLEY OF THE HUDSON RIVER FROM THE BATTLEFIELD OF REMIS HEIGHTS.

wide. Cuts are 22 ft. wide. In most of the track work the slopes at the sides are 1 1/2 to 1, except in clay work where they are made about 1 3/4 to 1. In fills up to 12 ft. in depth vitrified pipe is put in for drainage, but in deeper fills cast iron pipe is used. There are a few concrete culverts.

The rails are bonded with a new style of rail bond which was devised by Mr. J. A. Powers, general manager of the road. This



OVERHEAD CROSSING FILL WITH RETAINING WALLS.



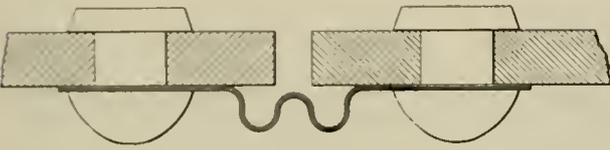
PLAN AND ELEVATION OF CONCRETE ARCHES OVER ANTHONY KILL.

comprises a set of tinned copper leaves 1-100 in. thick, the number used depending on the conductivity desired, and held in place by two 1/2-in. copper rivets driven in the end of the rail 1 in. from the end. Corrugation in the leaves between the rivets make the necessary provision for expansion. The rails are drilled and the surface faced off under the rivet head and the rivet driven by steam or hydraulic pressure.

The trolley wire is No. 000 copper of figure 8 section and two wires are strung the whole distance thus avoiding overhead switches and lessening the chance of a total breakdown through the snapping of a trolley wire. The wires are suspended from home-made brackets carried on 35-ft. chestnut poles having not less than 7-in. tops. Overhead material was supplied by the Ohio Brass Co.

About 85 miles of the road are on private right of way most of which is 50 ft. wide or over, making it possible to double-track the road when the increase in traffic demands it.

To the matter of a reliable signal system the company has given considerable consideration. As the first precaution a private tele-



SPECIAL RAIL BOND.

phone line has been installed with telephones in booths at turn-outs and instruments in all the company's offices, car barns and power houses. The dispatching of cars is done by telephone. Car reporting and regular orders are verbal but variation from the regular schedule are only made by using a triplicate train order ticket. The motorman receives the order over the telephone, it is repeated back by the conductor and checked by the dispatcher, the conductor punching an order slip in triplicate, one copy to be taken by the conductor, the second by the motorman and the third is deposited in a box kept for the purpose so that there is always a means of checking or verifying the orders. The system is found to be a trifle cumbersome but is believed to be reasonably safe.

more than one car in a block, the practice is to allow the conductor of the first car to unlock the block and hold the switch over until all the cars have entered, the last car to carry the staff, and all the cars carry the regular "car following" signal, lights by night and flags by day, as is done on steam roads.

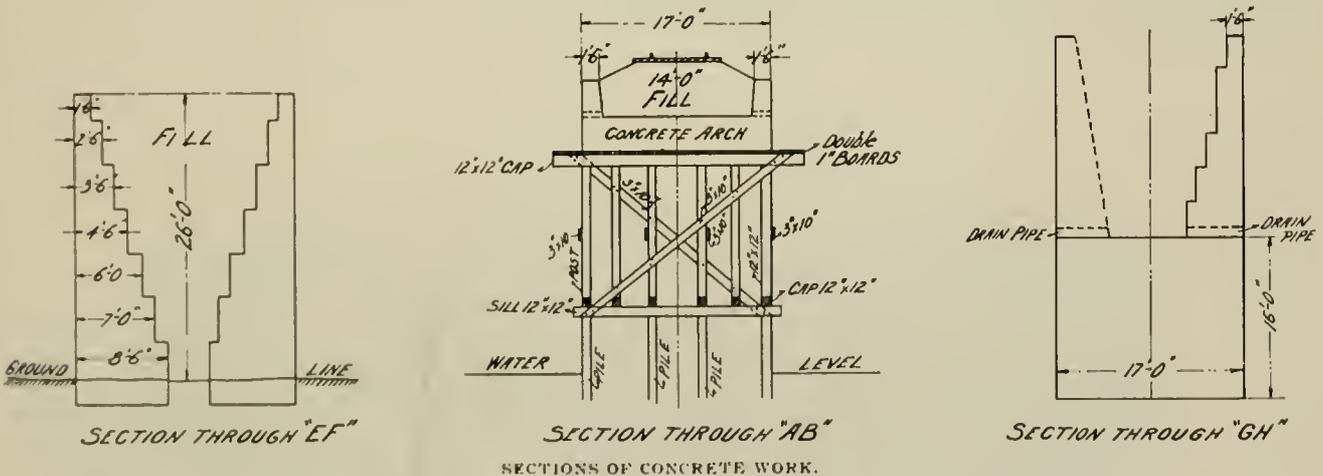
Mr. Powers is still giving this matter of protective signals close study and is of the opinion that the successful signal system of the future will be one in which the stationary block will be eliminated, and the automatic indicator on the car itself substituted therefor. He believes it is not impossible to arrange a circuit whereby an incandescent lamp in the motorman's vestibule will light up when another car approaches from either the front or rear say within a distance of a thousand feet. He thinks perhaps something, like the system employed in tall office buildings for signalling the operator and also for indicating the approach of the elevator car, can be applied to the problem of signalling on electric roads.

In times of fog or storm it is the practice on the Hudson Valley road to forbid any car to leave its switch except after it has met and passed the regular car going in the opposite direction, and the rule is adhered to even if it ties up the road indefinitely. It is believed that absolutely no chances should be taken in mist or fog when operating a single track road at high speed.

Wherever necessary to put in bridges or trestles the company has adopted the policy of using concrete arch masonry bridges. Mr. Powers informs us that the cost of this concrete arch work is practically the same as steel truss bridges with the required masonry abutments and is believed to be more durable, less expensive to maintain, and more satisfactory in every way. The concrete arches on the road range from 20-ft. spans upward, and there are two spans of 100 ft. each with 75 ft. of concrete viaduct.

The plans which we reproduce on page 194 show an over crossing structure on the Hudson Valley Ry. between Mechanicsville and Ballston. It carries the electric railway over the tracks of the Boston & Maine and the Delaware & Hudson railroads, and will be completed by May 1st, when connection will be made between Mechanicsville and Saratoga.

There will be two steel girder spans over the railroads, one of 68 ft. and the other 87 ft., the sub-structure for these is to consist of concrete abutments, pier and pedestal. On the "hog's back"



As an insurance of safety on portions of the road having sharp curves where cars can not be seen for any great distance in advance and where the danger is necessarily greatest, the movable staff system has been tried with satisfactory results. On the sections so protected a spring derail is put at each end of the block and is locked with a duplicate padlock, the key to which is attached to the staff. The motorman can get his car out of the block, but he cannot enter a block without having possession of the staff and the attached key. When a car enters a block the conductor takes the staff with him and delivers it to the opposing car at the other end of the block. The system is not adapted for protecting an entire road as the chances for delay would be too great but for short sections of crooked track it has many points to recommend it. If the travel becomes heavy enough to require

between the pier and the beginning of arch span, there will be concrete retaining wall and fill in center. The Anthony Kill is crossed with three concrete arches, two spans of 100 ft. each and one span of 55 ft. The rise of the former is 20 ft, and the latter 12 ft.

The false work consists of piles driven down to rock and timber bents spaced 10 ft. apart. The covering consists of double 1-in. boards.

The concrete is made and laid according to the following specifications:

Cement.—Must be of best quality of freshly burned and ground hydraulic cement, and be equal in quality to the best brands of cement. It will be subject to test made by the engineer or his appointed inspector and stand a proof tensile of 50 lb. per sq. in.

of sectional area on specimens allowed a set of 30 minutes in air and 24 hours under water.

Concrete.—Concrete shall be composed of fragments of hard, sound and acceptable stone or clean gravel, broken to a size that will pass through a 2 in. ring in any direction, thoroughly clean and free from mud, dust, dirt or any earthy admixture whatever. It is to be mixed in proportion of two parts in bulk of the broken stone and clean gravel, to one part of fresh made cement mortar of the quality described, and is to be quickly laid in sections and in layers not exceeding 9 in. in thickness, and to be thoroughly

will be stepped up to 22,000 volts for transmission to the converter and transformer sub-stations. The transmission line will be No. 3 copper wire supported on poles having two cross arms. The high-potential wires will be carried on the outside of the poles leaving the inside pins for such use as may arise.

The five direct current stations now owned by the company were taken over with the individual companies at the time of the merger and are more or less antiquated as regards equipment. Much of this apparatus is still doing good work, however, and it would almost seem that there are lessons that could be learned from the



FALSE WORK FOR CONCRETE ARCH HUDSON VALLEY RY.

rammed until the mortar flushes to the surface; it shall be allowed at least 12 hours to set before any work is laid on it.

Stones not more than a cubic foot can be placed in the heart of piers, abutments and wing walls where the wall is over 4 ft. wide. These stones are to be placed so that there will be at least 1 ft. of concrete to cover them and 6 in. of concrete between them.

One of the illustrations shows the false work and molds for springing the concrete arches into place.

POWER GENERATION AND DISTRIBUTION.

At the present writing it is not possible to give all details for the permanent power scheme. Broadly the plan is to do away with the five power houses owned by the company and substitute a

designs of these early machines. Mr. Powers states as a curious fact that two of the small generators in the Glens Falls power house which were installed by the United States Electric Co. in 1891, and which have run on an average of 20 hours a day since that time, are still running with the same brushes, armatures and commutators that they had when first installed, the commutator wear for 11 years not exceeding 1-16 in. He attributes this long life to the unusually large and heavy brushes used and to the comparatively slow speed at which the machines are run. The commutators are built up with hard fiber insulation between the bars.

It is proposed to eventually shut down these stations with the exception of the combined water and steam plant at Stillwater



STANDARD CLOSED CAR J. M. JONES SONS.

three-phase 22,000-volt transmission system with sub-stations of 300 kw. rated capacity placed at intervals of approximately 10 miles; current to be generated in two water-driven plants of large capacity, one near the northern terminus and one somewhere near the southern terminus of the road. The upper water power, where about 3,000 h. p. is available, will be developed first and the second one in the future, the final plans calling for an aggregate of 8,500 h. p., including the two water power plants now in use. The new stations will probably contain 650-kw. turbine-connected units generating alternating three-phase current of 40 cycles at 390 volts, which

where the economy of operation will always insure that the station be kept in service. The other plants will not be dismantled but will be held in reserve for emergency duty.

As a temporary resource or until the larger water power stations are available, it is proposed to install at once at the present power houses and at the rotary sub-stations the rotary converters that will be used under the new alternating system of distribution. For the immediate future and at least for the coming summer the power house will be reversed, converting direct current to alternating from the direct current machines and transmitting the al-

ternating current after passing through the transformers to the nearest rotary sub-stations at 22,000 volts.

The Hudson Valley Railway Co. owns 130 cars, of which over half are double truck. Most of the cars were built by the J. W.



PARLOR IN HUDSON VALLEY CAR.

Jones' Sons Co., of Watervliet, N. Y., and are said to be the finest ever turned out by that concern.

The closed cars which have 31-ft. bodies represent the Jones standard high speed car, which is 8 ft. wide and has 4 ft. 3 in. vestibules at each end. The cars have center sills, side and end sills, and are reinforced by steel plates. It will be noticed that the car is somewhat high on the trucks, thus dispensing with traps in the floors and allowing of motor inspection from underneath the car. The front platform is provided with controller, air-brake, switches, etc., and the rear platform has a Baker heater installed, the car being piped for and heated by that system. The interior is divided into smoking and passenger compartments, the smoking compartment being in the forward end. The seats are made and arranged so as to be easily removed, and carpet, chairs, card tables and tapestry, arranged as shown in one of the illustrations for use as a chair car. The interior finish is of mahogany, with plate glass in sash and doors.

The 15-bench open car is also the Jones standard high speed car of that type. The extreme length is 41 ft. 5 in.; width, 7 ft. 9 in. over seats. The ends are of extra strong buffer construction,



STANDARD FREIGHT CAR J. M. JONES' SONS.

reinforced by steel plates which continue around front and along sides. The cars are equipped with double steps on one side (the lower tread may be folded if desired) and on each side are wooden guard poles.

The freight cars are 40 ft. long over platforms, and 8 ft. wide over siding, they are made strong and serviceable, the capacity being 40,000 lb. The tracks are arranged with Y's at the terminals and at stated intervals, and cars run the same end on at all times. One side of each platform is permanently enclosed.

The standard equipment for all double truck cars is the standard wing motion extra heavy double trucks made by the Taylor Elec-

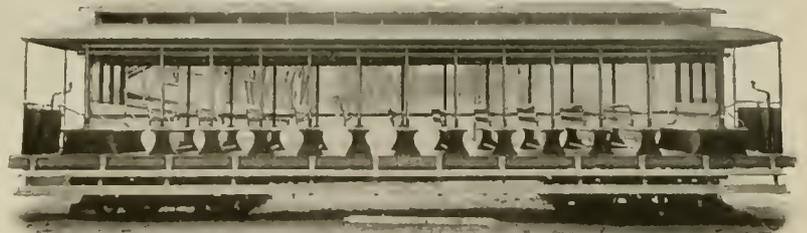
tric Truck Co., of Troy, N. Y. There are four Westinghouse No. 56 motors to each closed car and two on each open car, but both motors are carried on the forward truck, the rear truck running as a trailer. It is held the motors work better when thus mounted and the arrangement greatly facilitates the changing of trucks from open to closed car bodies and vice versa.

All double truck cars are fitted with Westinghouse standard automatic air brakes. The air supply is carried in a storage tank at about 300 lb. pressure and from this is reduced through valves to a working pressure of about 75 lb. in the brake cylinder. The cars are all provided with Baker hot water heaters made by W. C. Baker, of 143 Liberty St., New York City.

The company owns two electric locomotives that are utilized for hauling standard steam railroad freight cars from the mills and factories on the route to steam railroad connection with the Delaware & Hudson and the New York Central railroads. The locomotives were assembled in the company's own shops. The bodies were built by the J. M. Jones' Sons Co., and are mounted on Taylor trucks. Each locomotive has four Westinghouse No. 56 motors.

CAR HOUSE STANDARDS

The company has operating barns and repair shops at Glens Falls and Stillwater and storage barns at advantageous points. In all power house and car barn construction a standard style has been adopted and most of the buildings have been rebuilt to conform to the new standards. These include brick walls, steel I-beam roof construction with flat roofs covered with 3-in. planking with loose tongue and groove matching, and protected with tar and gravel roofing. In building car barns the interior is divided into compartments with not more than three tracks in a compartment. The partitions are heavy brick walls and are carried 4 ft. above the roof. There are no doors or openings of any kind in



STANDARD OPEN CAR J. M. JONES' SONS.

these fire walls, the only communication with different compartments being around through the front doors. It is believed the little additional inconvenience occasioned in this way is more than offset by the security against the destruction of any large portion of the rolling stock by fire. Pits in the barns have been done away with entirely and instead, the barn floor is dropped 4 ft. at either side of each rail. It is found this arrangement not only insures better light for the truck repair men but also renders all parts of the truck and motors more readily accessible.

THE HANDLING OF FREIGHT AND EXPRESS MATTER.

All of the franchises of the company give it the right to carry freight and express in connection with its passenger traffic. This department has steadily widened in scope and the traffic increased in volume but is expected to reach greater proportions during this year. Not only is small freight handled but the company also owns, as stated elsewhere, two heavy electric locomotives, that haul trains of steam railroad cars to and from the railroad connections. Many of the larger plants along the route have sidings and switches from the electric road into their yards and make all their shipments in freight cars which are delivered and taken away by the electric locomotives with less delay and annoyance than would be the case if they had to depend upon steam locomotives. The facilities of the company will soon be taxed to the utmost to care for all the business of this nature presented.

The handling of packages, farm produce and other small freight within the territory directly served is also to become a valuable

source of income. Four box express and freight cars are making regular trips at present but this number is to be increased. The company has an agreement with the United Traction Co., of Albany, whereby the freight house of the latter company at Troy will be used jointly by the two roads for the handling and transferring of express and freight matter.

SYSTEM OF PLEASURE PARKS.

As has been intimated, the Hudson Valley Railway Co., aside from the excursion travel naturally gravitating toward the famous resorts of Saratoga Springs and Lake George, has endeavored

where is had a commanding view of the Hudson Valley, the lake, and the Adirondacks.

The second pleasure ground owned by the Hudson Valley Railway Co. is Onda Park, 30 miles from Waterford and 20 miles from Glens Falls, on the branch from Schuylerville to Greenwich, in the heart of the pine forest. The place has all the charms of the woods and has been fitted with facilities for picnic parties and excursionists, including dancing pavilion, restaurant, bicycle track and base ball field. The car stops at a little rustic station that adds to the charm of the surroundings. At the upper end of the park is the celebrated gorge of Dionondhawa, whose cliffs are



THEATER IN KAYDEROSS PARK—HUDSON VALLEY RY.

to encourage and create pleasure riding by developing a system of parks and pleasure resorts arranged with proper regard to the facilities at hand for rapidly moving large crowds.

The most northerly of these resorts is Fort William Henry Park, at the extreme southern end of Lake George and about 53 miles from Waterford or 65 miles from Albany. In this park which borders the lake stands a splendid hotel that is also owned and managed by the railway company. The house is called Fort William Henry Hotel, and has earned a reputation which makes it one of the chief hostleries in the Adirondack region. The house contains 300 rooms, has a broad attractive piazza commanding a fine view of the lake and mountains, and is fitted with all the appurtenances of a first-class hotel. The property cost over half a million dollars. It may be well to note here that the railway management does not intend to run the Fort William Henry House as a large dividend payer in itself, but the hotel is to be managed with the interest of the railway primarily in view to the extent that excellent accommodations and cuisine will be furnished at reasonable rates with the view of keeping the house filled with a desirable class of guests and thus increasing the number of possible and probable patrons for the road. As further inducement the company will arrange to run special cars from Albany to Fort William Henry for the accommodation of private parties going to and from the hotel, and it is believed this trolley ride lasting about four hours will be not the least interesting and enjoyable feature of an outing in this region.

Near the hotel is an artistic casino built at a cost of \$10,000. The architecture is Spanish in style. The casino is fitted with stage and dressing rooms for out-of-door theatrical and vaudeville entertainments, and is also arranged for dancing and for the use of conventions. There are bath houses below on a sandy beach and along the lake is an evergreen walk which has been a favorite spot with amateur photographers. Near the park is Prospect Mountain, up which runs an inclined cable road to the summit

115 ft. high and covered with shrubbery and ferns. At the foot of the cliffs runs a picturesque stream making the spot one of unusual beauty and attractiveness. The company's railroad crosses this gorge on a steel span 180 ft. long.

Kaydeross Park, near Saratoga Lake, on the Mechanicsville-Saratoga branch, is the third park in the series. The pleasure



KAYDEROSS PARK.

grounds extend for half a mile along the lake shore. In a natural hollow has been arranged a rustic stage and dressing rooms of logs with none of the bark removed. The seats for 1,200 people are placed around three sides of the amphitheater, and at irregular intervals are small platforms on which are comfortable wicker chairs, these constituting the boxes for this unconventional thea-

ter. Back of the stage is a shadowy pool which with its surrounding trees forms part of the scenery for the performances on the stage. There is a restaurant here, a merry-go-round, and a conservatory, and on the rise from the shore is a casino, set with the water and hills forming a charming and effective background. The

excursions if desired. Sacred concerts are held on Sundays during July and August. A specialty is made of elaborate displays of fireworks at frequently recurring intervals and the company has a standing contract with the Payne Fireworks Co. for a certain number of fireworks displays during the season.



HOTEL, BOAT HOUSE AND CASINO AT FT. WILLIAM HENRY.

stage has foot lights across the front and electric lights on poles and among the trees furnish adequate illumination at night. The paths which lead to the theater also communicate with a shaded grove where there are swings and other outdoor attractions for the children and rustic seats and shady nooks inviting repose.

The three parks mentioned are the chief recreation points on the road but there are also camp meeting grounds and numerous lesser resorts and pleasure grounds on the many small waterways and mineral springs with which the territory abounds.

In the handling of excursion crowds on its cars the company has had considerable experience and has been very fortunate in this traffic, always having in mind that the crowds are to be started moving and to be kept moving with all possible dispatch, but without personal risk to any individual making up the crowd. As pointed out in a recent issue of the "Review" the experiment of hauling cars in trains with a heavy snow plow as the locomotive has been tried. This worked satisfactorily and 600 passengers have been carried in a single train of five trail cars without accident. During the coming season the new electric locomotives built by the company will probably be utilized in this service.

DISTANCES, FARES AND TICKETS.

From Albany, Watervliet, Troy and Cohoes to Waterford (via lines of United Traction Co.), distance Albany to Waterford, 12 miles; running time, 60 minutes; fare, 15 cents.

Waterford to Fort Edward, distance 36 miles; running time, 1 hour and 50 minutes; fare, 75 cents.

Fort Edward to Glens Falls, distance 7 miles; running time, 35 minutes; fare, 12 cents.

Glens Falls to Warrensburg, distance 16 miles; running time, 60 minutes; fare, 25 cents.

Through tickets are sold Albany to Glens Falls, for \$1; round trip, \$1.90. The total distance is a trifle over 70 miles, and the running time about 5 hours.

The Saratoga branch from Mechanicville to Saratoga Lake is 18 miles long. The fare between these terminals is 50 cents, and the running time 55 minutes.

The Greenwich branch is 6 1/2 miles long. The fare from the main line to Greenwich is 10 cents and the running time 25 minutes.

In the general interests of its patrons the company makes a number of combination rates of fare to suit different classes of riders.

In caring for the ordinary transient passengers riding from any town to any other on the route and paying fare to the conductor in accordance with the established tariff, the company employs the form of ticket reproduced here. The ticket is on the duplex system and after punching the name of the station from which and to which the passenger is going, the total fare collected, and the direction, the conductor tears the two halves of the ticket apart,

Book No.	Ticket No.	AM'T FARE PAID	AM'T FARE PAID	Ticket No.	Book No.
177	8892			8892	177
HUDSON VALLEY RAILWAY COMPANY. CONDUCTOR'S CHECK. NOT GOOD FOR PASSENGER. This half of duplex ticket is of NO VALUE except in conductor's office who must return it to the Accounting Department with this trip report. CHAS. T. ANDES, Gen. Pass. Agent.		5	5	5	5
		10	10	10	10
		15	15	15	15
		20	20	20	20
		25	25	25	25
		30	30	30	30
		35	35	35	35
		40	40	40	40
		45	45	45	45
		50	50	50	50
		55	55	55	55
		60	60	60	60
		65	65	65	65
		70	70	70	70
		75	75	75	75
		80	80	80	80
		85	85	85	85
		90	90	90	90
		95	95	95	95
		1.00	1.00	1.00	1.00
SOUTH | NORTH		NORTH | SOUTH			

DUPLIX TICKET.

To all the company's recreation points special rates are offered to Sunday schools, labor organizations, fire companies, and all organized bodies able to guarantee a reasonable number of attendants. This traffic is especially sought. First-class musical concerts, comic opera, or object vaudeville performances are provided at all the parks and special events are prepared in connection with

NEW ORLEANS STRIKE AVERTED.

In June, 1901, the employes of the four street railway companies operating in New Orleans made a request for higher wages and shorter working hours. In response to this request the wages of conductors and motormen were raised from 13 to 18 cents per hour and the day's work was shortened to ten hours of platform work. These concessions were brought about largely through the efforts of Mayor Capdevielle and the agreement was accepted by the men as absolutely satisfactory. For some time past, however, there has been considerable agitation among the street railway employes for further concessions from the company. A union was formed among the men and W. D. Mahon, president of the Amalgamated Association of Street Railway Employes of America, came to New Orleans at the request of the union and a number of meetings were held at which demands were formulated to be presented to the street railway companies. Before these demands had been presented the officers of the four street railway companies addressed a joint letter to Mayor Capdevielle in regard to the subject as follows:

"Dear Sir—As you exhibited your care for the public welfare last year by lending your kind and able assistance to the settlement of a pending controversy between the undersigned street railway companies and their employes, we take the liberty of addressing you this communication, because we are informed by the public prints that a nonresident, not in any way connected with this city, or interested in its peace, comfort and well being, is now here conferring with our employes and organizing them for the purpose of formulating and presenting, in the near future, demands upon us, the central and principal one of which is that these companies shall recognize a labor union composed of these employes.

"We understand that what is meant by the term 'recognition of the union,' which this nonresident is formulating for presentation to us is:

"1. That we shall not have the right to employ, and that we shall not employ in our service any person who is not a member of such union in good standing.

"2. That we shall not have the right to discharge and shall not discharge any employe without the consent of said union.

"We are further informed that an all-night meeting of our employes will be held this very night, under the leadership and auspices of this nonresident to agree upon the demands to be presented to us.

"If we are right in our understanding that the principal point to be presented to us is 'recognition of the union,' and that this recognition means what we have stated above, then we feel compelled to make to you, and through you to the public and to our employes, the announcement that, under no circumstances whatever and under no pressure or persuasion, will we accede to this demand. We cannot and will not consent to surrender control of properties like these, affected with a public interest, standing in such vital relations to the business, the safety, the comfort, the health and the happiness of the community, representing such large investments of capital and contributing such large sums to the support of the public functions of this municipality, into the hands of our employes, among whom discipline is necessary and over whom discipline can never be enforced under such circumstances.

"In our judgment the granting of any such demand would impair our ownership, cripple our control, and ultimately result in the destruction of our properties and the grievous injury of the public.

"If our employes have any grievance as to hours, wages or rules, we individually and collectively stand ready at all times to confer with them, to discuss and adjust amicably and fairly all differences thereto pertaining, and in proper cases to submit our differences to arbitration.

"We feel confident, Mr. Mayor, that if any struggle is to come over these matters, we shall have your support and countenance, and the good will and backing of the community at large."

On March 19th a mass meeting of the union employes of the various roads was held at which the men decided on the demands to be made upon the company. This demand included recognition of the union, shorter working days and higher wages. The following resolutions were adopted by the men at this meeting:

Section 1. The workday for motormen and conductors shall be nine hours, to be completed made of eleven consecutive hours, with the single exception of swing and tripper runs, swing and tripper runs to be completed inside of fourteen consecutive hours, and no run to work over seven hours without a relief for meals.

Sec. 2. The wages for all motormen and conductors to be twenty cents per hour.

Sec. 3. Where men are laid off to look up evidence in the case of accidents, and so on, they shall be paid the same rate of pay they would receive had they been operating their cars.

Sec. 4. All employes to be promoted to the best runs in accordance with their continuous age in the service of the company.

Sec. 5. This section included the rules and penalties in regard to the men missing their cars.

Sec. 6. All motormen and conductors are to be members in good standing of this association. This section to in no way interfere with the company in their selecting or hiring employes, the rule to be that where the company employs new men, these men shall work sixty days, and if at the end of that period they are satisfactory to the company, they then shall become members of the association. Any motorman or conductor at the present time in the employment of the company, and not a member of the association, shall become a member within the next sixty days from the date of this agreement.

Sec. 7. All business arising between the parties hereunto shall be transacted through the properly accredited officers of the company and the properly accredited committees of the association, with the exception of the cases or complaints that might arise over conductors who have been discharged for missing or other irregularities in the collection of fares. It being understood that the committee to treat with this company shall be selected from the regular employes of the company.

Sec. 8. For the purpose of hearing and deciding any contention that might arise over the discharge of conductors for missing or other irregularities in the collection of fares, there shall be selected a committee of two members of the association, the members of this committee to be mutually agreed upon by the officers of the company and the accredited committee of the association. It shall be the duty of this committee to investigate any case of this kind that may arise. They shall treat confidentially all information and evidence that is submitted to them, and they shall have full power to decide these cases without any further consideration on the part of the organization. This committee is to be selected and to serve the same period that the other officers of the association serve, vacancies to be filled as heretofore prescribed.

Sec. 9 fixed the wages of pitmen, helpers and washers and prescribed the hours of work and the pay for overtime.

Sec. 10 related to the settlement of disputes between the men and the companies by a board of arbitration.

As was to be expected the companies refused to treat with the union, and on this point the companies were all in accord. The following letter, which was signed by the presidents of all the street railway companies, was sent in answer to the demands of the Amalgamated Association:

"Gentlemen—We have received, from persons stating themselves to be your subcommittee, a 'memorandum of agreement' which you propose shall be entered into between your association and the street railway companies of this city.

"This suggested contract provides that the railway companies, among other things, are to obligate themselves to retain in their service no motormen or conductors not members in good standing of the association, and that all business arising between the parties to said contract shall be transacted through the properly accredited officers of the companies and of the association, with the exception that conductors discharged for dishonesty shall have their 'contention' tried and decided by a committee to be composed of two members of the association.

"And this suggested contract provides that these, among other obligations, are to be assumed by the street railway companies in consideration of the association 'continuing the operation of the said (companies') street railways for one year from the first day of April, 1902.'

"That is to say, your association proposes not only to interpose itself in all matters of management between these companies and their employes; to restrict them in their right to employ men outside of that association, or to discharge a conductor, even if convicted of embezzling fares, but it arrogates to itself the power to continue, or inferentially, to discontinue the operation of these railways.

"These pretensions are an insult to these companies and to this community, and your association, in making them, openly proclaims itself an enemy alike to private and to public rights.

"We decline, therefore, to recognize your association and to discuss with it the affairs of these companies, or the relations existing between them and their employes."

This refusal on the part of the companies to treat with the Amalgamated Association created considerable excitement among the men and a number of meetings were held not only by this union, but by a number of other trade and labor unions of the city, at which resolutions were passed promising moral and financial assistance to street railway men in case of the strike which threatened.

March 25th a modified form of the demands already mentioned was adopted by the men and submitted to the company. These were however, essentially the same as the previous demands and were unanimously rejected by the officers of the street railway companies. The relations between the employes and the companies had become greatly strained but Mr. Mahon, who was the leading spirit in the negotiations apparently became convinced that a strike at this time would prove disastrous to the men, as Mayor Capdevielle and public opinion were opposed to the demands of the men. Instead of a proposition to strike therefore, Mr. Mahon submitted a proposition to the vote of the men which had been arranged at a conference with Mayor Capdevielle. This agreement provided for the continuance of the arrangements under which the men had been at work. It was voted upon by the members of the union March 27th, and while the more radical of the men were eager to precipitate a strike, the conservative element prevailed at the election and the proposition of Mayor Capdevielle was carried by a very large majority of the votes.

The agreement which the mayor submitted and to which the companies agreed in a written communication was as follows:

"Should the present demands of the men be withdrawn or not insisted upon, we do not hesitate to give you our assurance that:

"1. We are willing to sign with our employes a renewal of the agreement of last June for one year from date.

"2. We are willing to discuss with the pitmen, carhelpers, etc., the question of their wages whenever they themselves approach us regarding same.

"3. If not already provided, we will provide sufficient and proper accommodations for the use of our men.

"4. We will so adjust matters as to allow our men sufficient stand time to make use of the accommodations provided in paragraph 3.

"5. The rules for missing to be: When a man misses his car, for the first offense he shall serve three days on the extra list; should he miss his car a second time in thirty days, he shall serve five days on the extra list; and for missing his car the third time inside of thirty days, he shall lose his run and be placed at the bottom of the extra list. Men missing their cars shall report in time for the next relief. Should a man miss any relief while serving on the extra list, an additional day to be added for each miss."

CLEVELAND THREE-CENT FARE ROADS.

The organization of the Peoples Railway Co., of Cleveland, to build 3-cent fare roads in that city was mentioned in the "Review" for March, 1902. At that time Mr. Hoefgen, one of the principal promoters of the new lines, had secured an injunction against the Cleveland City Railway Co., preventing it from interfering with the efforts of the new company to secure the consents of the property owners. March 20th the circuit court dissolved this injunction after the city council had granted franchises to the new company. The Cleveland Recorder states that Mr. Hoefgen will begin operations on the building of the 3-cent fare lines just as soon as the ordinance becomes operative, and that it will be but a few months until the roads will be completed and running. The lines are to be built where there is need of railway facilities and the company will be able to secure considerable business even in case the existing lines in the city should reduce the fares to the same figures.

April 7th an interlocutory injunction restraining Mr. Hoefgen and his associates from proceeding with the work was granted, it being alleged in the bill that the ordinances were illegal. The hearing on the merits of the case was set for April 14th.

The first passenger train was run over the new third-rail system on the Third Ave. Elevated road, New York, March 23d. Fifteen or 20 trains of the new type will be put in commission in April.

THE CHICAGO STREET RAILWAYS.

At the meeting of the Chicago City Council March 18th, a resolution was unanimously passed requesting the traction companies of Chicago to present by June 15th proposals for renewals of their franchises. The preamble stated that as important street railway franchises are to expire within 18 months the discussion of the terms of their renewal at the last moment would put the city at a disadvantage, as the terms of the new ordinances could not be satisfactorily discussed without perhaps a temporary cessation of transportation facilities. The resolution concluded that even in the event of the failure or refusal of the old companies to begin such negotiations by June 15th the city, through an appropriate committee, should ask for bids from outside parties.

It was announced that the Union Traction Co. was preparing to meet the terms of this resolution and is engaged in preparing a proposition to submit to the council on the date specified. Counsel for the company stated that the cost of carrying out the improvements discussed by the directors of the company will approximate \$20,000,000 and the company is prepared to spend this amount if a long term franchise is granted.

The debate on the report of the committee of transportation in the city council in regard to the proper form of franchise extension ordinance has been postponed until the new aldermen elected April 1st shall have taken their seats.

Immediately after the city election, which showed a majority of some 125,000 votes in favor of municipal ownership, the mayor asserted that he would veto any franchise extension ordinances passed before the legislature passes municipal laws for the city. As the legislature does not assemble until next winter it is thought that the mayor will probably postpone the consideration of the traction franchise question until next year. The City Council, however, has gone on record demanding that the traction companies present propositions for new franchises by April 15th.

In the "Review" for November, 1901, page 830, we noted the decision of the Illinois Supreme Court in the mandamus proceeding brought by the Chicago Teachers' Federation to compel the State Board of Equalization to increase the assessment for 1900 of 23 corporations doing business in Chicago, including 20 street railway, 1 telephone and 2 lighting companies. In accordance with this ruling the Board reassessed these properties fixing the value as stock market value of the capital and indebtedness of the several companies on Apr. 1, 1900.

The companies interested filed a bill in the United States Circuit Court praying an injunction to prevent the collection of taxes based on the reassessment, and this court rendered its decision April 4th.

In its decision the court said in part after comparing the assessment of seven companies for 1900, which was about 42 million dollars, and for 1901, which was about 26 million dollars: "These assessments, widely divergent, were upon the same properties, substantially by the same board, entered almost on the same day.

"In the very nature of things one or the other has been made up under some species of mistake, fraud, or coercion, and a few pregnant circumstances convince us that whatever may be said of the assessment for 1901, the reassessment for 1900 cannot be accepted as the independent judgment of the state board. One of those circumstances is this: The reassessment of each of the complainant corporations for 1900 is a close approximation to the aggregate of its indebtedness and its stock value as measured by the stock market quotations for April 1, 1900. The board seems to have adopted as its own standard in the making of these reassessments the Stock Exchange records for that one day of the 365, and to have restricted its function to the mere arithmetic of adding up the figures of that day's record.

"It goes far towards convincing us that the objective of the board was not the real value of the properties as entireties, but simply what the stock market for one day indicated such value to have been.

"What was the real value in fact of the property reassessed? To arrive at such value we have looked into the earnings of the several companies for the year 1900. An annual reduction equal to 6 per cent of the current value of cars, tracks and machinery has been allowed.

"Several other elements in a fair calculation, beside the net earnings, have raised questions to which we have given careful consideration. The first of these is upon what rate of true net earnings the

aggregate value of the property should be capitalized? We have fixed the rate at 6 per cent. It is less than the rate that some advanced advocates of municipal ownership are willing to guarantee to investors upon any securities of this character. The rate as adopted is, we think, justified by the consideration that usually attend a real investor's purchase of stock.

Uniformity Over the State.

"Another element entering into the calculation is this: Should the capitalization thus arrived at be equalized to the assessment on the other property of the state? The record before us convinces us that the assessment on other property throughout the state, including railroads, for the year 1900, as finally equalized by the State Board of Equalization, did not exceed 70 per cent of the cash value, and that such standard was not adopted by the state board unintentionally or through inadvertance, but deliberately as a means of arriving at an equalization of taxable values generally throughout the state.

"In our opinion uniformity is still the statutory policy of the state in the laying of taxes with respect to franchise corporations as well as other property; accordingly it was imperative that before the reassessments for 1900 were entered there should have been such deductions as would have equalized the valuation adopted with the valuation placed upon the other properties of the state.

Must Pay to Get Benefit.

"Before an injunction issues we shall require the payment to the proper officers by the complainants of the taxes of the year 1900 according to the following rule: The basis shall be the true net earnings of the several complainants for the year covering April 1, 1900, proper allowances being made for depreciation and replacement, but not for extensions, and reduced further by the amount of additional taxes that the enforcement of this rule produces. Upon this basis the value of complainants' capital stock, including franchises and tangible property, shall be capitalized at a rate of 6 per cent, this equalized by reduction of 30 per cent, and then divided by five. The sums thus produced will be regarded as the true assessments for the year 1900. Upon this the taxes will be extended at the true rate for 1900 exclusive of interest and penalties not to exceed 8.37 per cent, from which will be subtracted the taxes already paid, and the balance will be the sum required. We allow 30 penalties, for the reason that the reassessments complained of are in our judgment void."

As a guide to the masters the judges gave estimates of the decrease their rule would make in the valuations of the capital stock of the seven companies parties to the suit, the figures being:

Company.	State board value.	Court value.	Decrease.
Union Traction	\$14,013,000	\$7,763,000	\$6,250,000
Consolidated Traction	3,821,000	621,000	3,200,000
People's Gas	12,631,000	8,501,000	4,130,000
City railway	6,023,000	4,015,000	2,108,000
Telephone	2,600,000	1,850,000	750,000
Edison	2,400,000	1,800,000	600,000
Totals	\$41,488,000	\$24,550,000	\$17,038,000

CHICAGO FRANCHISE TAXES HELD VALID.

A decision was rendered March 28th in the case of the city of Chicago against the Union and Consolidated Traction companies which upholds the levy made by the Illinois State Board of Equalization for 1901 on the capital stock and franchises of these two companies. The decision holds that these taxes are not only valid but the amount, \$350,000, must be paid in cash to the county treasurer.

The traction companies allege that the State Board of Equalization had not the right to levy taxes against them to be used for local purposes only, but the Circuit Court holds that the state legislature had the right to delegate to a state taxing body the power to levy taxes to be used for local purposes, provided such taxes were levied in a uniform manner and according to law. The companies will appeal the case, and according to the decision, if they pay the tax they can recover by suit if the reviewing court reverse the present decision.

Another decision of interest was that rendered March 19th in the case of the city against the Union Traction Co. and the Consolidated Traction Co., which compels each of these companies to recognize transfers from the other company. It was claimed that the

two corporations were separate and therefore could not be compelled to issue transfers to each other's lines. The decision, however, states that both corporations are in charge of Mr. J. M. Roach and that since the operating agreement between the two roads went into effect in 1890, the two companies have been practically one. The final decision was that upon lines owned by practically one company one fare must prevail. This means that the citizens of Austin and the northwest suburbs will be carried into the business center of Chicago for a 5-cent fare if the decision is sustained by the supreme court to which it was appealed. The ordinance passed by the city council in 1897 requiring 5-cent fares to all points within the city limits was also declared valid.

ELECTROLYSIS CASE AT DAYTON, O.

The case of the city of Dayton, O., against the City Railway Co. was decided in the Court of Common Pleas on Apr. 5, 1902, the summary of the findings being as follows:

"This court has no authority in law to compel a change in the system from the single trolley to the double trolley, and, if the same was warranted by the law, the facts would not justify such a change.

"The defendant has been, and is, operating its road in a negligent manner, causing continual damage to the water pipes of the plaintiff, for which the plaintiff has no adequate remedy at law, and cannot by any practical method prevent such damage.

"It is no excuse in law, and the facts would not justify the defense that other electric lines in Dayton are contributing to this or doing like damage.

"It is therefore the duty of the court to enjoin the defendant from so operating its railway and to compel it, within a reasonable time, to introduce such improvements in the system, in order that the operation of the single trolley system authorized by the franchise and contract, will be in accordance with the present standard of the art of operating single trolley roads. The plaintiff shall co-operate to that end.

"All matters of detail can be arranged between counsel and the court in the final order.

"The costs will be adjudged against the defendant."

ELECTRIC LINE FOR LAKE COUNTY, ILL.

Messrs. R. D. Wynn, David T. Webb and John M. Gray, of Waukegan, Ill., have secured franchises for an entrance into Waukegan and options on private rights of way from Waukegan to the Fox Lake region that give them the key to what should be a profitable electric interurban line in Lake County, Ill. There are in Lake County, which lies just north of Cook County, over fifty lakes, the greater number being in the northern part of the county.

The route chosen by Mr. Wynn and his associates is the most advantageous one that could be chosen through this territory; the proposed 25-mile line from Waukegan to Adrian, via Gurnee, Milburn, Lake Villa and Antioch reaches 17 of the lakes direct and as many more are easily accessible by buses. At the present time there are hundreds of hacks and buses which regularly meet trains to serve this lake region during the summer season.

Waukegan is connected with Chicago by the Chicago & Milwaukee Electric Ry. and the Chicago & Northwestern Ry., and is the first harbor out from Chicago on the west shore of Lake Michigan. The winter populations of the towns in the region are small, but the country is well settled and in summer the town populations are doubled and a large number of people resort to the Fox Lake district, Lake Villa and Grays Lake; the last named it is intended to reach by a 3-mile branch line. A conservative estimate places the summer "lake population" at 70,000.

While the Waukegan franchise secured by the promoters gives them until Nov. 1, 1903, to commence building and the options on the rights of way are for the same term, it is Mr. Wynn's intention to push the construction this season as soon as he can arrange for the capital needed.

The Burlington (Ia.) Railway & Light Co. has granted a liberal increase in wages to conductors and motormen in its employ, the new scale being as follows: 12½ cents per hour for a 12-hour day for the first six months of service; \$1.65 per day after the first six months, and \$1.80 per day after the first year.

PROTECTION FOR SINGLE TRACK CITY ROADS.

The task of finding a signal system for properly protecting single track electric roads has proved to be difficult in the extreme, although committees appointed by the American Street Railway Association, by the New York and other state associations, and by individual companies have spent much time, money and effort in endeavoring to find a system that would be reliable under all conditions.

The problem is one that confronts not only the builders of new interurban lines, but also forces itself upon the owners of city systems built in the earlier days of the art. In fact, difficulties not encountered on straight-away interurban roads are introduced by the complicated nature of many of the smaller city systems, including as they usually do several single track lines converging at some prominent center, with irregularly spaced sections of double track combined with long stretches of single track and with switches not always placed to the best advantage.

Mr. John Daly, the superintendent of the Yonkers (N. Y.) Railroad Co., has devised two or three ingenious schemes for affording protection at several of the more complicated points on the system in his charge. The Yonkers company is now controlled by the Metropolitan Street Railway Co., of New York, through the latter's lease of the Union Railway Co., which some time ago purchased control of the Yonkers Railroad Co., but the Yonkers road is still operated practically as an independent system. The company has 25 miles of track and about 32 cars. The road is a typical small city line with double tracks on a few of the main streets, and single track branches reaching out to several nearby points of local attraction. One line runs to Hastings, which is six or eight miles to the north; one out Park Ave., for five or six miles through a residential section, and one runs to Mount Vernon, about four miles to the west. These and other lines converge on the main streets, and all of them run on different schedules which have to be frequently changed upon short notice to accommodate extra heavy travel on holidays and evenings. The situation is further complicated by a large number of excessive grades and sharp curves on all of the outlying lines and also upon several of the business streets.

Mr. Daly has taken the individual lines separately, and also the two or three points in the city where the congestion and delay has been the most annoying, and has endeavored to find a solution for each particular situation, as it was feared no one system or regulations could be found to cover the requirements for all the lines. In proof of the efficacy of the rules adopted it might be stated that prior to their enforcement about seven months ago, the company was having a serious head-on collision at least once a month,

YONKERS R. R. COMPANY.

First Car to Receive Instructions.

OUT.

Leave Depot at 6:30 P. M. on 4 car time

2nd trip out meet at Getty Square, Ashburton and Lake Avenue, then to end of line.

IN.

On 4 car time and lays at Depot until 7:15.

2nd trip in meet at Club House, Ashburton Avenue, and go to Depot.

After that on 3 car time.

INSTRUCTION CARD FOR MOTORMAN.

to say nothing of vexing delays and congestion. During the past seven months not a single collision has taken place.

One of the serious difficulties on the single track lines was the necessity of changing the schedule every morning and evening. For instance, the line to Mount Vernon for several hours of the day is run on what is called 4-car time; that is, four cars fill the line between Yonkers and Mount Vernon, there being always two going in either direction. As the traffic increases during the rush hours in the evening, the schedule is changed to 6-car time, and sometimes to 8-car time. Of course, this changes all the meeting

points en route, and introduces a much to be dreaded opportunity for the motormen to forget what schedule they are operating under, and so "run" their switch. Similar conditions are found to a large degree on the Park Ave. line, where the schedule changes from 3-car to 4-car time.

As the New York railroad commissioners have always looked with more or less disfavor on automatic mechanical safety signaling devices, Mr. Daly concluded to do away with mechanical expedients as far as possible, and rely solely on the responsibility of his car crews. To this end, the utmost care is taken in the selec-



SIGNAL BOX—YONKERS RAILROAD CO.

tion and training of the conductors and motormen, and inasmuch as the number of men required is not excessive, the superintendent is able to give his personal attention to this matter. He selects only the best men and then takes care that their instructions shall be in such form as to leave no excuse whatsoever for neglect of duty. The regulations on the Park Ave. line will illustrate this point.

During the regular 3-car schedule for the most part of the day there is very little difficulty, as the men become thoroughly familiar with the 3-car passing points. In the late afternoon when the extra car is put on, the first motorman out under the 4-car schedule is handed a little cardboard folder, about $4\frac{1}{2}$ in. wide by $4\frac{1}{4}$ in. high, folded down the center so that it will slip into his vest pocket. This notifies him of the increased schedule and gives him full instructions. The inside of the folder is illustrated herewith. Likewise the motorman on the second car starting out on the changed schedule is handed a similar folder with his passing points clearly stated, and so on with the third and fourth cars. The men are required to read these instructions each day and to keep them about their persons for instant reference if any doubt arises as to the proper meeting point. As soon as the running time is changed again the cards are collected by the dispatcher as each crew comes in.

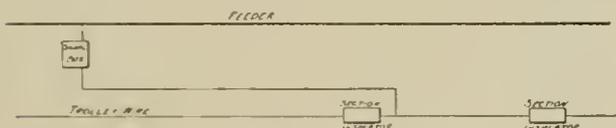
As an additional check each motorman as he starts, hangs up a small number under the hood over his platform. The number is painted in white on a small metal disk and serves the purpose of identification for the crews of passing cars. The numbers for this line are 1, 2, 3 and 4, each crew keeping the same number for the day's run. The car starting out first in the morning takes No. 1, the second No. 2 and the third No. 3, No. 4 being reserved for the extra car that goes on during the rush hours. This scheme of hanging up the numbers has been instrumental in preventing one or two accidents at least, as it enables every employe of the company who may see the number to check the car and determine whether or not it is at its proper place on the line.

In the case of non-arrival of an opposing car the crews are instructed to wait at the switch for five minutes, and then to proceed cautiously, ringing the bell and flagging around curves.

Another expedient is in force to prevent accidents and delays at the entrance to a long loop running around several city blocks in

the business district. Two or three lines of cars use this loop and congestion was caused through the inability of the motormen to tell after they had run around the loop whether or not the single track at the entrance was clear for them to proceed on their outward trips. The running times were such that certain cars should reach the entrance and pass into the loop at just about the time that opposing cars were scheduled to pass out of the loop at the same point. To avoid misunderstanding at this place, a small wooden box was hung on a pole at the point where the cars turn off to run around the loop. This box has a small compartment for each separate line using the track, and is fitted with a glass door. In the bottom of each compartment are several numbered metal disks corresponding to the numbers carried on the cars. When a car enters the loop the conductor jumps off and places the disk bearing his car's number in an upright position so that it will be visible through the glass door. The motorman of the car coming in the opposite direction can thus tell at a glance what cars have entered the loop and whether the track is clear for him to proceed on his outward run. Of course each conductor after completing the run around the business district turns the number down in the box as he passes the point on his outward trip.

The only mechanical signal on the Yonkers system is one on a principal street where a very severe grade combined with a sharp compound curve prevents motormen from seeing but a few feet



WIRING FOR SIGNAL BOX.

ahead. At the foot of the hill is a complicated set of crossings and switches and it is desirable to have but one car on the section at a time. A tell-tale signal was therefore arranged to indicate at one end of the section whether or not a car had entered the section from the other end. The section in question is about 1,000 ft. long. The diagram and half tone engraving will give an idea of the device which is very simple. A section of the trolley wire about 400 ft. long was insulated by section insulators and the current for this stretch of 400 ft. is taken by means of an auxiliary wire through a signal apparatus placed at the other end of the 1,000 ft. section. The signal apparatus is housed in a wooden box hung on a pole and consists of a solenoid which when actuated moves a semaphore arm. It will be evident that current will flow through the coil only as long as there is a car on the insulated section. The fact that the insulated section of trolley wire is only 400 ft. long is explained by the statement that a car on this stretch is obstructed from view by the sharp curve and as soon as it has passed through this 400 ft. it is visible from the top of the hill and the signal is not needed.

ANTI-SMOKE LAW IN WASHINGTON, D. C.

A determined effort is being made in Washington to enforce the anti-smoke law at the various factories and warehouses in that city, and the first of 35 suits against Mr. L. L. Sinclair, general manager and superintendent of the Washington Traction & Electric Co., for violating this law was tried last month. The suit relates to the alleged omissions of dense black smoke from the stack of the United States Electric Lighting Co's. plant, and the case is being vigorously contested. It is claimed by the company that full compliance with the anti smoke law is a physical impossibility, and it is said that in case a verdict is rendered against the company in any of the pending suits the higher court will be resorted to.

The Union Electric Co., which operates the street railway and electric plant at Dubuque, Ia., will build a car house 108x250 ft

The local street railway system in Logansport, Ind., has been sold by George J. Marott to the Wabash River Traction Co. for a price which is reported to approximate \$150,000. The Wabash company now operates 18 miles of railways between Wabash and Peru and projects a 14-mile line from Wabash to Logansport. D. A. Blakeslee, 28 Waverly Place, New Haven, Conn., is president of the Wabash company.

CONSOLIDATION IN PENNSYLVANIA.

Negotiations for the merger of the Pittsburg, McKeesport & Connellsville Ry., and the Pittsburg, McKeesport & Greensburg Ry., are stated to have been closed, and arrangements for operating the lines by the new interests were expected to be completed about April 1st. The company running through Connellsville is building its line through the coke region at this point with Mansontown as its objective point. A number of branch lines are to be built to run through important towns in the counties through which this road operates.

To furnish power for this system a large plant is to be built at New Haven, directly across the river from Connellsville. The company running to Greensburg is building a line from that place to Irwin with an extension recently opened to Youngwood. This company has also secured franchises for two extensions west from Lima. One is via North Irwin to East Pittsburg and the other is to McKeesport via Jacksonville and Stuartsville. The extension to McKeesport is to be built at once. In addition to these traction interests the new consolidation also includes the purchase of the Westmoreland Light & Power Co., which operates several electric lighting plants. The consolidation represents a total capitalization of nearly \$5,000,000.

THE RHODE ISLAND LEGISLATURE.

In the closing days of its last session the Rhode Island Legislature passed three important bills affecting the electric roads of the state.

One known as the "Merger Bill" makes possible a consolidation of the street railway interests controlled by the United Traction & Electric Co., of Providence, with the Providence Gas Co. and the Narragansett Electric Lighting Co. It is said that all these properties will be taken over by a new company incorporated as the Rhode Island Co.

Another bill provides for a universal transfer system among the roads operating in Providence.

A third bill provides that a day's work for all conductors and motormen in the state shall not exceed ten hours' work, to be performed within 12 consecutive hours.

PROPOSED BOSTON-PROVIDENCE INTER-URBAN.

A plan is being promoted to furnish a through line of electric cars from Providence to Boston in which five or six different companies are interested. It is thought by the promoters that all the street car companies between these two points will derive considerable benefits by inaugurating a through system. The lines of the Boston Elevated extend through Hyde Park and a continuous line extends through Providence and Attleborough. It is proposed to build a connecting link between Attleboro and Hyde Park by means of which cars from Providence to Boston can make a through trip in about three hours. The fare will be about 60 cents, which is 40 cents less than the regular fare on steam roads. The length of the through electric road will be about 45 miles. It is thought that through electric cars will be run over this route without change within a short time.

NORTH JERSEY STREET RAILWAY EXTENSION.

The North Jersey Street Railway Co. has formulated plans for building a belt line 17 miles in length to run between Jersey City, Greenville and Bayonne. The new line will connect the Pennsylvania Ferry at Jersey City with Bergen Point and Bayonne. The company's engineers have made the surveys and mapped out the line to be followed. The only requirement now necessary is to secure franchises which it is expected will be readily granted as the improvements would be of great benefit to the section covered by the contemplated road. The property owners are joining heartily in the plan, as the trolley line is needed to develop the section west of Greenville which has not improved as rapidly as that on the east side because of the trolley line already there.

JACOB LOWMAN GREATSINGER.

One hears so much nowadays about the potent influence exerted by the electric railway upon the lives, habits, customs and conditions of the people that the expression has become hackneyed and fails to make the impression it once did. But in speaking of the transportation conditions of the city of Brooklyn it becomes a necessity to repeat the statement and with emphasis.

It may be said without fear of contradiction that the future growth of Brooklyn depends solely upon the facilities for crossing the East River. If these accommodations are enlarged to meet the requirements of the city's progress, real estate values will advance, new property will become available and more people will go to Brooklyn not only to live but to build factories and transact business.

The Brooklyn Rapid Transit Co. from the nature of its franchise holdings controls, with the exception of a single steam road doing business on Long Island, every avenue of approach to all the present facilities in operation for carrying passengers from Brooklyn to Manhattan, and the situation is such that it must necessarily control the travel to any other facilities that may be offered in the future for crossing the river, in the form of new bridges, tunnels other than private enterprises, or additional ferry routes. It will be seen therefore to what degree the welfare of the city has been entrusted to this company.

The man who directs the policies of the Brooklyn Rapid Transit Co. and the constituent companies which it controls, is Mr. J. L. Greatsinger, who was elected its president on March 20, 1901. And he it said that no man appreciates better the responsibilities that go with this office.

Under the skillful and able management of Mr. Greatsinger the Brooklyn Rapid Transit Co.—notwithstanding ill-informed and prejudiced newspaper criticism to the contrary—is doing everything possible to meet the requirements put upon it. In fact it is probably doing more for its patrons than any other road in the United States. For instance by operating the tramways of the Brooklyn Bridge at an annual expense of nearly \$700,000, it is saving the people of Brooklyn \$2,500,000 every year by carrying free 100,000,000 passengers over the bridge who otherwise would have to pay at least 2½ cents each or walk. Moreover the saving in time is in itself important inasmuch as the company now lands its passengers in the central portions of both Brooklyn and Manhattan, where they are in direct touch with radiating lines to all city and suburban portions of the metropolitan district. These very concessions in the interests of the people are largely responsible for the present congestion and thus we have the anomaly of the company bearing harsh criticism for conditions brought about by its own efforts to meet the demands for better and cheaper transit.

In transfer regulations the management has almost gone to excess in its liberality. There are several possible continuous rides of over 12 miles in one direction for a single fare, and by taking transfers a passenger may ride 24 miles in the same general direction. As a matter of fact a person could ride all day for 5 cents if he so desired. Taking the number of transfers issued the company computes that the fare of each person is brought down to practically 3.56 cents per ride.

Since Mr. Greatsinger assumed the presidency arrangements have been made and are in process of execution for securing additional equipment, new tracks, and more available motive power. The number of closed cars has been increased 50 per cent, and the number of open cars 25 per cent, the design of the new rolling stock providing increased passenger capacity per car as well. A new combined alternating and direct current power house is nearing completion and will soon enable the company to make needed increases in car mileage and improve the service on certain lines hitherto hampered by insufficient supply of power.

Mr. Greatsinger was born July 1, 1849, in Elmira, N. Y. His father, John S. Greatsinger, was a New York farmer of German and Scotch parentage. His mother, Aurelia C. Greatsinger, is a Pennsylvanian of Irish parentage. Both parents are still living in Chemung County, N. Y.

Jacob Lowman Greatsinger received his first education in the district schools of Chemung County, and later attended the Elmira free academy. While attending school in Elmira he was employed as clerk in a hardware store. He was afterwards in the Bank of Chemung for a short time. Later he entered the wholesale and

retail coal business in Elmira. The desire for railroad work was evidenced while engaged in the coal and agricultural implement business and he frequently took a hand at firing the 6-ft gage Erie R. R. switch engine in his coal yard. He subsequently sold his interests in the coal and agricultural implement business and secured a position with the Utica, Ithaca & Elmira R. R. as fireman. He subsequently became machinist, station agent, roadmaster, locomotive engineer, train dispatcher, master mechanic and superintendent in quick succession. The road expanded and when he severed his connection with it in 1886 it comprised five lines, including the Elmira, Cortland & Northern R. R., all of which have since been merged with the Lehigh Valley System.

In 1886 Mr. Greatsinger left New York State and entered the employ of the Chicago & Eastern Illinois R. R. as master mechanic with headquarters at Brazil, Ind., and later at Danville, Ill. In 1888 he was transferred to the Duluth & Iron Range Railroad Co. in Minnesota as master mechanic. In 1890 he was appointed general superintendent, and in 1891 he was elected president and general manager of the Duluth & Iron Range Railroad Co. On Mar. 20, 1901, he was elected president of the Brooklyn Rapid Transit Co., the Brooklyn Heights Railroad Co. and constituent companies.

Under Mr. Greatsinger the Duluth & Iron Range road was one of the first railroads in the country to introduce heavy locomotives and 70-ton cars. In point of number of trains per mile and tonnage moved the road ranks high among western steam railroads.

In the matter of considerate and fair treatment of employes Mr. Greatsinger has always taken a decided stand. He early recognized the value of the Railroad Young Men's Christian Association work among railroad men and encouraged the formation of branch associations among the men on his road. He provided rooms for this purpose properly equipped for the comfort and entertainment of members, including reading, reception, smoking and class rooms, baths, locker boxes for the men's clothing, bowling alleys, billiards and other games, gymnasiums, etc. As stated elsewhere in this issue he is carrying out the same idea among the employes of the Brooklyn Rapid Transit Co., with mutual insurance and benefit funds added.

During his career in the west as a railroad man Mr. Greatsinger has also been president of the Minnesota Iron Co. and its constituent companies, a director of the First National Bank of Duluth, and president of the Kitchi-Gammi Club.

In 1872 Mr. Greatsinger married Catherine F. Dailey, who died in 1882. He has one daughter, Edna, who married Dr. P. J. H. Farrell and now resides in Chicago.

Upon leaving the Duluth & Iron Range R. R., as attesting Mr. Greatsinger's popularity with his employes, a souvenir photograph album containing about 500 photographs of his employes, which includes office clerks, engineers, firemen, brakemen, train dispatchers, switchmen and others, has been presented him, together with framed resolutions from the Brotherhoods of Locomotive Engineers, Firemen and Conductors. He has also been the recipient of other testimonials.

Mr. Greatsinger is affiliated with the Kitchi Gammi Club of Duluth, the Minnesota Club of St. Paul, the Chicago Club of Chicago, the Brooklyn, Hamilton, Marine and Field, Crescent, Montauk, and Riding and Driving Clubs of Brooklyn, and the Metropolitan Club of New York City, besides numerous railroad, engineering and mechanical associations.

YERKES' LONDON RAILWAY PROJECTS.

After long negotiations, Mr. Charles T. Yerkes has completed an arrangement with the Baker St. & Waterloo Ry. which gives him control of four different underground lines. This road is about half built and a new contract has been signed for its completion. The old contractors will finish it and it is expected that it will be ready to operate as soon as the power house can be built, and the Metropolitan District road is ready to run. The four roads owned by Mr. Yerkes will form a system connecting with the Metropolitan District railway. The latter will act as a terminal for the others and it is intended to build connecting lines and transfer stations for the other roads. The contracts for most of the work have been let to British companies. The first engine is to be in operation 18 months after December, 1901, and the last engine six months later.



J. L. Greasinger

NEW CAR HOUSE OF CHICAGO CITY RY.

By courtesy of Capt. Robert McCulloch, general manager of the Chicago City Railway Co., and Mr. Richard McCulloch, assistant general manager, we are enabled to present some of the details concerning the new car house the company is now building at 77th St. and Wentworth Ave. The company owns the entire block bounded by 77th and 78th Sts., Wentworth Ave. and

the idea was to have nothing combustible about the house except the cars themselves.

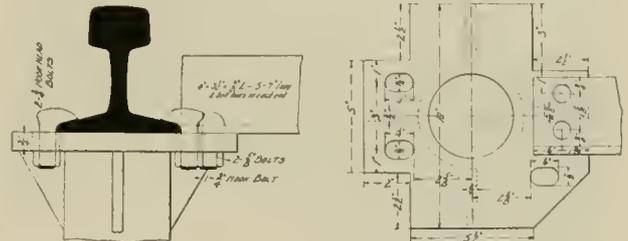
A section of one bay is shown in the line drawing. Each bay contains five tracks, which are spaced 11 ft. from center to center, making room for 34 of the large double truck cars such as are used on the Wentworth Ave. division, and giving a total capacity for the house of 204 of these cars. The grade of the lot was below the street track level and the track rails, which are 100-lb. T section, in the car house are therefore carried on cast iron columns spaced 6 ft. between centers longitudinally. This gives a pit extending over the entire area; the pit floor is concrete and well drained to a sump from which the water is taken by a motor driven pump.

The spaces between the tracks, the rails of which are 4 ft. 6 in.



INTERIOR OF CAR HOUSE.

Vincennes Road, a location which is convenient to the Wentworth Ave. and Halsted St. lines, two of the largest divisions of the system, and in event the State St. line is converted for electrical operation cars for that division would also use this barn. The building now under construction is 353 ft. 4 in. long, from east to west, and 348 ft. 8 in. wide, and is at the northeast corner of the lot. A structure of like capacity will later be erected west of this barn, leaving a space for a possible street, and the tracks extended clear through both buildings. The entrance to the second house will be on Vincennes Road.

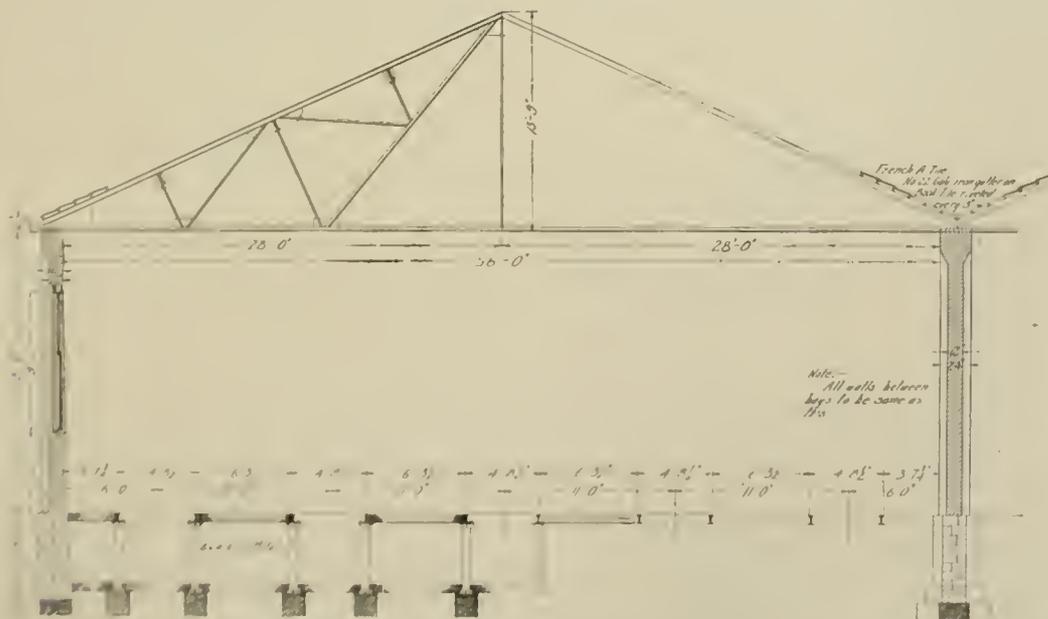


DETAIL OF TOP OF SUPPORTING COLUMN.

above the pit floor, are floored with concrete laid in arches with a sheet of wire netting in the center. The rails between which the arches are laid are kept from spreading by transverse angles bolted to the supporting columns. The methods of attaching these angles and of securing the track rails to the posts are shown in the detail of the post top.

At the front or Wentworth Ave. end of the house each bay has two 27 ft. 5 in. doors; at the other end there are five 10-ft. doors per bay, one to each track. All of these are of the steel rolling lift type furnished by the Kinnear Manufacturing Co., of Columbus, O.

The building is 52 ft. from the center of the track in Wentworth Ave. from which the entrance curves branch. The middle track of each bay is not entered directly but is reached from a cross-over connecting just inside the building with one of the adjacent



CROSS SECTION OF CHICAGO CITY RY. CAR HOUSE.

The present building is divided into six bays, separated by 17 brick walls in each of which there is but one small door for the use of workmen. The roof is of tile laid on a steel frame work, glass tile being used for roof lighting, the floors are all of concrete, and the doors are all of the Kinnear rolling type;

tracks; this leaves four curves entering the house for each bay, and these are brought together in pairs making only 13 branches from the main track in Wentworth Ave. for the entire house.

Each bay is to be provided with one or more sets of hydraulic jacks for lifting car bodies from the trucks. The arrangement

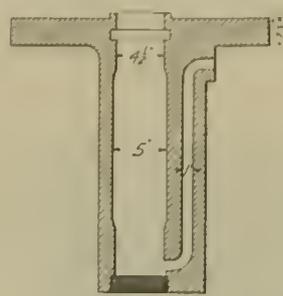
of the piping for the jacks is shown in one of the line drawings, and another of the illustrations shows the jack cylinder in plan and section. The lifting pistons in this mechanism are $4\frac{1}{2}$ in. in

the admission of oil to the two pairs of cylinders, and the third for opening a passage to the oil reservoir when the jacks are lowered. Ft. Zero oil is used in the jacks.

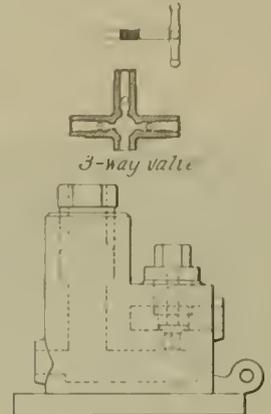


CAR BODY ON JACKS.

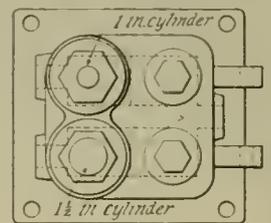
diameter and 7 ft. long, made of cold rolled steel. Bearings for the pistons are furnished by the upper and lower portions of the jack cylinder casting which is extended below by a section of piping long enough to accommodate the pistons when lowered. In this case the cylinder castings are supported on the tops of



CYLINDER CASTING.

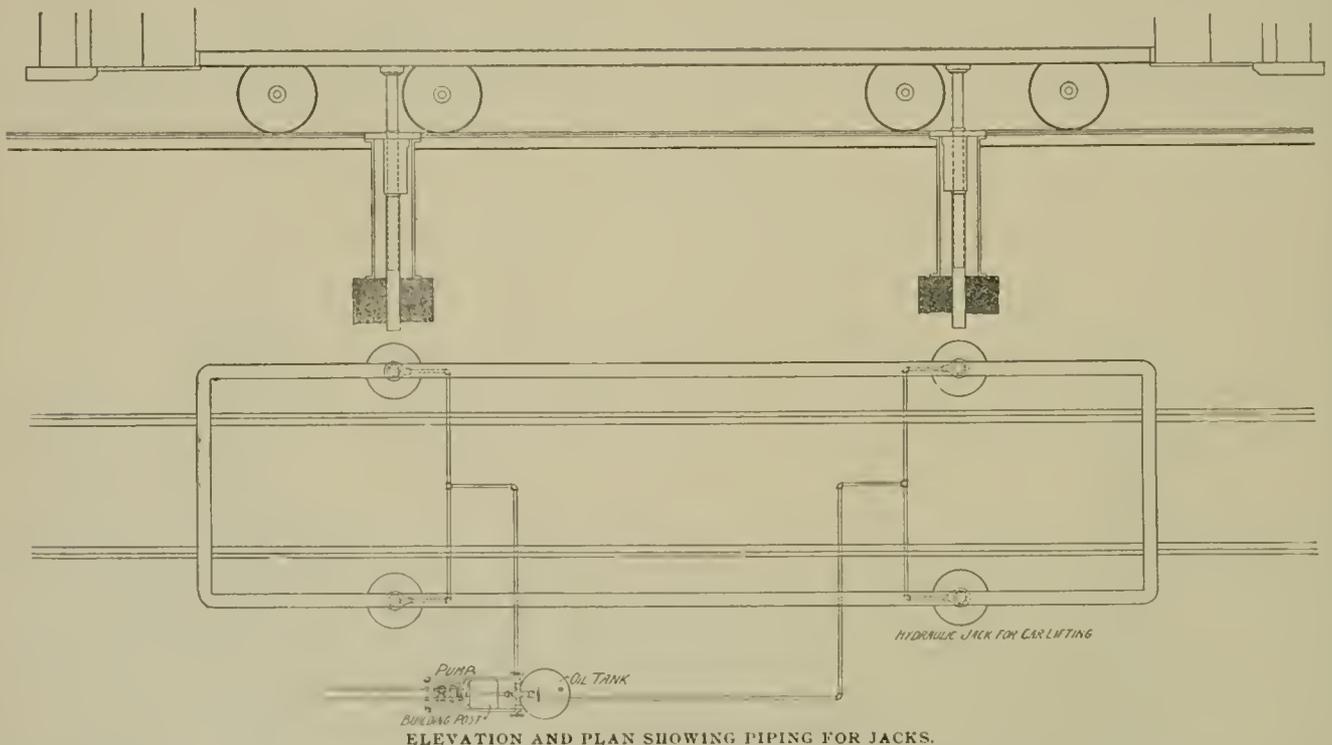


3-way valve



HAND PUMP.

At the 77th St. house motor-driven pumps will be used for operating the jacks but our drawings show a hand pump, which is used in connection with similar installations at other of the com-



columns which rest on concrete foundations which are flush with the pit floor.

It will be remarked from the piping plan that the two cylinders at one end of the car are fed from one supply pipe which has branches of equal length so that the oil pressure is as nearly as possible the same in both. A special fitting, shown in detail in one of the drawings, has three valves in it, two for regulating

pany's car houses. This pump has two cylinders each operated separately by independent handles. One is $1\frac{1}{2}$ in. in diameter and is used in pumping up the pistons to a position ready to take the load. The smaller piston is 1 in. in diameter and is used after the load comes on the jacks. The jacks were designed and built in the company's shops under the direction of Mr. M. O'Brien, master mechanic.

VISION, COLOR-SENSE AND HEARING.

A paper on this subject was read at the meeting of the Western Railway Club by Charles H. Williams, M. D., of Boston, Mass., in which he considered some of the examinations which are needed to secure reliable results and which are fair to both the employes and the company. To those who are skeptical as to the necessity of such examinations, the experience of one railroad running out of Chicago should be convincing. On this road, from June, 1899, to Nov. 30, 1901, there were rejected 1,888 men applying for work who could not pass the test for acuteness of vision, and 441 who were defective in their color perception to a dangerous amount. These figures also show that defects of vision are more frequent than those of color sense. For many years it was supposed that tests with Holmgren's colored worsteds was sufficient to detect all dangerous forms of defective color perception, but reports of cases are beginning to accumulate where it has failed. Some times the man who can without hesitation pass the worsted test will make many mistakes in naming the color in a distant green or red signal.

The Pennsylvania Railroad and New York, New Haven & Hartford Railroad adopted methods of examination about three years ago which extend to the whole system of employes. Each examiner of the company is appointed by the division superintendent, subject to the approval of the general superintendent, and the examiner is himself first examined as to his vision, color sense and hearing by an expert oculist, and when found qualified for the position is supplied by the company with the following outfit:

A set of standard test letters on cards, including cards on which semaphore signals are printed, for testing the acuteness of vision.

A set of cards with reading matter in print of various standard sizes and some train orders written on a manifold copying sheet for the reading test.

A set of approved Holmgren's worsteds (125 colors, each with numbered tags) and a standard testing lantern with 13 glasses of different colors and smoked glasses for testing the color sense.

A ratchet acoumeter for the hearing test.

Two pairs of spectacles, one with plain glass and the other with a convex lens of two diopters for each eye.

Blank forms of certificates for noting the results of the examination.

An experience of three years with this outfit has not suggested any change except that the lantern at first used has been replaced by an improved form showing one or two lights at a time of different colors or of the same color.

The tests are made in a well lighted room in which a distance of 20 ft. can be measured from the test type to the person to be examined. Dark shades or shutters should be provided to darken the room for the lantern test.

Acuteness of Vision.

The person to be examined is placed so that he will not face a strong light and one eye is completely covered by holding a card over it. One of the 20-ft. cards is hung at a distance of 20 ft. from him in a good light and if he can read the letters correctly another 20-ft. card is held up. If the second one is read correctly the examiner notes on the form the distance at which the different letters were read and underneath it the number of the smallest line of test type read correctly; in this case 20/20, or normal vision. If he cannot read the letters on the 20-ft. card at 20 ft. hold up a 30 ft. card or a 40 ft. card and so on until letters are found that he can read. If the letters on the 40-ft. line are the smallest that can be seen with his eye at 20 ft. his vision will be noted at 20/40 of normal. The numerator of the fraction being the distance at which the letters were read and the denominator being the number of feet printed above the smallest line that can be read. This test is repeated with the other eye, the first one being covered.

A position signal test is made by placing one of the cards with semaphore at a distance of 20 ft. as in the first vision test and with each eye separately, having the applicant read the signal beginning at one end of the card with one eye and the other end of the card with the other eye. The test is repeated with another of the semaphore cards with both eyes open and the distance in

feet is noted at which the signals can be read correctly without glasses. The reading test is made by noting the smallest size of print read correctly at the ordinary distance of about 18 in. either with or without glasses. Also it is noted whether manifold train orders can be read correctly at that distance. The latter is intended both as a test for acuteness of vision as far as concerns the size of type which can be read and also as to the test of the ability to read both printed and written cards. A case was found at one time where a man had learned the alphabet and could sign his name but was unable to read and for years had depended upon his fireman to read to him every order he received. In case of men making applications to enter the engine service a test with glasses is also prescribed. Place one pair of test glasses in spectacle frames before the eyes of the applicant and if he reads one of the 20 ft. cards at 20 ft. then try the other pair of glasses. If he can read the letters through the plain glass but cannot read them through the convex, or magnifying glasses, enter on the form, "Test with Glasses Satisfactory" but if the letters can be read through both pairs of glasses enter "test with test glasses not satisfactory." If engineers and firemen have 20/20 or 20/30 vision, with both pairs of glasses they will be examined yearly for vision. The object of these tests is to ascertain, when a man applies for work, whether his eyes are in such shape that when he is 45 years old or sooner, he will be unable to read distant signals without glasses.

Color Sense.

The whole number of colored worsteds are placed on the table in good clear daylight. The light green test skein A, is placed at a little distance from the others and the person examined is asked to select from the heap of colors all that look to him like the test skein and place them opposite it. He is not expected to find an exact match for the test skein but it is explained to him that he is to choose all the colors that appear to him of the same general color as the test skein, both those that are lighter and those that are darker in shade. If he does not understand what is wanted the examiner himself selects the colors, then having returned them to the general heap and mixed them with the rest, the person examined is called on to repeat the selection. This demonstration will not enable the person who is defective in his color perception to select the colors correctly. He will pick out as looking like the green test skein, some green and also some of the gray or brown confusion colors which will appear to him of the same general color as the test skein, only varying from it in shade. The numbers on the tags of the colors selected are noted on the form. Also, whether the selection is prompt or hesitating. All the colors are returned to the heap and mixed together and the rose test skein is placed apart from the rest and the applicant selects as before all the colors that look to him like this skein. The numbers on the colors so chosen are also noted on the form. In the first case if the person examined selects any of the grays and browns as looking like the green skein it shows that he is defective in his color perception either for red or green, if in the second test he selects some blues or violets as looking like the rose skein he is defective in his color perception for red, or if he selects for the rose colors some of the greens or blues, he is defective in his perception for green. The test with the green skein shows the existence of defective color sense and the test with the rose skein shows whether the defect is more for red or for green.

For the lantern test the room is darkened and the lighted test lantern is placed 20 ft. from the person being examined, and about level with his eyes. Different colors are shown which the applicant must name, the colors being shown two at a time or two of the same color at once. This test is repeated with a diaphragm showing the color through only a small opening. In case there is any question as to color perception other tests are made by combining smoked glasses with the colored glasses. No person can be considered to have satisfactory color perception who calls a red light green, and vice versa, under any of the conditions of the lantern tests.

Hearing Test.

The person examined is placed at a distance of 20 ft. with one ear toward the examiner and his other ear stopped by placing the finger over it. He then repeats aloud words and numbers spoken by the examiner in a conversational tone, and the distance in feet

at which they can be repeated correctly is noted. The test is repeated with the other ear.

With one ear closed as above, the greatest distance in feet is noted at which the ticks of a ratchet acoumeter can be counted correctly with each ear. The advantage of the second test with the acoumeter in addition to the test with the voice is that it prevents a man being rejected on account of a low tone of voice or indistinct speech of the examiner.

PROPER DRAINAGE AT CROSSINGS.

Mr. John Kerwin, superintendent of tracks of the Detroit United Ry., has kindly furnished us the following particulars concerning his practice in laying crossings with steam railroad track. The steam tracks are never paved and if excessive maintenance charges are to be avoided proper drainage must be provided.

For this purpose a line of ordinary red or unglazed drain tiling is laid under the center line of each steam track. These empty

no little difficulty in maintaining track at road crossings arises from the practice of some engineers who grade highways up to a point higher than the roadbed outside the ends of the ties, thus forming an obstruction which prevents the water from draining freely away from the track. The method of drainage adopted by a vote of the meeting is as follows: "Approaches of highways at crossings should be dug out 5 ft. from the ends of the ties, to a depth of one foot below the bottom of ties at the ends of the same, and 18 in. below bottom of ties 5 ft. from the ends of the same, this space to be filled in with cobble stones.

To show clearly the method decided upon in this important matter the reader is referred to the two accompanying sketches. Sketch "A" shows the mistake sometimes found, where the track and ballast are made to lie in a trench of earth formed by grading the road up to the level of the top of the rail. From this trench there is no side drainage. Sketch "B" shows the method adopted by the society, the space for a distance of 5 ft. outside the ends of the ties, excavated to a slope starting 12 in. below the ties at their ends and running to a depth of 18 in. in the distance of 5 ft., being filled in with cobble stones, permitting not only the drainage of surface water sinking into the track, but also catching and diverting water which otherwise might run upon the track. It would seem that the latter method should afford efficient drainage at road crossings."

MUNICIPAL OWNERSHIP IN COLOGNE.

The Belgian company which built the first street railway system in Cologne in 1878, obtained concessions which would not have expired until 1924 had not the municipality come into possession of the lines on the following terms: the city of Cologne was to pay the street railway company the equivalent of \$238,000 per annum from January 1, 1899, to June 30, 1913, and the sum of \$5,950 each year from 1903 to June, 30, 1913, making a total, inclusive of the cost of buildings subsequently taken over, of \$3,927,000. An appropriation amounting to \$4,284,000 was granted by the city for the conversion of existing lines into the overhead trolley system and the construction of two new lines. The installation was made by Siemens & Halske, of Berlin, and a section was opened for traffic on October 15.

The management of the railways is in the hands of the municipal council, an actual manager being appointed by that body. Motormen are paid 83 cents and conductors 71.4 cents per day of 10 hours. Profits to the company are said to have increased regularly.

COST OF REMOVING SNOW IN MONTREAL.

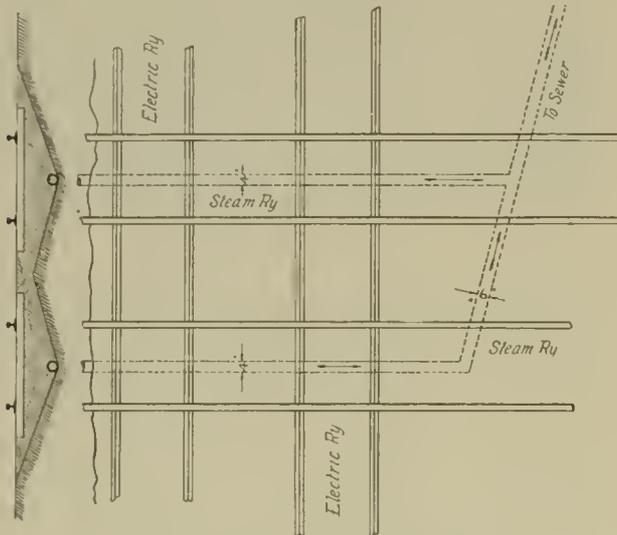
The following table shows the cost of removing snow from those streets in Montreal which are occupied by street railway tracks and also the amount of this which is borne by the company. The proportion paid by the company has varied under different agreements between the city and the Montreal Street Railway Co. At present the city removes the snow and the company pays two-thirds of the cost.

Winter.	Total Cost.	Paid by Company.
1893-94	\$89,029.38.....	\$57,101.18
1894-95	75,532.35.....	44,200.00
1895-96	71,975.87.....	52,470.00
1896-97	52,367.98.....	49,457.87
1897-98	102,416.10.....	59,131.66
1898-99	90,608.00.....	60,456.00
1899-00	126,384.00.....	84,256.50
1900-01	118,757.45.....	79,171.65

The street railway company is now asking that it be allowed to do the removing of the snow, claiming that under the city supervision this work is costing altogether too much. The company claims that by the use of an equipment consisting of electric shovels, and self-dumping cars, it could do this in a much more thorough manner, in about one-quarter of the time, and at about one-half the cost.

The Clinton (Mo.) Street Railway Co., of which H. P. Faris is president and manager, contemplates converting its horse car line into an electric railway.

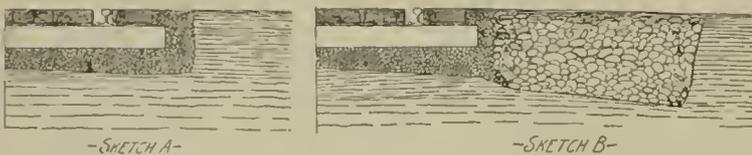
METHOD OF DRAINING CROSSINGS.



into a main which is led to the nearest sewer. In some cases three lines of tiling are laid for a double steam track. The minimum distance below the grade for the tiling is 18 in. and where the level of the outlet to the sewer is such as to permit the fall is made 1 in 18.

The red tiles are 4 in. or 5 in. in diameter while the main is larger, for which glazed or sewer tiles are used. The sketch shows a tiled crossing in plan and section. In excavating the undisturbed earth is shaped to give drainage to the tile as indicated in the section.

The Railway and Engineering Review recently reported a meeting of an association of section foremen on the Chicago, Milwau-



kee & St. Paul Ry., where the subject of draining road crossings was discussed. We reproduce two sketches and the following extract from this report:

"One remedy proposed was to lay tile drains parallel with the track, outside the ends of the ties and between the tracks on double track, where the crossing comes in a cut or where water is liable to settle around the crossing. In the case of double track the tile in the center space is to be turned under one of the tracks into the ditch. The remarks of a number of the speakers were directed to the great difficulty of maintaining track surface at undrained road crossings in wet places. It also appeared that

MUNICIPAL OWNERSHIP AND OPERATION OF STREET RAILWAYS.

By H. M. Sloan, General Manager Calumet Electric Street Ry., Third Vice-President American Street Railway Association.*

There are a great many people who believe that public ownership, and even public operation of street railways, would be beneficial to the people, but I am inclined to the belief that a great majority of those who would recommend such action on the part of the city have not given the subject the thought it deserves, or perhaps have not had the opportunity to thoroughly understand both sides of the controversy.

To unthinking people the idea of public ownership and operation is no doubt very enticing. They look only at the rosy side, without stopping to figure, or may be to understand the difficulties lying in the way, which would make it not only unadvisable, but impracticable.

As a relative question, which it is admitted does not bear on the matter in its entirety, but in which the principle is identical, the query might be made, "Why should not the city obtain enabling acts and build upon its school land?"

There can be no doubt but that large revenues result from this class of property. Presuming the municipality had the power, would it be justified in tearing down existing buildings, as is now being done by lessees of school property in Chicago? Would there not be opportunities for jobbery and speculation? Keep in mind that the men who speculate with the people's money have nothing to lose, and this kind of speculation is very attractive. This, of course, is not a parallel case, but it is merely desired to bring out the thought that there are large profits made by lessees of school lands. The fact remains, however, that the city is much better off in leasing the ground than in attempting to build, and this same idea is carried out by individual owners, for a great proportion of the valuable inside property is let on ground rent for long terms, not only in this, but in every large city in this country as well as in Europe. The collecting of ground rent involves but little detail, and the security is enormous.

Practically without any further legislation the city possesses all the functions of ownership that a safe business man would care to have, with the full knowledge that his estate could be increased at any time, for franchises granted or renewed must carry with them such terms and conditions as the city chooses to impose, and these conditions and terms could be so onerous that no individual or corporation could possibly bear. The query then arises, Why does the city want ownership with all its attending responsibilities, when it can obtain better results either by taxes on the gross receipts, or to the citizen with reduced fare, than could be realized by owning the property and renting it on a percentage, or any other basis?

In this connection the claim will doubtless be made, that the street railways of Chicago are financed beyond their legitimate limit. Whether they are is not a question of this paper, but upon any basis the conditions set forth remain the same.

To own the property, the city would have to pay some price. Say it would pay what it would cost to renew the tracks already laid. Now, then, the municipality would have entered into ownership assuming the responsibility of defalcation and leakage of all kinds in the collection of the revenue and all other burdens which ownership implies. The contract, to whomever given, would require among other things that the property should be kept in repair, but notwithstanding the contract there would naturally result a general running down from the condition at the beginning. To keep up railway property involves an enormous expenditure of money, so a struggle to make the original track last with as little outlay as possible might be expected.

There would be supervisors of course, but would supervisors always supervise? Do street inspectors at the present under civil service inspect as you would have them?

Among other suggestions advanced is the proposition to rent the railway tracks on a percentage basis, and all over and above a certain percentage earned by the lessee to revert to the city. As an example of how this scheme works may be cited the case of the New York, New Haven & Hartford R. R. Incorporated in

their charter is the provision that all over and above a stipulated percentage of earnings on a prescribed security issue is to revert to the state. I am not positive as to the results within the last two or three years, but up to a very few years ago the road had not earned anything over the stipulated percentage.

The reader's attention is called to the workings of municipal ownership in the city of Edinburg, Scotland.

"The municipal cable system was installed in this city in 1897 and has proved a costly failure to the city both financially and mechanically. In 1892 the municipality acquired the horse tramways for the sum of \$1,070,000. The council decided that the citizens would not permit the streets to be disfigured with the overhead trolley system and the underground trolley system was considered too expensive, so the cable was finally adopted though it was pointed out at the time that cables were being abandoned in the United States. It was estimated that a cable plant could be put in operation for about \$3,900,000, but the expense has already reached \$5,840,000, and the system is not yet complete. A number of costly mechanical devices for conducting cars around complicated curves have been tried and abandoned. Following these mechanical failures comes the failure of the company which leased the tramways to pay the agreed 7 per cent on the capital expenditure, which amounted to about \$389,320 a year, and which the leasing company declares it cannot pay out of the earnings. It has therefore applied to be relieved of its lease, and the city is suing for a large amount of arrears."

Incidentally, a word in this connection might be said of the fares charged on the street railways of Glasgow, the much-vaunted city of municipal ownership. While it is true that short distance passengers ride for less than a nickel, yet at the same time it must be remembered that a ride such as the Chicago City Railway Co. gives, for instance, from Clark and Washington to 79th and Halsted Sts. for 5 cents, would cost in Glasgow nearly 11 cents, notwithstanding the fact the cost of operation is much cheaper than in this country. Glasgow has one mile of street railway for about every 10,000 inhabitants; Chicago one mile for about every 2,500.

The demand in this country is for cheap transportation reaching limits from the crowded centers to homes which are at once healthful and economical, and cheap transportation is the only avenue by which the desired end can be accomplished.

Ten years ago street cars were operated by horses and cable, all of which have become obsolete and their replacement by cars propelled by electricity has become necessary, running into an expenditure involving millions, and which will cost many millions more before completion.

While at present electricity is wonderful in its performance, the best minds in the profession are a unit in the conclusion that it is in but its swaddling clothes compared with its possible developments.

So the great probabilities are that in a few years the present methods will become obsolete and new ones will materialize which at once will demand recognition and adoption because of their utility and greater economy.

As it is with the school lands, so it is with the street railways, buildings that were once modern become old and past their profitable use and have to make way for new and more modern structures. The land becomes more valuable and the city's interests are enhanced, and that which today is modern in street railway practice, in time will become worn and antiquated, and will have to make way for something that is better fitted and up to date.

It is argued that if the city owned the street railways it would be in better position to enforce regulations. This is a weak argument, for like the laws which are oftentimes said to be inadequate, the thought occurs to most all that the trouble is not with the laws, but with their enforcement, and it is maintained that any condition imposed on street railways could be enforced just as rigidly under an ordinary license or franchise as could be the conditions imposed on a lessee under municipal ownership.

Of what can be said antagonistic to municipal ownership, much weightier objections can be cited as to the inadvisability and impracticability of municipal operation. The most prominent trouble that would in fact arise and make the whole undertaking a failure would be the condition that is best described by the word "graft"

*From an article published in the "Calumet Record."

If it were not financial, then it would be political, or a mixture of both, and there can be no doubt but that the whole structure of municipal operation would be doomed at an early stage of its history to disappointment and utter failure.

The opportunity for political manipulation is a grave matter to consider. You can only guess at its possibilities, and no one can prophesy its development.

As party affiliation in municipal politics is becoming a bugbear, at each successive election party preference would be less potent, and it would logically follow that party lines would be entirely obliterated with street car employes, for their interests would lie directly with the "powers that be."

The politician would appeal to the employe's hope of personal advancement; he would promise him larger wages and shorter hours, and in time it would result in an obligation far beyond the possibility of a nickel fare to meet. This with other forces to hold men together would result in a political organization that would relatively be far more powerful than Tammany. There would arise a boss and you would have a political condition that would be almost impossible to overthrow.

Municipal operation would be the victim of the selfishness of every citizen who might have a purpose to serve, frequency of cars would be demanded and put in service that would be totally unjustified by the business, surrounding farms would be subdivided, a few cottages run up, and then would come the clamor for unprofitable extensions; the track force would be augmented; additions made in car repair and line repair gang; inspector's checking clerks, and all the safeguards in the way of superfluous men that governments surround themselves with in the manipulation of their business detail.

CITY CANNOT OPERATE AS CHEAPLY AS PRIVATE COMPANIES.

It easily follows that the present force employed in operating the roads today could and would be swelled at least one thousand men, and at a conservative figure of \$60 a month, would aggregate a yearly sum that would be sufficient nearly to meet the interest charges on practically half the present bonded debt of the Chicago street railways. It can not be argued that a municipality can operate a utility as cheaply, or manage it as wisely, as an individual or a company. The street railway business is one of vast detail, and the city is no more fitted for municipal operation of railways than to manage a large department store.

Governmental operation is notoriously lax and expensively cumbersome in its business methods, and the many leaks that exist in conducting the affairs would, under private ownership, pay a big dividend on the money invested in any commercial enterprise. It would be necessary by the very nature of things, for the purpose of a reasonable safeguard, to employ men to watch others, thus adding to the pay roll unnecessarily.

As an exemplification of the foregoing, the chief naval constructor a short time ago appeared before the committee of naval affairs, and advised that all warships be given out on contract, as it costs the government from 50 to 100 per cent more to build the vessels in the navy yards of the government than they would cost by contract to private builders.

When you consider with municipal operation that the conductors of the cars are the cashiers of the business, you may imagine what a force of clerks would be necessary to see that the receipts reach the treasury.

And then what about the accidents? As a conservative estimate the street railways of Chicago pay out over a million dollars a year in satisfying judgments and settling accident claims.

Contemplate for a moment the graft possible in disbursing the money to satisfy personal injury cases, for a great many threatened suits are settled out of court, both for the city and the street railways. At least three-fourths of the money thus paid by the street railways of the city of Chicago is in personal injury cases that are either fraudulent or unjustified. If street railways were managed by the city, attorneys elected to office or appointed through political influence would have the handling and disbursement of all this money, and what an opportunity it would be for dishonorable men.

The attorneys who take care of the business for street railways are men selected for their qualifications as trial lawyers; citizens

could not exercise such discretion in selecting their candidates, besides which, as it would take a great number of them, the city would not pay the fees that street railways pay their lawyers. The companies are compelled to have the very best legal advice, for the claims are in a great many instances fraudulent, and, of course, it takes the brightest minds to combat this element. Juries are just as heedless of justice in personal injury suits against the city as they are against any other corporation. As an example I quote from the Chicago Tribune, Saturday, Jan. 18, 1902:

"After the jury had been selected in Judge Hutchinson's court Saturday to try the case of Dominico Rosse for damages against the city on account of personal injury, Maurice Barnett, one of the twelve, asked the judge to excuse him on the ground that some of the members of the jury were prejudiced.

"'Before the jury was formed,' said Barnett, 'I heard a number personal injury cases, and that they were in favor of soaking the city every time.'

"The judge excused Barnett, and gave the lawyers permission to re-examine the other jurors."

This exemplifies the justice that the city may expect in its numerous personal injury cases if it were operating the street railways.

As a matter of fact, the treasuries of corporate bodies, whether city or individual, are objects of public plunder. With individual corporations these marauders get at the treasury only through accidents and alleged injuries. With the city other methods besides injury cases are used to get at the funds.

In prosecuting and persecuting corporations through their accidents there has arisen a class of "shysters" who give themselves the title of lawyer. They employ procurers, who are technically termed "ambulance chasers," and who earn a livelihood in running after and inflaming the minds of individuals who may be slightly injured with the idea that they can obtain thousands of dollars as damages. These parasites frequently create criminals by holding out the alluring promise of large results, and consequently tempting claimants otherwise honestly inclined to perjure themselves. In many instances, if they have not the evidence they create it. In a word, they are a disgrace to their profession. They prey like hungry wolves around corporate bodies and their game is just as toothsome, whether it be just or unjust. With them ends justify means. They are a menace to society, for their work is far-reaching in its effects.

It is by no means meant to imply that every lawyer who handles a personal injury case is necessarily of the class described. When a client goes to an attorney who cares for his reputation, with a trumped-up case, or one with no merit, he will tell him at once that his plea will have no standing in court, and will not stoop for a moment to the methods that the "shyster" is not only willing but eager to undertake.

The city of Chicago is robbed of vast sums yearly by the means that have been enumerated, and in this connection it would be well to state, that the city has standing against it \$3,300,000 in unpaid judgments, and \$800,000 unadjusted; 80 per cent of these are personal injury judgments. To combat this, requires the most watchful, sagacious management, as well as honest and faithful service to the principle.

The class of dishonorable lawyers referred to will sue a company with the idea of settlement, knowing that it costs the corporation, let it be the city or individual, a considerable sum to try a case, hoping to bleed it to avoid the cost of suit. All this in turn involves a great deal of business before the courts, that has in justice, absolutely no place there, consequently swelling the city's expenses and necessarily its taxes.

The civil service is the landing net used by the advocates of municipal operation for their argument. Some of the more conservative believe that while at present it is not in the desired condition that it may be brought to, but by better methods it can reach a more perfect standard. The civil service is undoubtedly a grand thing and all good citizens should be in favor of it, for its mission is to prevent corruption in public office. It can very successfully select mail carriers and clerks, but nevertheless, it is practically a machine, pure and simple, and never can successfully pick out the most efficient men to manage a street railway, or any other business involving voluminous detail.

The man who rises from the ranks is the man of selection. He

is picked out from a minor position and placed in one of greater responsibility. The great chances are that many in the ranks from which he rose could pass a much more successful civil service examination, but the man promoted has been carefully watched; his work has been satisfactory, and the chances are the confidence placed in him will be verified; if not, he will be relegated to his former position and another selection made. The successful one possesses judgment, executive ability, honesty, perseverance and application. These factors can be known only by those who are in constant and daily touch with him. Upon the degree of these qualifications depend his further advancement.

The human mind, with all its cunning, could not possibly develop a machine that would bring out these traits. It is very frequently the case that the poorest mechanic makes the best foreman; that he is a poor mechanic is possibly the fault of his birth, but he has that something about him that keeps his men not only in good spirits, but inspires them to perform their duties willingly and cheerfully.

Glance for a moment on the methods used by the civil service in the selection of a candidate from the ranks. He will be interrogated as to his knowledge of geography, arithmetic, history and in the main, of course, questions appertaining to his business. It is very possible that the one passing the best examination would be the man least fitted for the position. He might in the performance of his duties exercise all the prudence and ability he possessed, but he might not fill the bill by a good deal. All of us see examples of this class of men, of which all we are able to say about him is, that he is not the man for the place. Under civil service, charges would have to be preferred against him. Civil service could not find anything particularly against him, and if the charges were sustained he would have recourse to the courts, and they would have less opportunity to discover his shortcomings, and the result is possible that he would be reinstated.

The writer looks at this whole matter purely from a business standpoint, with all sentiment left out; but if the chief desire is ownership merely, without any regard for results, then it is a different matter and all this argument is useless.

But it is supposed, however, that the city desires to obtain the best results in the better way, and if the city can get as much revenue out of street railways without owning them, it must follow that it is much more desirable that the roads should be owned by private interests. There can be no doubt but that the city can accomplish this by taxing the gross receipts on a sliding scale, so that when receipts increase the city's revenue will increase proportionately.

Peculiarly situated as the city is to realize any tax it chooses to impose, it leaves the proposition of ownership ill-advised and unprofitable.

Ownership would necessitate the exploration in a new field that may prove disastrous, and if there is nothing to be gained, what is the use of assuming the responsibilities?

Arguments are advanced that municipal ownership is successful in other countries. This has by no means been proved. It is new, and much is still left in doubt, and, while it may be in some locations an apparent success, it certainly has been a failure in others. But that which is possible in Africa is not possible in Europe and that which is possible in Europe is wholly unfitted for this country. Take as an example, no-seat-no-fare proposition. The strongest advocates of this scheme have abandoned it as impossible in Chicago, though it is a well-known fact that it is strictly enforced in some cities of continental Europe.

Our faults and shortcomings are too much in the way of the successful handling of utilities by municipality. The moral standard of the average citizen as to corporations is far below par. You can get an ocular demonstration of this on any crowded street car. Rarely does a passenger go to very much trouble to proffer a fare that has been missed. Well-dressed, prosperous-looking business men can be seen any day on the suburban trains industriously hiding behind their newspapers to avoid the clipping of their commutation ticket. A great many of these very same people would not for a moment think of cheating an individual. It seems to be in the air that looting corporations is one of the vested rights of human nature, and if the charge be true that corporations rob the people it might naturally be expected that the inherent inclination to get even is as strong with the corporation as with the individual.

There is no doubt but that the question of municipal ownership

has been and is being debated in the minds of a great many thoughtful and prudent men, and some, influenced by what they consider violations of their ideas of what street railway corporations should do, have concluded that municipal ownership is the better thing.

But the advocates of municipal operation are in the main politicians who have personal ends to gain; or social revolutionists whose dreams bear the relative relation to sound business principle that perpetual motion does to mechanics, and the other class who know absolutely nothing about the subject.

To those who are in favor of the municipal operation it might be suggested they are beginning at the wrong end of the subject; that when we can educate out of human nature all selfishness, all acquisitiveness, all covetousness and general cussedness then and not until then we will be fit for municipal operation and all attending socialistic ideas.

Over and above all the subjects here treated comes the demand for the referendum—a strong argument against municipal control, for it is but a confession that the people do not trust the men they elect to attend to their interests, and if the citizens lack confidence in their officers to make a contract how can the referendum be brought to bear in the case of ownership in all the detail that may go to make up a ruinous whole? The referendum is all right and self-satisfying if care is taken to thoroughly educate the public, but to call on them to vote on a subject when their prejudice only and not their intelligence has been appealed to may result in an evil to the community that would take years to correct.

In preparing this article the writer has not drawn on his fancy, but merely fitted cold, existing facts to conditions sure to arise with municipal ownership and operation.

UNLOADING PASSENGERS FROM MOVING TRAINS.

A novel patent for loading and unloading passengers from rapidly moving trains without making any stops or reductions in the running speed has recently been granted to Mr. John W. Jenkins of New York City. The prominent feature of this invention consists of what is called a saddle car, one of which is placed at each station on the line and is picked up by the moving train and carried along to the next station where it is dropped. The railroad cars are supposed to be of the usual pattern with the exception that each car is provided on its roof with a pair of rails which project over the hoods so as to form a continuous track along the whole length of the roof of the train, and the ends of the rails on each car are bent laterally so as to preserve the continuity of the roof track when the train is on a curve. The saddle car consists of a narrow compartment to which is connected an iron truss frame under which the train runs. Normally this saddle car stands upon auxiliary track laid just outside of the regular tracks and rests upon four flanged wheels, two of which are under the passenger compartment and the other two being under the iron lattice which spans the train. The auxiliary tracks for the saddle car extend only a short distance either side of the station and are raised at one end and depressed at the other. When the train passes under the frame of the saddle car four broad faced wheels of the latter rest on the roof tracks of the train and the saddle car is slightly raised from the depressed portion of the auxiliary track and is carried along on the roof of the train.

When it leaves the train the saddle car runs upon the elevated end of the auxiliary track which takes its weight and allows the train to pass out from beneath the upper broad faced wheels. The saddle car would be of course provided with a set of brakes to check its motion at the desired point. By this means the invention anticipates running trains over long distances without making any stops whatever, meanwhile unloading and loading the train between each two stations by means of the saddle car.

The inventor also believes that this system will be applicable to street railways to a limited extent. Of course, he says, it would be impossible of application in narrow streets but on broad streets under certain conditions the system would save considerable time.

Two difficulties may be pointed out, however, in regard to the street traffic which are namely, that teams could not be allowed to use the street car tracks and that the trolley poles on the cars would have to be switched onto an auxiliary trolley wire stretched inside of the saddle car.

CONNECTICUT STREET RAILWAYS.

In 1901 the Connecticut Legislature extended the supervision of the Railroad Commissioners over the street railroads and the report of the commission for 1901 which has recently been published includes statistics of all of the street railway companies of that state. These are shown on the accompanying map which is redrawn from a map included in the general report. No Connecticut street railway can now be opened for public traffic until it has been examined by the Railroad Commissioners and a certificate issued that it is in a suitable and safe condition. They are required to examine the street railways once in each year or oftener when they deem that public safety so requires. The examination of these roads during the past year showed them to be in good condition generally and the commissioners had but a few suggestions to make in the line of improvements. On some of the roads the trolley poles

The companies having the largest mileage are the Connecticut Railway & Lighting Co., owning and operating 152.172 miles, the Hartford Street Railway Co., with 73.085 miles and the Fairhaven & Westville with 68.020 miles. The Winchester Avenue Railroad is owned and operated by the latter company which brings its mileage up to 80.000 miles.

The financial statement made up from the reports of the various companies is characterized as to a certain extent unsatisfactory and indefinite in so far as it relates to capitalization, construction and equipment, on account of the fact that some of the companies are engaged not only in operating street railways but also in operating gas and electric lighting properties. The capital stock, bonds and floating indebtedness are chargeable upon the property and consequently the amounts shown under these accounts are not all applicable to the street railway business. As far as the gross receipts and operating expenses are concerned,



MAP OF CONNECTICUT SHOWING TROLLEY ROADS OF THE STATE.

have been placed nearer the tracks than was considered safe for the operation of open cars with running boards. It has been recommended that poles be placed not less than 5 ft. from the nearest rail and changes in the location of poles were generally voluntarily made at the time of the inspection. It was also recommended that all the large double truck cars should be furnished with power brakes in order to be controlled with safety. This is considered essential on roads with steep grades and it is a wise precaution in thickly settled cities where prompt stopping of the cars may avert an accident.

The total mileage of the street railways in operation in Connecticut reporting for the year ending June 30, 1901, is 492.227 miles exclusive of sidings, and 515.835 miles including sidings, making the length of the latter 23,608 miles. This shows an increase during the year of 21.257 miles in the length of main tracks and the decrease of 5.153 miles in the length of sidings reported. No new companies were added to the list of operating roads except the Connecticut Railway & Lighting Co.

however, the street railway departments have been kept separate and distinct, and are correctly shown in the reports.

The capitalization and construction equipment accounts of the Connecticut Railway & Lighting Co., including its subsidiary companies, are as follows:

Capital stock, \$15,000,000; bonded debt, \$9,350,000; floating indebtedness, \$75,000. Total, \$24,425,000. The construction and equipment accounts of this company are as follows:

Capital stock, bonds and properties purchased, \$21,220,034; bet terments on gas and electric properties, \$32,207; expenditures during six months, \$153,248. Total, \$24,405,525.

The capital stock of the other street railway companies of the state comprising 340.055 miles of road, is \$8,137,044, being \$23,931 of capital stock per mile of road.

The bonded debt of all other street railway companies is \$6,008,000, being \$20,314 per mile of road.

The floating indebtedness of all other companies is \$822,593, being \$2,419 per mile of road.

The cost of installation and equipment of all other companies is \$15,816,288, being \$46,510 per mile of road constructed, excluding siding.

The gross earnings of all the street railway companies for the year were \$3,629,783, being \$7,162 per mile of road operated, and \$0,2001 per mile run.

The operating expenses of all the companies were \$2,298,063, being 62.11 per cent of the gross earnings. The average expense per mile operated was \$4,554, and the expense per mile run \$0.1266.

The net earnings for the year have been \$1,333,976; the net earnings per mile operated were \$2,627, and per mile run \$0.0735.

Eleven of the 27 operating roads paid dividends amounting to \$383,300, upon a total capital stock of \$6,005,000. No dividends were reported as paid on \$2,132,048 of capital stock. The number of miles run was 18,138,124. The approximated cost of operating per mile run was \$0.1266, and the gross earnings per mile run were \$0.2001. The total number of passengers carried was 78,222,462 as compared with 54,235,707 carried by the steam roads of this state. The number of cash passengers per mile of main track operated was 136,137, and the number of cash passengers per mile run was 3.8.

There were 225 persons injured on the street railways during the year, 15 being killed. Of those killed 3 were passengers, one was an employee and 11 were persons on the street.

The railroad commissioners for Connecticut during the past year were Washington F. Wilcox, William O. Seymour and Orasmus R. Fyler.

THE BROWN SYSTEM OF DISCIPLINE AT BIRMINGHAM, ALA.

Mention was made in February issue of the "Review" of the Brown system of discipline in effect since Jan. 1, 1902, on the Detroit United Railway. The Birmingham Railway Light & Power Co. inaugurated this system on July 1, 1901, and has found its results highly satisfactory. Previous to its adoption when it became necessary to discipline an employe he was suspended from work for a specified number of days and on account of this suspension of work it was necessary to maintain an excessive number of extra men in order to have enough crews to operate the cars. With the adoption of the merit system this extra list was reduced to a large extent. Instead of merits and demerits "Debit days" and "Credit days" are the terms used in this connection. A book called the "Suspension Book" is kept in the general office and when an infraction of rules occurs a bulletin order is sent to all the bulletin boards relating the circumstances, place, etc., but withholding the name of the one who violated the rule. A copy of this bulletin is mailed him in an envelope and in the lower left hand corner the words "You are the man" are written. When a man gets as many as thirty days on the debit side of his account he is called in the office and the suspensions are discussed. If the previous good conduct of the employe justifies it a credit is placed to his account and he is allowed to continue in the service of the company, if not he is dismissed. It is believed that the system is productive of more efficient service and stricter adherence to rules than the suspension with loss of time, as in that case when a man wanted a vacation and thought it would not be granted him an infraction of a rule would place the coveted leave of absence in his way.

The "Suspension Book" in which the records of the men are kept is a large volume with pages measuring 8x13½ in., each two facing pages having the same number. The left hand pages contain at the top blanks for the name of the employe, his address and number, whether married or single, age, previous experience and date of entering service. These blanks are repeated four times at the top of each page in order to allow entering a new name on the page in case the man formerly entered leaves the service before the expiration of a year. In the case of employes remaining but a short time with the company the use of several names on a page successively economizes considerable space in the book. Below these blanks the page is divided into 25 vertical columns, the left hand one being for the day of the month and the remaining 24 a debit and credit column for each month. The total debit and credits and the balance is footed up at the bottom of the columns for each month.

The facing page is headed "Explanation" and the description of the accident or occurrence for which the employe is disciplined is entered under the subheads "line," "car," and "place." By this method a complete record of each employe's conduct is displayed for a year, or any portion thereof, in concrete form on a single page of the suspension book.

SURFACE CONTACT SYSTEM AT WOLVERHAMPTON.

The first surface contact system to be used in the United Kingdom has been installed in Wolverhampton, the system employed being that of the Lorain Steel Co., of Johnstown, Pa. Two miles of this system have been installed, and will be tested for a period of 30 days. If the results of this experimental line are deemed satisfactory, the balance of the system is to be similarly equipped and the entire installation must be completed by May next, at which time an exposition is to take place in Wolverhampton. The total length of the line to be equipped is 11 miles.

There are two general classes of surface systems, namely, those in which the switch mechanism is actuated by solenoids, or electromagnetic devices, one in each contact box, or a number grouped together in a manhole in the street; and second, those which carry the magnets underneath the car, with a switch in each contact box, which is actuated by the magnets carried on the car. The Lorain system is of the latter class, of which the only prominent examples are two systems operating in Paris. One of the claims of superiority made for the Lorain method over the French system is the absence of vapor of mercury in the switches. Some years ago the Lorain company carried out a series of experiments, employing a switch consisting of an iron sphere floating in mercury. It was found, however, that the results were disastrous, on account of the vapor of the mercury collecting on the interior surface of the insulated cup. This so reduced the insulation that the contact plates would become charged sufficiently to injure horses and other animals coming in contact with them. The present system has the advantage that a defect in the magnetic coil cannot under any possibility leave a contact plate charged in the street. The switch, which is the only moving part of the system below the ground, is enclosed in a cup of insulating material and hermetically sealed against all moisture. In this system a minimum number of cables is required for connecting the contact boxes with the current supply main, and no T joints are required in any of the cables.

The parts are all accessible for replacing or repairs without disturbing any of the paving. By removing two nuts holding the cover of the contact boxes, the latter may be lifted up, and with it the switching mechanism in the cup of insulating material. The replacing of this can be done in two or three minutes. The contact box cover is 12¾ in. by 6¾ in. wide, the upper surface being convex and projecting a fraction of an inch above the surface of the paving. The vacant space in the contact box is filled with oil to prevent the possible creeping in of moisture, and if such should occur, the moisture will naturally rise to the top of the oil, where it does no harm. A special oil is used, which does not thicken in cold weather and does not oxidize or deteriorate. A long collector shoe is provided under the car, which is durable and said to be noiseless in its operation. The collector consists of a phosphor bronze strip 2x¼ in. in section, which is carried by a 2 in. rubber hose, which in turn is carried by a wooden piece attached to the magnet. The rubber hose gives the necessary insulation and flexibility. The 30 days period of trial has been entered upon, and at the present time there appears to be no doubt as to its successful issue. The system has been developed by Mr. W. M. Brown, chief electrical engineer for the Lorain Steel Co., and it is regarded as a practical substitute where overhead wires are objectionable. The Lorain company expects to enlarge its plant at Johnstown for the purpose of manufacturing the new appliances.

Swedish engineers project converting all the railroads of Sweden, comprising some 7,500 miles, into electric lines, to be operated from 12 power stations of 3,000 h. p. each, in various parts of the country. Estimates of the power required and the cost of consummating the project have been prepared by one of the prominent electricians of Stockholm. The cost is placed at \$10,000,000.

BERLIN ELEVATED AND UNDERGROUND RAILWAY.

BY FRANK C. PERKINS.

The recent equipment of the elevated and underground electric railways in Berlin, is particularly interesting at this time on account of the activity in this line of railway practice in the principal American and European cities. The Berlin railways are operated by the Gesellschaft für Elektrische Hoch- und Untergrundbahnen in Berlin, and the electrical equipment was installed by Siemens & Halske.

The subway system, together with the elevated road, extends from the Warsaw bridge to the Zoological Garden, a distance of nearly 7 miles, and runs approximately east and west through the central portion of the city. A branch line about half a mile long runs to Potsdamer Platz and ends there in an underground terminal.

The road descends 13 ft. below the surface from the junction of this line first passing over a bridge spanning the Landwehrkanal and then running down to the Droschkenplatz at the Potsdam railroad station. The underground tunnels are excavated in the main streets and the subways constructed, concrete arches being used at the

Great care has been taken to avoid vibration of the elevated structure and a sort of pumice cement and gravel is used for ballast and to deaden the sound. This ballast is clearly shown in the accompanying illustration. The third rails for supplying the current are well insulated and mounted inside the track. They are constructed of iron, and copper feeders are used for supplying the current at a potential of 750 volts. Part of the track consists of rails weighing 80 lb. per yd. and some of 56 lb. per yd., while the distance between the ties is 28 in. in the latter case and 39 in. in the former case. These are fastened securely to the iron work.

The trains of three cars weigh about 80 tons, carry 22 passengers and have a 5 minute headway. Each of the motor cars runs on two bogies, and four single reduction motors are mounted on the two trucks. The current consumption varies from 1,000 to 1,400 amperes at 750 volts. The normal speed is 18 to 25 miles per hour and the stations are about 2,000 feet apart. The wheels of the motor cars are 33 in. in diameter and the weight of the car about 24 tons. The motor cars are 10½ ft. high and 7 ft. 10 in. wide, while the total length between buffers is 41 ft. 7 in. The cars are divided into two parts, one for the driver or motorman and the other for the passengers. The motor cars are arranged for third class passengers



VIEW OF BERLIN ELEVATED RAILWAY SHOWING LIGHT STONE BALLAST.

crown 8½ in. thick, the surface of the street being 2 ft. above. The distance between the transverse girders is about 5 ft., the rise of the arch 8 in. and the total width of the subway is 21 ft. 3 in. Water tight asphalt sheathing and cement is used in the trenches, side walls and ceiling which insures a dry subway. The floor of the tunnel consists of concrete about 3 ft. thick and the rails have a gage of 4 ft. 8 in.

Iron pillars are used as supports between the tracks on account of the width of the tunnel. The underground portion of the line starts at the west of the city, north of Charlottenburg, near the Zoological Garden and terminates at Nollendorf Pl. Electric trains consisting of three coaches, the two end ones being equipped with motors, pass from the underground subway to the elevated structure illustrated herewith.

The elevated part of the line is supported on uprights, free to swing, as they are set in globular foundation shoes. Much of the work on this structure needed the highest engineering skill, particularly in places where the tracks were carried over streets, the canal and railway lines and in passing the Potsdamhof, some of the spans being nearly 400 ft. long. At several points the line cuts directly through houses. These are known as "slit-houses," part of the walls being removed and the buildings strengthened.

and the center car is used for second class passengers, no first class compartments being provided.

Air brakes are provided for all of the cars, which also have hand brakes for emergency. Forty-one motor cars and 21 second class cars are required to make the schedule trips.

The power house is located near the center of the line and at a point where the greatest consumption of energy takes place. This is near the triangular junction illustrated, where the line meets the Ringbahn at Potsdam bahnhof. The station is built with the coal bunkers at the top of the building, and just below them are the boilers which supply the superheated steam at 135 lb. pressure to the 900-h. p. vertical engines located on the floor below.

There are three generating sets, each having a normal capacity of 900 h. p., but capable of standing an overload of 1,200 h. p. The engines are of the vertical cross compound type and are directly coupled to compound wound direct current generators of the inner pole type with ring armatures. The firm of Siemens & Halske designed a special dynamo for this plant, the combined armature and commutator type not being adapted to it, but a very large commutator is used, which does not, however, form the actual surface of the armature winding. The generators are 80-kw. machines and have 10 poles, and in addition a large fly-wheel weighing 33 tons

is mounted on the engine shaft, and a 20-h. p. electric motor is arranged for turning over the engine and fly wheel when desired. There are six tubular boilers each having a heating surface of 2,480 sq. ft., the pressure being 135 lb. and superheating 230° C. The feed water is supplied by two steam pumps having a capacity of 21,000 gallons per hour. The coal is hoisted by automatic conveying apparatus. The chimney is 262½ ft. high and has a diameter of 11 ft. 9 in. at the top, only 216 ft. of the height being available for draft on account of the boilers being located at the top of the



SUBSTRUCTURE OF BERLIN ELEVATED RAILWAY.

building. The lower portion of the chimney is fitted up for closets, wash rooms and bath rooms.

The engine room is supplied with two traveling cranes, one of 15 tons and the other of 20 tons capacity. The power house was designed by Mr. D. Wittig, director of the company.

A PICKPOCKETS' UNION.

As a result of a sudden increase in the number of robberies occurring on street cars in the lower East Side of Manhattan, the police claim to have unearthed a perfectly organized pickpockets and sneak thieves' syndicate, with established offices and regularly appointed officers.

The association has two classes of members, the "workers," who do the actual stealing, and the "honest" members, whose part is to pose as respectable citizens. The city is divided into districts, and certain pickpockets are assigned to each district, street cars being the particular field chosen for activities. Each member pays into the general fund a percentage of his "takings."

Some original methods are introduced in the way of doing business. One successful plan has been as follows: Two men board a crowded car and at the first opportunity one of them takes a diamond stud, or watch, or a pocketbook, as the case may present itself, and immediately passes the booty to the other, who jumps from the car with the least possible delay and without attracting attention. If the article is missed the taker will probably be the one suspected, but when searched of course no trace of the stolen property is found.

If the victim insists on pressing the charge, or if either man is caught with the goods on him, the "honest" members of the association play their parts. The victim is waited upon by a well dressed citizen, who represents himself as a friend of the unfortunate thief who has been forced by want to take what does not belong to him. The gentleman offers to have the stolen property returned, and if necessary agrees to pay a small sum if the prosecution is dropped. In this case out of ten this proposition is accepted and the thief goes free. The expense, of course, comes out of the syndicate's fund. When the pickpocket is brought to trial the organization pays the expenses of a lawyer to defend him.

FIRE PROTECTION.*

Fire Extinction—It is better to prevent a fire if you can, but it is good to have facilities to extinguish one if it occurs. For depot buildings, coal houses and freight houses, my practice is to have each building equipped with at least one barrel of salted water and a bucket. Three pails of salt should be dissolved in each barrel of water. This will keep it from freezing in the coldest weather when inside a building, but you must see to it that the salt is dissolved. Locate the barrel near the door and keep it free from accumulations of freight or other material. A round bottom bucket is recommended. It is not so likely to be stolen and it cannot be used for ordinary purposes—two features tending towards its being where it ought to be when wanted. Paper buckets of this design are made especially for this purpose. Instruct agents that this equipment is just as much an important part of their station supplies as their stove or safe, and must receive as much care. If they ever need a pail of water for fire extinguishing purposes, they will need it very badly and very quickly. Excellent results have followed this practice. Where water tanks are at a station, an inside hydrant will answer the purpose of a barrel of water, providing you have a fire bucket, and also providing it does not freeze up in the winter. Do not permit the agents to empty the barrels in summer and use them to catch rain water in for scrubbing purposes. The barrel of water and bucket, although one of the simplest, is one of the best equipments for small stations. You can furnish it for all kinds of buildings, it is cheap, it requires the minimum amount of care, is not patented, and every one of your employes knows how to use it. Do not despise it because it is homely. It holds the record. For large freight houses the fire pail pump is an excellent hand apparatus. This is nothing more than a large tin pail (holding about five gallons of water) with a small submerged pump in it, with a short hose. Its advantages are that it requires no skill to operate it; can throw water overhead, which is very important, is easily transported through a yard to burning cars; does not corrode and is not patented. They are used quite extensively. Cost about \$5.00 each. The fire hazard of freight houses is low, should not be greater than a dwelling house, and there is no excuse for so many of them burning.

Shop Plants—The protection of large shop plants is not only a very important, but is also a very broad and difficult proposition. It is dependent upon many circumstances—location, character of construction of buildings, their exposure to each other, water supply, contiguity to a first class fire department, and willingness of the company to spend money for protection. In general, there should be both inside and outside protections. For inside protection, assuming you have plenty of water and power, I like 1½-in. hose connections, with 50 ft. or less of linen hose at each upon a reel, and attached ready for instant service. Connections should be so made that all parts of the building can be reached by a stream of water. The connections should not be upon a pipe smaller than two inches. The hose and valve thread of this size is standard, and there is no difficulty in buying the equipment, including the reels. Do not spend your money for this equipment, however, unless you have a constant pressure of not less than 20 lbs. upon the pipes. The equipment must be ready for business at all times, and the workmen impressed with the knowledge that it can be depended upon. If conditions are such that you cannot get the hose service, do not forget the barrels and buckets. Some chemical extinguishers are very good, if taken care of and the men trained how to use them, but my experience is that they are shamefully neglected, as a rule, and that the men are often afraid of them. Hand grenades are not as good as a bucket of water. In your paint shop, oil room and parts of your plant where oil is stored or drawn, be sure to have pails of dry, sharp sand. Paint the pails red, and mark them: "For Fire Purposes." Then tell the men that sand is one of the best things you know of for extinguishing fires. Design your inside equipment with the idea of immediate use on incipient fires.

Apparatus for Outside Use—If you have not a good permanent water supply, do not spend much money on it. The best thing to do is to buy a chemical engine and drill your men how to use it. If you have a good water supply, see if your pump and steam plant

*Extracts from a paper on "Fire Rules of Railways," read before the Western Railway Club by W. S. Worman, fire inspector, C. & N. W. Ry.

are so housed that it will not be involved in the burning of the building or buildings you are aiming to protect. Keep in mind that when a fire gets to a stage where you must fight it from the outside, you have a very serious proposition on your hands. Probably the most you will be able to accomplish will be the protection of adjacent property. Assuming that you have the water and power, have your yard mains of ample size. I will not take your time discussing the necessity of having piping of sufficient size more than to say that in no department is more care needed in this regard than in your fire department. Where a plant is self-dependent in the matter of a heavy hose service, a fire pump of the "Underwriter's" pattern, or one equally as good, is a necessity. A 14x7 $\frac{1}{4}$ x12, or 500 gallon pump, throws two good hose streams. A 16x9x12, or 750 gallon pump, throws three good hose streams. An 18x10x12, or 1,000 gallon pump, throws four good hose streams. A 20x11 $\frac{1}{2}$ x15, or 1,500 gallon pump, throws six or seven good hose streams. As stated, conditions so vary that full rules cannot be given. A 6-in. yard main for a small plant is good, but an 8-in. main is better. After getting a yard main, a 4-in. pipe is large enough to branch to a yard hydrant, if not more than 75 ft. from the main. Place your hydrants sufficiently remote from buildings to be free from danger of falling walls. Place them near roadways. Outside hydrants are usually double, 2 $\frac{1}{2}$ in., with frost case, and 4-in. or large ground connection. Have cut-off valves near the yard main on all pipes leading into buildings, and have the valves boxed so that you can get at them. Your hose for outside use should be 2 $\frac{1}{2}$ -in. cotton, rubber lined. There is no standard 2 $\frac{1}{2}$ -in. thread, so be sure that your hose fits your hydrants. Also see that you have facilities for utilizing the city or town service, if the thread of its fire hose differs from your own. Get first-class hose. It is cheapest. Rubber hose for fire protection purposes is cumbersome, and apt to crack near couplings. Have the couplings put on by the makers. The hose may be kept upon a cart, or may be attached to each hydrant and covered by a house about 6 ft. square. The house plan is best, when plant is of moderate size. Have the house weather tight, with big doors, well-ventilated. Do not coil the hose, but keep it on a slatted shelf, raised from the floor of the house, and piled in a zig-zag fashion. Do not forget spanners, wrenches and nozzles. These tools are needful to work the hose. Do not attach the hose to both sides of the hydrant. Keep the cap on one of the butts of the hydrant. Take good care of your hose. The chief cause of rotting is from water remaining in it. See that it is properly drained after use, also that the hydrant does not leak into it. When hose is kept on a reel, it should be taken off and aired occasionally, particularly during the summer months. When replaced on the cart, reel it up the opposite way.

Private Organization—This is a vexed subject. You certainly cannot train all of your help, and yet it is clear that your protective apparatus is useless unless some concerted use can be made of it. It seems reasonable, however, that every shop should have some one, the foreman or his assistant, who shall know what fire apparatus there is, and shall keep it in good condition. He should also select some of the men from each department and drill or instruct them as to action in case of fire. The following are general suggestions:

Select men likely to be permanently employed—active, sober and intelligent. It will be found that a few men who know where to find and how to work the apparatus will be able to control the balance of the men.

Take those whose homes are in closest proximity to the plant when practicable.

Always take the watchmen.

Organize your night force. This is very important.

Distribute the selection as greatly as possible over your entire department.

Do not give the men the idea that you are trying to make firemen of them.

Do not permit any horse-play in the handling of the apparatus or at drills.

Drills should be simple, consisting principally of the running out of a length of hose from a hydrant to the building where the men being drilled are employed, and the opening up of a stream through one or two of the inside connections. Use different hydrants and different connections at each drill. Give the men time enough to

require them to take care of the hose properly after the drill. It must be thoroughly drained and dried and returned to its reel.

It is, perhaps, more satisfactory that the men be remunerated for drills than that their services be voluntary—say time and a half during one hour's drill. The remuneration is a useful lever for the maintenance of proper discipline and is in many ways more efficient than a voluntary one combined with some special benefit.

Every selected member should be made acquainted with the working of all the different appliances, etc. The drills should have special reference to the buildings they are primarily expected to protect.

The inspections by the chiefs, or such selected men as they may designate from time to time to make inspections, should not be of a perfunctory nature, but a thorough examination of all hydrants, valves, hose, etc., in his jurisdiction, and any defect should be repaired promptly.

Do not provide the chiefs, their assistants, nor the selected men, with any distinctive badge or paraphernalia; educate them to the idea that the best results are obtained while the fire is young, and that quickness, without demoralization, is the very essence of the best service; that when an alarm of fire is given, they are expected to get there quickly, but quietly and coolly, and be able to handle the apparatus to the best advantage.

Particularly, drill the night watchmen in the quick handling of the inside hose and the location of the fire alarm boxes.

Do not permit any racing at drills, nor competition between selected men of different divisions or departments.

Furnish each chief and each of his assistants with blue prints, showing water system, hydrants and fire alarm boxes, to be framed and hung in the office of each.

General Order and Cleanliness—The only general rule is not to have anything about that cannot show some good reason for its presence.

Ordinarily dirt and accumulations are not always inflammable or liable to spontaneous combustion, but you never can tell what day something may be mixed up with it that is.

The value of cleanliness in preventing fires applies to every part of the plant; it not only removes nearly all the causes of spontaneous combustion, but brings about a double inspection service, first from the sweepers, and second from the foreman, who sees that the shop is clean. As a moral effect, cleanliness improves the pride and caution of employes. It is a matter of habit and men disciplined to it will do better and more work.

COMPLAINT CLERK AT MEMPHIS, TENN.

The Memphis Street Railway Co. has introduced an innovation in employing a complaint clerk whose duties are solely to listen to the troubles of dissatisfied passengers. Mr. Frank Smith, superintendent of the company, stated that the purpose of the company is to look carefully after the rights of its patrons. The company intends to give the people a good service, to correct the defects which may be made apparent in the service and to guarantee courteous treatment of its passengers. All these matters will hereafter be attended to by the complaint clerk.

It would undoubtedly surprise many people to know the number of letters received by a street car company daily relating to various complaints. One person is easily kept busy answering these communications and attending to the little details which they involve. The company will consider it a favor if any patron sends in a report of any lost article or of any dereliction in the conduct of its employes. The company hopes, through the establishment of this office, to give its patrons the very best service possible.

AN ATTRACTIVE FOLDER.

The New Orleans & Carrollton Railway, Light & Power Co., has issued a handsomely illustrated folder, entitled "Around the St. Charles Belt." This describes a trip over the company's lines, and points out the numerous monuments and buildings of interest which are passed on this route. A map of the road is also printed on the back of the folder, which is as handsome as well as a useful souvenir, and will prove of value to visitors desiring to reach the prominent points of interest in the city.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

DUTY OF MOTORMAN SEEING CHILD AHEAD ON OPPOSITE TRACK.

Jones v. United Traction Co. (Pa.), 50 Atl. Rep. 826. Jan. 6, 1902.

Where a child not quite two years old was walking on one track, the motorman of a car coming from the opposite direction on the other track, the supreme court of Pennsylvania holds, was bound to know that in her childish caprice she was as likely to cross over in front of his moving car as to go back to the pavement; and his duty, the instant he saw her, or, if exercising proper care and watchfulness, he ought to have seen her, was to stop or to so absolutely control his car as to avoid the risk before him.

FAILURE TO STOP THE CAR WHEN FIRST REQUESTED NO EXCUSE FOR GETTING OFF WHILE IT IS IN MOTION.

Campbell v. Los Angeles Railway Co. (Cal.), 67 Pac. Rep. 50. Dec. 21, 1901.

While it says there might be cases in which, by reason of a condition brought about by the negligence of the carrier, where great danger was apparent, or where the passenger was told by the person in charge of the car to jump off, or other peculiar circumstances, it would not be negligence in a passenger to alight from a car while the car was moving, the supreme court of California holds that because a motorman did not stop his car when first requested furnished no excuse for a passenger getting off while it was in motion, especially when the motorman did finally stop it in a careful manner, and with due caution to the passenger not to get off till the car stopped.

WALKING ON TRACK AT NIGHT TO AVOID MUD IS CONTRIBUTORY NEGLIGENCE.

Penman v. McKeesport, Wilmerding & Duquesne Street Railway Co. (Pa.), 50 Atl. Rep. 973. Jan. 6, 1902.

A man walking on an electric street railway track at night to avoid the inconvenience arising from the muddy condition of the paved portion of the street, wherein he could have walked with perfect safety, was run down and injured by an electric car coming up from behind him. He said that he looked back several times, the last time just before he was struck; and the testimony tended to show that the bell on the car was not rung until just about the time he was struck, and that the motorman was looking back in the car at the time. The testimony in the case, the supreme court of Pennsylvania holds, clearly showed the negligence of the man, and fully justified the direction of a compulsory nonsuit, on the ground of contributory negligence, and a refusal to set it aside.

INJURY TO PASSENGER BY FALL OF FIRE EXTINGUISHER.

Allen v. United Traction Co. (N. Y. Sup.), 73 N. Y. Supp. 737. Dec. 31, 1901.

A passenger was injured by the fall of a metal fire extinguisher. The third appellate division of the supreme court of New York says that had this extinguisher been securely fastened, the passenger would not have suffered injury. Its fall must have been due either to negligent fastening originally or to a negligent maintenance of a fastening originally sound. The fastening was beyond the reach of ordinary interference by those going to and from the car. That an outsider should have interfered and rendered insecure this fastening was most improbable. Wherefore, without deciding the degree of care required of the company in securing this extinguisher, the court is clearly of the opinion that the circumstances surrounding the happening of the accident pointed to some negligence on the part of the company which called for its explanation and holds that it was error to dismiss the passenger's complaint.

LIABILITY TO ASSESSMENT FOR STREET IMPROVEMENT OR REPAVING NOT IMPOSED.

State (Dean, Prosecutor) v. Mayor, Etc., of City of Paterson (N. J. Sup.), 50 Atl. Rep. 620. Nov. 29, 1901.

While the ties, rails, and other equipment of a street railway may partake of the nature of real estate, and be liable to general taxation as such, and may be benefited by a street improvement such as the repaving of a street, still, whether it is liable to assessment for such benefits the supreme court of New Jersey says, must depend upon the fair meaning of the governing statute. It thinks it clear, for example, that, under the act of June 13, 1898, which directs the assessment to be made in proportion to the benefits acquired by lands and real estate bordering on the street so improved, an assessment upon a street railway for benefits would be without authority.

Moreover, under the provisions of an ordinance requiring a street railway to keep and maintain the portion of a street inside its rails and for two feet outside of them in good and sufficient repair, the court holds that the company is not bound to repave within those limits with a new and different material selected by the city, nor is it liable to the expense of such repaving when laid down by the city.

RIGHT OF ABUTTER TO INJUNCTION AGAINST CONSTRUCTION OF ROAD.

Peck v. Schenectady Railway Co. (N. Y. Sup.), 73 N. Y. Supp. 704. Dec. 31, 1901.

The third appellate division of the supreme court of New York holds that the appropriation by a street railroad company of a street in which the abutting owner has the fee or title is the taking of private property, within the settled law of that state, and that such owner is entitled to an injunction against its construction, without his alleging damage. Nor does it consider that it is rendered otherwise by the offer of the company that the court should estimate the damage which such abutting owner would suffer by reason of its appropriation of any property rights which he might have, and also offering to give any undertaking which the court might require to indemnify him for any damages he might suffer by reason of the company's appropriation of his land. To hold that the court should, against his protest, assess the damage and grant an alternative judgment, it says, would practically deprive him of his constitutional right in that state to the assessment of such damage either by a jury or by a commission of not less than three persons. Furthermore, where it is not shown that the company has taken the preliminary steps required by the statute to authorize the condemnation of private property, and it is not already in possession, the court holds that the injunction should not be denied because of the company's offering to give adequate security for the payment of any compensation which might lawfully be found to be due the owner by reason of its appropriation of the land.

COMPANY NOT INSURED AGAINST LIABILITY FOR PASSENGER BEING INSTANTLY KILLED.

Worcester & Suburban Street Railway Co. v. Travelers' Insurance Co. (Mass.), 62 N. E. Rep. 364. Jan. 3, 1902.

The street railway company was insured "against loss from liability to every person," who might, during a period of twelve months from a time named, "accidentally sustain bodily injuries while traveling on the railroad of the insured, or while in the car or upon the railroad bed or other property of the insured, under circumstances which shall impose upon the insured a common law or statutory liability for such injuries." The question arose whether the terms of the policy were broad enough to cover the case where a person who was a traveler on this road died instantly, and without conscious suffering, in consequence of an acci-

dent for which the company was responsible. The supreme judicial court of Massachusetts says that the diligence of counsel furnished it with no case in which a policy in the terms of this one had been construed, and it was obliged to consider the case mainly upon general principles. Its decision is in favor of the insurance company. It says that the liability insured against was that to a person who sustained bodily injuries, and such person must have a right of action therefor, either at common law or by statute. The policy could not include the case of death, for which the person never had a right of action. In that commonwealth there is no common-law liability for death. Nor is there any statute which gives a right of action for the death of a person to his executor or administrator as an asset of the estate. In all the statutes which have allowed an executor or administrator to bring an action on account of the killing of a person by the negligence of a corporation or its servants the action is for the benefit of the widow, children, or next of kin.

LIABILITY FOR SAFETY OF STATION PLATFORMS.

Indianapolis Street Railway Co. v. Robinson (Ind.), 61 N. E. Rep. 936. Nov. 22, 1901.

In this case the supreme court of Indiana affirms a judgment for damages for permanent personal injuries sustained by a woman stepping upon a rotten board that broke under her, or into a hole in it, as she was crossing a platform at one of the company's stations on her way to its cars. The court says that if the situation at the time of the accident was such that the woman could not see the hole, or if there was nothing in the appearance of the decayed plank to indicate that it was liable to break, she was not negligent in stepping into the hole or upon the plank. By reason of an effort to shift the responsibility for the accident from the company to the crowd which pushed the woman into a place of danger, or prevented her from avoiding the place by the exercise of ordinary care, the court says that the company was bound to know that crowds might congregate upon its platform, and that injury to its intended passengers might result from defects in its platform under such circumstances. The presence and struggle of the crowd to get upon its cars only increased the danger of accidents from the unsafe platform. It did not relieve the company from responsibility for such accidents. It is settled by numerous decisions that railroad companies must provide means by which their passengers may safely enter their cars at stations, and must keep their platforms provided for that purpose in a safe condition. They are bound to know that if platforms become unsafe the lives and limbs of passengers are put in peril. Failure to keep such platform in a safe condition for the use of passengers entering or leaving their cars is a neglect of duty which makes the company liable to persons injured without fault on their part by reason of such defective platform.

MOVEMENT OF CAR BACKWARD FROM SLIPPING OF TROLLEY WHEEL.

Campbell v. Consolidated Traction Co. (Pa.), 50 Atl. Rep. 829. Jan. 6, 1902.

In front of a man seated in a wagon standing on a street railway track were two cars, the nearest being about 10 feet in advance of his horses, and a car was back of him, close to his wagon. On another track a car stood to his left, and to his right the street was crowded with people, so that he was completely hemmed in. As the second car in front of him moved ahead on an ascending grade, the trolley wheel slipped from the wire, and the car stopped, and then slipped backward about 60 feet, and struck the car back of it. Either the force of the collision drove the rear car against the man's horses and wagon, or the motorman of that car moved it backward to avoid a collision.

In affirming a judgment for damages in the man's favor, the supreme court of Pennsylvania says that the proof of the foregoing facts established a prima facie case for him. He was not bound to go further, and slow, by affirmative evidence, that the accident was an unavoidable one. He was in a place of apparent safety, and had no reason to apprehend danger from a backward movement of the cars. In the ordinary course of events such a movement was not to be expected. No extraneous cause interfered with

the company's control of its cars. The loss of control may have been a pure accident, or the result of mismanagement, or of defective appliances. If the slipping of the wheel was an accident which could not have been guarded against, the question would arise whether proper means had been provided to arrest the movement of the car in such an emergency; and, if so, whether proper use had been made of them. The case was one in which the proof of the accident and the attendant circumstances gave rise to a presumption of negligence, and made it incumbent on the company to show that due care had been used. Whether this was shown was necessarily for the jury.

OWNER OF TRACK NOT LIABLE FOR A USER'S PASSENGER BEING STRUCK BY TREE.

Sias v. Rochester Railway Co. (N. Y.), 62 N. E. Rep. 132. Dec. 20, 1901.

A passenger on a car of a suburban electric trolley road which used the tracks of another company in the city while standing upon the platform and projecting his person beyond the side of the car was struck upon the head by a tree standing within one foot and seven inches of the rail, receiving fatal injuries. This was in the city. There was no lease of either road, and each company operated and managed its own trains of cars. And notwithstanding that the contract of the passenger for his carriage was with the suburban company, it was sought to make the other company liable for the results of the accident, the negligence relied upon to create the liability consisting in the construction of its railway in such close proximity to a tree. But the court of appeals of New York does not think that the company sued was chargeable, upon the proofs, with the neglect of any duty owing to this passenger on the other company's car, and it holds that for that reason the dismissal of the complaint was proper. It says that the company sued sustained no contractual relations to that passenger, and none such could be predicated upon a mere traffic arrangement between the two companies, which permitted the suburban company, for a compensation, to run its cars over the tracks of the company sued. The company sued had the right to construct its tracks as and where it did, and what duty of care and precaution it was under for the safe operation of its cars it owed to its passengers. How it performed its duty, the court was not informed, and it says it was immaterial here. It knew that cars could pass the tree. If there was any negligence, from which the passenger in question suffered, it could only have been in the manner in which the suburban company operated its cars upon such a track. If the construction of its cars was defective, or if their operation and management were such as not to furnish adequate security for passengers, then that company would be at fault.

WHERE DUTY IS TO KEEP IN REPAIR SURFACE OF STREET ALONG TRACKS.

Leary v. Boston Elevated Railway Co. (Mass.), 62 N. E. Rep. 1. Jan. 1, 1902.

Section 32 of chapter 113 of the Public Statutes of Massachusetts provides that a street railway corporation shall keep in repair, to the satisfaction of certain officers therein named, simply "the paving, upper planking or other surface materials" of the part of the street covered by its tracks, and, in the case of an unpaved street, an additional space of 18 inches upon each side of its tracks. Under this statute the railway corporation, the supreme judicial court of Massachusetts says, is no longer required, as formerly, to keep in repair the whole of that part of the street covered by its tracks, but only the surface thereof. This limited liability cannot be construed as imposing upon the corporation the duty of filling an excavation from the bottom. It is only when the excavation has been so filled by the municipality or other party upon whom rests the general responsibility for the safety of the street as to reach the plane where surface material is required that the duty of the railway company begins, and it is only when its duty begins that it can be held answerable for the condition of the street and then only to the extent of that duty.

In this case, it appeared that the corporation in question owned and operated a street railway with tracks in a street which the

court assumes was unpaved. A trench was dug so as to come within 18 inches of the track, by a party, under a permit, it was said, from the city, for the purpose of constructing a sewer in the street. If so, then the opening, the court holds, was legally made, and the corporation had no authority to close it; and while the trench was legally there it was not charged with the duty of keeping in repair the portion of the street within the lines of the trench until the latter had been so far filled as to call upon it to fix the surface. Until that time arrived, there was no surface to be cared for by the corporation, and the responsibility for the condition of the street and the duty of protecting travelers, either by guards or otherwise, were upon the city.

BICYCLIST BOUND TO LOOK AND LISTEN BEFORE CROSSING TRACK—DOMINANT RIGHT OF COMPANY—GETTING ON OR OFF MOVING CAR.

McCracken v. Consolidated Traction Co. (Pa.), 50 Atl. Rep. 830. Jan. 6, 1902.

The supreme court of Pennsylvania says that in this case both a bicyclist and the company attempted to use one particular place on the track at the same instant of time. The dominant right to the track was in the company. That right must be conceded and deferred to by all of the public who have a right to cross. When about to cross they must use ordinary prudence to ascertain whether the owner of the track is about to use it. This bicyclist was bound to look and listen before crossing. A bicyclist is not exempt from observing the caution imposed upon all others of the public about to cross railway tracks. To hold otherwise would be to give the bicyclist a right on the tracks superior to that of the railway company. As a necessary preventive of accident, the court would be compelled then to hold that the motorman must stop and look out for the bicyclist. In passing on the question as to whether the bicycle is a vehicle chargeable with toll on turnpikes, this court has held that it was; therefore in propelling his vehicle the rider was bound to exercise in some degree the care of a driver of a team.

Again, the court says that it is per se negligence, or negligence in and of itself, to get on or off a moving car, yet we see usually prudent and careful men every day commit that act, and comparatively few are injured; but nevertheless it is negligence. Many persons usually careful attempt to cross in front of a moving car; many do not stop, look, and listen when about to use the crossing of a steam railroad. While the fear of death or mangling ought to prompt care, this court knows from long observation of the appeals in it that in very many cases it does not. The court cannot, therefore, assume that it is incredible that this bicyclist attempted to cross in front of a rapidly moving car in full view. It is possible, but not probable, that when he made up his mind to cross the car was 100 or 200 feet distant; but where was it just as he approached the first rail? He was then bound to look. It was then just about one second in time distant, about the time it took him to cross the roadbed. If he then looked, as he was bound to do, he saw it, and was negligent in attempting to cross. If he did not look, it was negligence in him not to do so. There was no imperious necessity dictated by hastily formed judgment impelling him to go straight on, as in cases where a man by no fault of his own is in peril. He was then still in a place of safety. He could have stopped and dismounted, or he could have kept outside of the rail on the same side of the road. To argue that he could not cross because a car, when he saw it, 500 feet off, with out fault on his part ran him down, is at war with every man's senses and experience derived from observation. The car obviously had only to traverse as many feet on the rails as would equal his time in the 17½ feet crossing them.

CARE REQUIRED FOR PROTECTION OF PERSONS AT RETURN STATIONS IN PARKS.

Mehlhaase v. Monongahela Street Railway Co. (Pa.), 50 Atl. Rep. 937. Jan. 6, 1902.

A carrier, the supreme court of Pennsylvania holds, must furnish a safe and efficient means of ingress to and egress from its trains. It is likewise incumbent upon it to exercise ordinary care in protecting from danger persons assembled at its stations,

intending to depart by its trains. Rudeness and bad manners of strangers and intending passengers, resulting in injuries, will not convict a carrier of negligence. Such conduct is not to be anticipated, and the carrier is not required to provide against it. But when a street car company invites the public to use its line to visit a park or other public place of amusement or recreation, and thereby induces large crowds of people to assemble at its stations in such place, the corporation must use reasonable care in handling the people and in protecting them from injuries arising from the conduct of the crowd in entering and leaving its cars.

That many people will collect at the stations on such occasions, the corporation must anticipate, and it is obligatory on it to see that its station accommodations and means for assuring the safety of its intending passengers are commensurate to the crowd which is likely to assemble. It is the experience of every one, and especially of those who operate street cars, that large bodies of people awaiting transportation rush on the car to secure seats immediately on its arrival at the station, regardless of consequences to individuals; and this is true of all classes of people. This fact the corporation is presumed to know, and to use proper care in controlling the crowd and guarding against the dangers arising from its probable conduct. What means shall be employed to insure the safety of persons on such occasions must be left to the corporation, subject, however, when the question is raised, to the approval or disapproval of the proper legal tribunal.

In this case, a boy standing one Sunday evening, at about three feet from the track in an inclosure for taking cars in a park was knocked under the car wheel by the crowd which rushed for a car hanging on it and projecting from the running board striking his sister, causing her to fall against him. In affirming a judgment in his favor for damages, the court points out that large crowds were attracted to the park by the advertisements and inducements held out by the company, whose street car lines furnished the means of transportation to and from it, and whose cars and stations were crowded on such occasions, on this one not in excess of other similar occasions, and it says that it was therefore clearly the company's duty to anticipate the size of the crowd that would assemble at the station on the evening of the accident, and to make suitable arrangements for its control and management. The case it says was necessarily carried to the jury on the question of the company's negligence by evidence that there were 150 to 200 people at the station, ready and anxious to board the first departing car, when but a single open car entered to carry them to their destination, and this at an excessive rate of speed, much beyond what the safety of the people awaiting it permitted, and that there was no person in charge of the gateway used as an entrance to the station, nor was there any officer or person at the station to control or direct the movements of the crowd.

CROSSING DIAGONALLY IN FRONT OF CAR TO TAKE SAME—CAR NOT STOPPING—HEARING RUMBLING AND NOT LOOKING SECOND TIME.

Copeland v. Metropolitan Street Railway Co. (N. Y. Sup.), 73 N. Y. Supp. 856. Jan. 10, 1902.

A woman started diagonally across a street crossing to be in position to take a car. Before proceeding, she had observed the position of an approaching car, which, when she was near the track, she saw half a block away, and observed at that moment that her son, who was with her, gave a signal to stop it. She, no doubt, thought that the signal would cause the car to slow down or to stop, and it would seem that in such event she would have crossed in safety, because without the motorman having done anything, so far as appeared, to check the speed of the car, she had almost reached the sidewalk, and was in the act of placing her left foot thereon, when she was struck by the rapidly passing car, which did not stop after the accident occurred until it had gone two lengths further on. Under these circumstances, the first appellate division of the supreme court of New York thinks that the question of contributory negligence, as well as that of the company's negligence, should have been submitted to the jury, and that the dismissal of the complaint at the close of the plaintiff's case was error, for which the judgment should be reversed, and a new trial ordered.

The woman's judgment that she could cross in safety, the court thinks the foregoing showed, was in fault only because of the fact that the motorman had decided not to stop, and did not, in answer to the signal, slow down; nor did he, by the ringing of the bell, notify her of his intentions. Had he rung the bell, thus indicating the nearness of the car, she could have accelerated her steps and reached a point of safety. It could not be said that, as matter of law, she was guilty of contributory negligence, since it appeared she had seen the car at a distance which she thought sufficient to enable her to cross in safety, and her judgment was at fault only because the unusual and exceptional thing occurred,—of the motorman, after the signal was given him to stop, and while she was in plain sight, crossing the track, failing to stop or slow down at the crossing, or to give warning, by ringing the bell, of his intention to proceed at undiminished speed.

There were two circumstances which would, no doubt, the court goes on to say, have some weight with the jury, namely, that after seeing the car when near the track, and starting to cross it diagonally, the woman did not again look, and that during such time she heard the rumbling of the wheels. The rumbling, in itself, however, would not be a warning, because she had heard this when the car was half a block away, and she expected such sound to continue until the car stopped at the crossing. And, as to her failure to look at the car, she could not very well do so, considering the direction in which she was walking, without turning nearly around; and not only would this have been difficult, but it would have tended to retard her progress, and thus increase the risk of reaching the sidewalk in safety. These circumstances, as stated, were to be considered by the jury; but they were not, in the court's opinion, sufficient to justify the inference, as matter of law, that the woman was guilty of contributory negligence.

DUTY TO PASSENGER TO SOUND GONG AND TO TRY TO AVOID COLLISION WITH VEHICLE.

West Chicago Street Railroad Co. v. Tuerk (Ill.), 61 N. E. Rep. 1087. Dec. 18, 1901.

This action was brought to recover for personal injuries which a passenger on a cable train sustained in a collision of the latter with a buggy. It appeared that the buggy had been driven several blocks along the same avenue that the train was running; that it would sometimes be behind the train, and sometimes ahead of it; that most of the time it was out of the track; that it was driven rapidly, and sometimes passed the train and sometimes was passed by the train; and that shortly before the accident, because of obstructions in the street, it had to be driven on the track along the street. Now, if the driver of the buggy, instead of a passenger on the train, had been suing the company, it might be, the supreme court of Illinois says, that there was such knowledge brought home to him that he would have been deemed, in law, to have not exercised ordinary care for his own safety, because of his knowledge of the presence of the train, or its proximity to him, and, under such state of the case, would not have been in a position to insist that the mere failure of the company to sound the bell was negligence, inasmuch as he might be deemed to know just what the sounding of the bell would inform him.

The duty of the company in this case, however, was not to be measured by the relative rights of the driver of the buggy and the company, but by the rights arising from the relation existing between it and the passenger. There was no pretense that she was not using all the care she could use for her own safety, and the question that was presented to the jury was, did the company use all the care for her safety that it was its duty under the circumstances of the case? While it might be that it could say to the driver of the buggy, "You have no right to complain. You knew our train was running on this track at that particular time, and near to you; and ordinary care required that you use reasonable effort to avoid injury, and that reasonable effort would have required you to have driven off our track, or, when off, to have remained off until we passed with our train." Yet the passenger had the right to demand and rely upon the company exercising every act that human care, vigilance and foresight could reasonably do, consistent with the operation of its road, to avoid injury to her; the court declares that it is unable to say that the judge should

have instructed the jury that it was not the company's duty to ring the bell, or to do any other and every other act that was calculated to avoid this injury. This was especially so in view of the fact that the train was running at full speed, and that it was not pretended that the company's servants in charge of the train did not know that the buggy was on the track, or that they did not see it.

Wherefore, the court holds it was not error to refuse an instruction in this case that, because the driver of the buggy knew that the train was traveling in the same direction he was driving, it was immaterial whether the bell or gong on the train was sounded or not, which meant the same as to say that the failure to ring the bell was not negligence. The declaration contained a general charge of negligence, and it was a question of fact for the jury to determine whether, under all the facts and circumstances, the company was guilty of such negligence as made it liable. Judgment against company affirmed.

VALIDITY AND EFFECT OF ORDINANCE REQUIRING REPAIR OF PAVEMENT—EVIDENCE OF NEGLIGENCE—NOTICE IMMATERIAL—INJURY OF PASSENGER PASSING BEHIND CAR.

Fielders v. North Jersey Street Railway Co. (N. J. Sup.), 50 Atl. Rep. 533. Nov. 11, 1901.

A city ordinance, passed under due legislative authority to regulate street railways, that require operating companies to repave and keep in repair, to the satisfaction of the proper city authorities, in any paved street of the city in which their tracks are or shall be laid, a space between lines one foot outside of their outer rails, under penalty that, on default after notice, the city may repair at the company's cost, the supreme court of New Jersey holds, is a valid police regulation, creating a duty towards the traveling public, and is evidential in an action for negligence brought against such a company by a passenger who is injured through a defect in that part of the street pavement while passing from car to sidewalk. In such a case the ordained duty is absolute, and not dependent on notice. It is immaterial whether the defective pavement was laid under the ordinance, or previously laid and fallen into repair.

In this case, there was evidence that the passenger alighted at the only place afforded for that purpose from a car which was stopped for her at a crosswalk. By direction of the conductor, she passed behind the car towards her destination, pointed out by the conductor, on the opposite side of the street. In so doing she was injured through a defect in the pavement adjoining the cross walk, at a place where it was the duty of the company to keep the pavement in repair. The defect had existed for upwards of two months. She did not see, and had no warning of, the danger. Under these circumstances, the court holds that it would not have been lawful for the trial judge to have held either that no negligence chargeable to the company had been proved, or that the negligence of the passenger indisputably contributed to her injury. The case, in both aspects, was for the jury.

As to the company, the court says, negligence was fairly inferable from a management of affairs that permitted the passenger, without warning, to alight from and pass behind the car when so overhanging the cross walk as to make her encounter a dangerous defect long existent in the pavement. When to this was added the ordained duty of the company to have kept the pavement in repair, negligence was hardly disputable. With regard to the contention that a passenger alighting from a street car should be held to take the risks of defects in the highway, the court says that depends upon circumstances, a most important one in this case being that the defect was a result of the carrier's breach of duty. Where a duty is imposed by law to keep a highway in good condition, an action lies for injury sustained by reason of the neglect of that duty. That the fulfillment of the requirement to repair was to be measured by the satisfaction of the board of street and water commissioners, the court says, was immaterial, as was also a provision for the city's making repairs at the company's cost on default after notice. The failure of the board to act would not be proof that it was satisfied with the condition of the pavement, nor did the provision for notice imply that no repair need be made except upon notice.

COST OF CAR REPAIRS—NORTH JERSEY STREET RAILWAY CO.

(See page 224)

CLOSED CARS.																																							
Class I.—42 Cars.				Class III.—55 Cars.				Class IV.—44 Cars.				Class V.—37 Cars.				Class VI.—26 Cars.				Class VII.—30 Cars.																			
West. No. 3 G. E. 800 G. E. 1000		Peck. 6 A Brill Max. Tract Brill 21A		Steph. 16 ft. and 18 ft. Gilbert 24 ft. Rogers 24 ft. American 18 ft. Brill 16 ft.		Mileage		West. No. 3 G. E. 1000		Brill Max. Tract.		Brill 22 ft.		Mileage		G. E. 1000		Brill 27D		Brill 25 ft.		Mileage		G. E. 57		Brill 27D		Brill 25 ft.		Mileage		G. E. 1200 G. E. 1000		Brill 23		Laclede 25 ft.		Mileage	
Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage	
Total for year 1901		\$6,167.84	\$2,274.62	\$2,222.94	808,998	\$16,192.66	\$4,600.30	\$3,692.03	1,510,148	\$9,404.04	\$4,455.92	\$4,116.23	1,158,699	\$10,587.93	\$3,880.17	\$1,612.84	993,195	\$3,335.74	\$3,022.10	\$1,497.33	651,144	\$5,811.52	\$3,596.21	\$5,364.51	548,695														
Av. Cost per 1901		.076	.028	.027		.096	.030	.024		.002	.038	.0036		.0106	.0029	.0016		.0051	.0046	.0023		.0106	.0064	.0078															
Car Mile 1900		.0097	.0032	.0103		.0095	.0034	.0095		.0095	.0034	.0006		.0093	.0029	.0016		.0093	.0037	.0059		.0114	.0054	.0023															

CLOSED CARS.																																															
Class VIII.—68 Cars.				Class IX.—52 Cars.				Class X.—20 Cars.				Class XI.—30 Cars.				Class XII.—50 Cars.				Class XIII.—46 Cars.																											
West. No. 3		Peckham Standard Brill 21A Remis		Brill 18 ft.		Mileage		G. E. 800		Peckham Standard		Brill 20 ft.		Mileage		G. E. 57		Brill 27D		Brill 32 ft.		Mileage		G. E. 57		Peckham Special		Laclede 32 ft.		Mileage		G. E. 57		Brill 27G		Laclede 32 ft.		Mileage		G. E. 57		Peckham 14-31-3		Laclede 32 ft.		Mileage	
Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage									
Total for year 1901		\$16,050.64	\$6,487.67	\$7,253.59	1,891,353	\$10,062.84	\$4,510.73	\$5,095.78	1,332,947	\$4,202.78	\$2,401.18	\$757.45	480,106	\$6,148.76	\$3,346.29	\$3,776.36	702,103	\$8,554.52	\$4,399.55	\$5,799.52	1,172,170	\$6,792.18	\$3,933.86	\$3,433.55	1,659,137																						
Av. Cost per 1901		.085	.034	.038		.075	.034	.038		.007	.0050	.0015		.0088	.0048	.0054		.061	.037	.040		.041	.023	.021																							
Car Mile 1900		.0097	.0034	.0063		.0068	.0040	.0031		.0078	.0041	.0046		.0099	.0045	.0018		.0040	.0021	.0011		.0024	.0012	.0005																							

OPEN CARS.																																										
Class I.—62 Cars.				Class II.—40 Cars.				Class III.—89 Cars.				Class IV.—32 Cars.				Class V.—50 Cars.																										
West. No. 3		Peck. 6 Ex. Brill 21C		Stephens' 9-bench		Mileage		G. E. 800		Brill 21C		Brill 9-bench		Mileage		West. No. 3		Brill 21C		Laclede 9-bench		Mileage		West. No. 3 G. E. 800		Brill 21A Peck. 6 Ex.		American (Rebuilt)		Mileage		West. No. 3 G. E. 57		Brill 27D		St. Louis 15-bench		Mileage				
Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage		Electrical Equip'm't		Trucks		Bodies		Mileage				
Total for year 1901		\$4,305.25	\$1,087.44	\$4,575.39	545,042	\$3,327.60	\$3,338.49	\$2,105.25	447,177	\$8,641.30	\$1,773.34	\$12,452.50	807,208	\$1,314.96	\$4,203	\$1,645.30	184,462	\$4,113.46	\$1,187.95	\$3,461.75	622,414																					
Av. Cost per 1901		.078	.029	.084		.074	.011	.047		.0107	.0022	.0154		.0071	.0023	.0089		.067	.019	.055		.027	.022	.039																		
Car Mile 1900		.0135	.0041			.0073	.0024	.0008		.0106	.0027	.0043		.0071	.0023	.0089		.0077	.0022	.0039																						

Repair Shops of the North Jersey Street Railway Co.

Describing Machines and Devices for Facilitating Repairs—Wire Cleaning and Coil Winding Machine—
Device for Testing Armatures—Special Armature Pit Truck—Special Car Hoist—
Complete List of Prices for All Street Car Repair Work.

We are indebted to the officials of the North Jersey Street Railway Co. for the privilege of inspecting the repair shops of the company at Newark, N. J., where practically all the repair and maintenance work on some 800 cars is done. Many of the records of the company have been placed at our disposal and we are able to present in this article statements of cost in detail of the various classes of equipment, together with other records, statistics and data, never before published to our knowledge.

The repair shops occupy a group of buildings with considerable yard space on the Plank Road near the center of Newark. The company is somewhat cramped for room, and this has necessitated the placing of the machine shop, armature department and storeroom on the second floor of the main building. To overcome this difficulty, electrically operated elevators are placed at convenient points and by means of the excellent shop methods employed, labor saving devices and good management, work is pushed through without interruption or delay.

All repairs to rolling stock, including painting and carpenter work, are under the supervision of Mr. F. F. Bodler, master mechanic. The shops are divided into five departments, namely, motor and truck department, armature department, machine shop, carpenter shop and paint shop. Each of these divisions has its own foreman, who reports directly to the master mechanic. The black-

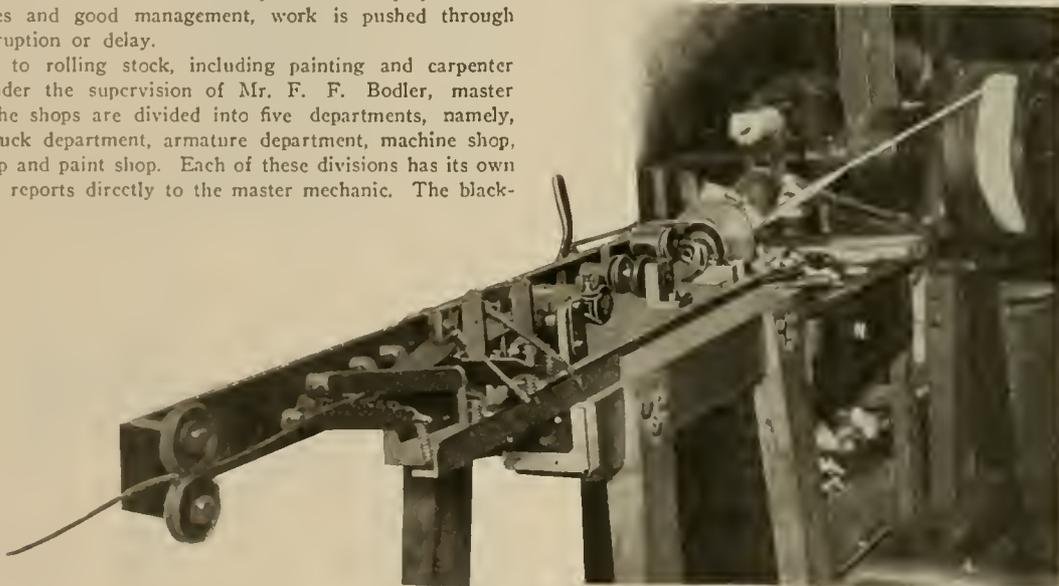
smith shop is under the foreman of the carpenter shop. In the motor repair department, in addition to the foreman, there are three inspectors, two assigned to house work and one to road work. It is the duty of this road inspector to take each car after it has been through the shops and give it a thorough running test on a spur track about a mile in length. He makes a final inspection of the controllers, switches, motors, wiring, etc., and he must give each car a clean bill of condition, as it were, before it goes back into service.

The company's system of keeping repair records is unique in many respects, and is exceedingly thorough and minute.

Much of the data desired from the master mechanic's department naturally centers about the car-mileage records. The mileage made by each car is entered in a large book ruled with columns about 1 1/2 in. wide. These columns are numbered consecutively at the top and the number for each car and the mileage figures are entered monthly from data furnished by the auditing department, the car-miles run being computed from the conductor's train sheets. From this car mileage book, all other mileage figures for separate portions of the equipment are made up. Every armature, all wheels, controllers, truck gears and pinions, registers and other parts are stamped with individual numbers, and by means of these numbers records are kept of the car on which each part of the equipment is running, together with the date it was placed in the car and the date it was taken off. The "miles run" for any part for any particular period are therefore easily determined by reference to the large book. Supplementing this, a separate book is kept for arma-

tures and also for car wheels, in which a complete history of each armature and wheel is entered, making it an easy matter to determine for instance, when an armature was purchased, what cars it has run in and the length of time, how often it has been in the shop, and what repairs have been made upon it.

The master mechanic keeps in close touch with the men under him, and with all work passing through the shops by means of daily reports from his department foremen. For instance, the foreman of the repair shop sends to the office before 10 o'clock in the morning of each day, a report covering the previous day, and giving the total number of men on duty, the total number of men off duty and the number of men on each class of work classified as painters, machinists, tinsmiths, register repairers, electricians, winders, etc.



MACHINE FOR CLEANING AND RETAPING WIRE.

He also gives a list by number, of the cars in his department for the day, the number of men that work on each car and the nature of the repairs. This enables the master mechanic to keep track of each car in the shop as the work progresses from day to day and if the work is taking too long in view of the repairs required, he is enabled to make inquiries and determine the cause of the delay.

Another report that greatly facilitates the work at the shops is one made by the motor shop foreman. This gives a list of crippled cars at the shop, the cars in the paint and carpenter shops and the crippled cars reported the previous day from each of the different divisions but not yet at the shop, and the crippled cars reported during the morning of the current day. The report is made on a blank 14 1/2 x 7 in. with 2 columns for each division of the system, one column for the car number and one for the cause of the disability. The foreman obtains this information by calling each morning by telephone the superintendent of each division and asking him what disabled cars are at the division barns and what cars will probably need repairs during the next day. It will be seen that this information enables the master mechanic to arrange his working forces, floor space, etc., in accordance with the work that may be expected for the following 24 hours. From this report he is enabled to give intelligent orders as to what cars shall be ordered into the shops and if his space is limited what cars may properly be continued in service for a few hours longer, or until he can provide for their reception at the repair shops. He is also in a position to engage help in advance and lay off men when necessary, thus distributing his forces to the best advantage. The value of this feature cannot

NORTH JERSEY STREET RAILWAY CO.
RECORD OF WORK ON CARS.

Work on... of..... Car No..... Received..... 100
 Nature of Work, No. 1 end..... SUBORDERS TO
 No. 2 end.....
 Names of Workmen.....
 Completed and inspected..... 100 In Charge.

NATURE OF REPAIRS	AMOUNT
Controllers, . . .	
Arm. and Fields, . . .	
Inspecting, . . .	
Bearings, . . .	
Trolleys, . . .	
Gears and Pinions	
El. Brakes, . . .	
Misc. El., . . .	
Brakes, . . .	
Journals, . . .	
Wheels, . . .	
Misc. Truck, . . .	
Sand Box, . . .	
Glass, . . .	
Fenders, . . .	
Misc. Body, . . .	
TOTAL, . . .	

FORM 1- REPAIR CARD.

be over-estimated, although it is one that is very frequently neglected by street railway companies.

When a car comes into the shop for any repair work whatsoever, the shop foreman makes out a card similar to the form reproduced in Form 1. The face of this card shows the nature of the work to be done. The foreman then writes sub-orders upon the foremen of each of the other departments for the work to be done upon the parts coming under the several departments of the shop, whether armature, machine shop, carpenter shop, etc. The sub-orders are made upon cards exactly similar to the one reproduced in Form 1, but of different color. After each class of work is completed, the foreman enters in the column at the right, under "Amount" the cost for labor on each job. On the reverse side of the card he enters the quantity of material and the cost of same. All the cards for each job bear the same serial number. The cards are sent to the office where they are assembled by job numbers, and the complete set of five cards (one for each department) gives the history of each job, including the amount paid for labor, and the amount for material. After entry in the proper book, each set of

the cards is filed in a cardboard filing case, about 9x4 1/2 in. x 1 in. thick. These boxes are set on edge in filing cases, and each one bears a separate car number. The box for each car therefore contains a record of all the repairs that have been made on that particular car.

The column headings of the book in which entries are made from the shop cards are shown in Form 2. As will be seen repairs are divided into electrical maintenance, maintenance of trucks and maintenance of bodies, with sub-headings for each of the various parts of the equipment.

In one of the tables accompanying is given the cost of repairs for two years on all cars of the North Jersey system. The equipment is divided into classes according to the type of motors, trucks and bodies. It will be understood in examining these records that the combination of trucks, electrical equipment and length of body will have considerable influence upon the cost of repairs. For instance, certain types of motors are better fitted for service with certain types of trucks, and so on. The number of the class indicates to some extent the relative age of the equipment and it is interesting to trace the influence of age upon the cost of maintenance.

These shops are somewhat unusual in that all repair work is done upon the piece work system and the foremen are practically the only employes of the shop who have a fixed salary. This piece system has given results satisfactory alike to the company and the men, as the employe finds that he makes more per week in the aggregate, and the company finds that it is able to accomplish more work with the same force of men than would be the case if the men worked on stipulated wages. The company also finds it possible to hold the men more thoroughly responsible for their work as when they are working on their own time they are required to remedy defects on their jobs due to carelessness or poor workmanship. For the information of officials who are consid-

Form No. 24. 3-22-100 M.

NORTH JERSEY STREET RAILWAY CO.
MACHINE SHOP TIME CARD.

Date,..... Car No.....
 Order No.....
 Nature of Occupation,.....
 Name,.....
 Time began,..... Time finished,.....
 Hours work,..... Rate,..... Amt,.....

DO NOT FOLD OR ROLL THIS SLIP.

NATURE OF REPAIRS.	TIME.	AMOUNT.
Controllers, . . .		
Arm. and Fields, . . .		
Inspecting, . . .		
Bearings, . . .		
Trolleys, . . .		
Gears and Pinions, . . .		
El. Brakes, . . .		
Misc. El., . . .		
Brakes, . . .		
Journals, . . .		
Wheels, . . .		
Misc. Truck, . . .		
Sand Box, . . .		
Fender, . . .		
Misc. Body, . . .		
Accident, . . .		
Other than Cars, . . .		

FORM 3-TIME CARD.

ELECTRICAL MAINTENANCE	MAINTENANCE OF TRUCKS			MAINTENANCE OF BODY			ACCIDENT		IMPROVEMENT						
	WIRING	GRAS	EL. BRKES	BRKES	JOURNALS	WHEELS	MISC.	SAND BOX	GLASS	FENDERS	MISC.	ACCT.	ACCT.	Description	AMOUNT
ARM. AND GREASING, FIELD INSPECTG.															
CONTROLLERS															

FORM 2 HEADINGS FROM REPAIR RECORD BOOK.

ering the advantages of the piece system, we give in this article a detailed schedule of prices paid by the North Jersey Company for all classes of car repair work. This schedule will also contain information of interest for comparison purposes to companies that hire their men at stipulated rates per day or per hour. In Form 3 is given the time card, which is made out by the men for each job that they do. These cards are approved by the foreman, and from them are made out the weekly payrolls. The paymaster vis-



ARMATURE TESTING DEVICE.

its the shop once a week and each man is required to sign his name on the payroll as receipt for wages paid him.

APPARATUS AND METHODS FOR TESTING.

The shops are equipped with a number of novel testing devices, both for insuring good work and also for securing data from which to determine the comparative merits of various supplies brought to the attention of the company.

A testing device for determining the condition of the armatures is illustrated. Briefly this consists of a magnetic core, formed of segments of sheet iron or steel, having wound about its center a coil consisting of about 1,200 turns of No. 19 B & S double covered cotton wire. The face of the laminated core is curved to fit roughly the contour of the armature. As shown, the core is mounted on a frame with screw attachment giving it considerable range of motion. The device is for locating short circuited coils in the armature and employ what has been termed the alternating-current method. That is, an alternating current of about 250 volts with a frequency of 60 is passed through the coil making a strong magnet of the laminated core. When the face of this core is brought in close proximity to an armature, an induced current will be caused in any coil or set of coils that may form a closed circuit. By slowly revolving the armature in this magnetic field the defective coils may be readily determined by holding a small strip of iron just above the surface of the armature. When the short circuited coil passes beneath the iron strip, the induced current will cause the iron piece to vibrate rapidly in synchronism with the alternations of the current.

The current for the testing apparatus is secured from an old S.

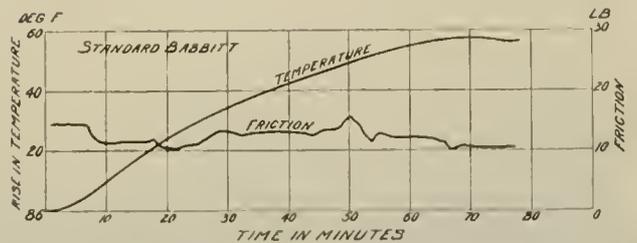
R. G. 30 direct-current motor rewound to act as a converter giving from its alternating current side, as stated, a 250-volt alternating current. Close to this motor are placed two small transformers with which it is possible to secure a 1,700-volt current for making ground tests. The iron frame carrying the magnetic core described is mounted on wheels and can be moved to any bench or lathe in the shop as desired. The upright rods upon which the core slides are of brass for the reason that brass will not conduct the magnetic lines of force and these are therefore concentrated on the core. The wires carrying the alternating current are suspended from the ceiling and have leads off at frequent intervals connecting to the machine by means of an ordinary lamp socket. Armatures are tested with this apparatus after winding, after soldering and after the commutator bars have been turned down.

The armatures are also put through a running test in which they are mounted by pairs in motor cases and made to run, one as a motor and the other as a generator for about 20 minutes. The connections are then reversed at the switchboard so that the relation between the machines is changed, the motor then running as the dynamo and vice versa.

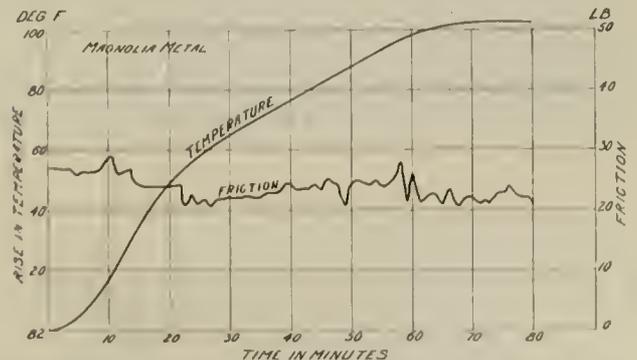
TESTS OF BABBITT METAL.

Mr. Bodler some time ago carried out a very interesting series of tests on babbitt bearings made from different compositions. For carrying on these experiments the bearing to be tested was mounted on a shaft and by means of levers similar to a "walking beam" weighing machine, about 300 lb. pressure was brought against each half of the lower side of the bearing. The relative frictional properties of the different metals was determined by the weight it was necessary to add to one of the levers in order to preserve an equilibrium between the two 300 lb. weights when the shaft was rotated. It will be understood this is not an accurate determination of the co-efficient of friction of the metals, but it is a fairly accurate comparative test of the frictional properties. The rise in temperature was determined by pressing the bulb of a thermometer on to the bearing metal through a small hole in the shell. Three of the curves secured are illustrated herewith. The curve for "Standard" babbitt is taken from the metal now used exclusively by the company for all armature and motor bearings. This metal is made from the following formula:

- Tin80 per cent.
- Antimony15 per cent.
- Copper4½ per cent.
- Lead½ per cent.



Hegerty summer motor grease. Copper feeder. Grease cup freshly filled. "Standard" Babbitt 2½-in. bearing. Load, 600 lb. Av. speed 524 r. p. m. Temperature at start 86° F.



Grease cup freshly filled (same as with "Standard"). Magnolia metal 2½-in. bearing. Load, 600 lb. Av. speed 524 r. p. m. Temperature at start 82° F.

TESTS OF BEARING METALS.



G. E. Babbitt. Load 600 lb. Av. speed, 520 r. p. m. Temperature at start, 53° F. TEST OF BEARING METAL.

Babbitt bearings are cast in iron moulds, it of course being necessary to have a different mould for each type of motor in service. After pouring the bearings are bored in a small lathe. The experiment is being tried of boring the bearings just a trifle off center, thus securing a greater thickness of babbitt in the lower half of the bearing where the greatest wear takes place. Shells so treated have not been in service long enough to determine the success of the idea, but no trouble is anticipated and it is believed the bearings will run a greater mileage without repouring. The oil grooves are cut with a pneumatic gouging tool.

WHEELS AND WHEEL RECORDS.

The North Jersey company has been giving especial attention to the subject of wheels in response to the demand made by certain "public improvement" officials of Newark, who have succeeded in having an ordinance passed fining the Street Railway Co. \$50 per car for each day it permits the car to run with a flat wheel. The effort of these guardians of the public welfare to abolish the flat wheel would be amusing if the matter were not so serious, and we could suggest no better method of convincing them of the difficulties in the way of solving this flat wheel problem than to invite them to take charge of a street railway repair shop for about a week. However, it is the desire of the company to do all in its power to improve its service and to this end very careful wheel records are being kept and the subject of proper dimensions and compositions for wheels, the advantages of grinding wheels and other matters in this connection have been carefully considered.

The company is now using three types of wheels: a 400-lb. New York Car Wheel Works chilled wheel with 2¼ tread and ¾ in. flange; a 7-spoke cast steel wheel, and the St. Louis Car Wheel Co's. re-enforced spoke wheel.

We append some of the wheel records:

From Jan. 3, 1901, to Jan. 1, 1902, 1,764 chilled iron wheels were shipped back to the makers for cause. These made an aggregate

or broken tread, 1 had loose spoke and 2 had cracked hub. Several of these wheels made individual records of over 80,000 miles.

The wheel shop is equipped with 1 wheel press, 1 boring machine, a Springfield wheel grinder, 1 lathe, 1 keyseating machine and 1 axle straightener. It is customary to regrind wheels whenever it



ARMATURE PIT JACK.

is thought the prolonged life so gained will justify the trouble involved.

CAR HOIST.

There has been in use at these shops for some time a hoist for raising car bodies for the purpose of removing wheels and trucks. Recently plans have been prepared for an improved form of this hoist and these plans appear in this article. With the aid of these drawings it will be seen that the device consists of a frame suspended from the ceiling girders over the car pits. The frame



WHEEL PLATFORMS.

of 63,982,731 miles or an average of 36,271 miles per wheel. Of the wheels making the highest individual records, one wheel made 92,346 miles and was removed as practically worn out; one made 91,669 miles, worn out; one made 91,688 miles and was removed on account of cracked hub; one made 90,143 miles and was removed on account of double flange.

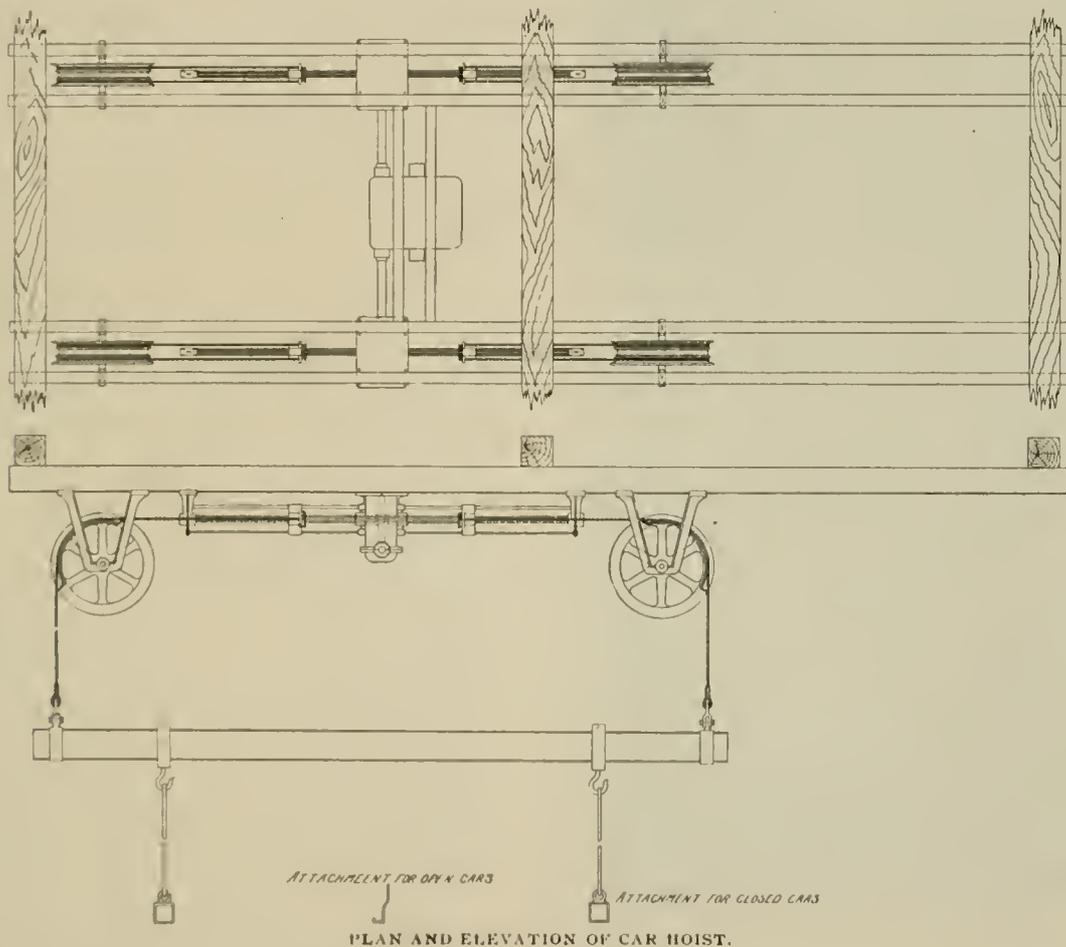
Of 143 steel wheels removed for causes, 1 was broken, 14 were small diameter, 32 had thin flange, 46 developed blow holes, 24 had double flange, 4 had broken flange, 1 had soft spot, 18 had cracked

work consists of four 12-in. I-beams about 25 ft. long and the two inside beams spaced far enough apart to clear widest car body. At the center of these are cross I-beams supporting the direct current railway motor, which drives a shaft about 11 ft. long by 3 in. in diameter. The two ends of this shaft are provided, one with right hand worm and the other with left hand worm, these worms being 5½ in. in diameter by 1½ in. pitch. These worms engage the worm wheels which are about 18 in. in diameter, 2½ in. face and 1½ in. pitch keyed to the shaft as shown in sketch. Running from each

worm wheel is a screw shaft 13 ft. long and 3 in. in diameter, cut with right hand thread at one side of the wheel and left hand thread on the other, the outer ends of these shafts being carried in bearings suspended from the main I-beams by special castings. Travelling upon the screw shafts are special carriers provided with nuts which engage the threads of the screws. These carriers slide upon stationary guide rods and to them are attached the ends of the hoist ropes. The rope used is a $\frac{5}{8}$ in. wire rope and about 215 ft. are required for the hoist. The rope passes over sheaves of 36 in. pitch diameter built to support a weight of 5 tons. At the lower ends of the rope are attached 10-in. I-beams and to these I-beams in turn are fastened the attachment for engaging the car body. When raising closed cars it is customary to place beams or sections of T-rails under the body at each end and these rails are carried in small square castings suspended as shown. For open cars the cross

are held against the wire by helical springs attached to the outer ends.

After leaving the scrapers the wire passes through a series of tension wheels mounted on the frame and which serve to straighten out the kinks in the wire as well as aiding in the cleaning process. After passing under the last tension wheel the wire leaves the machine through the center of a flat disk which carries near its outer edge a frame for receiving the roll of new tape. This disk is driven by a small belt from the shaft of one of the tension wheels and as the wire travels forward the disk revolves carrying with it the roll of tape and in this manner tapes the cleaned wire as it passes to the new field coil. The new core or field frame is mounted on a revolving shaft and draws the wire through the machine on to itself, the whole operation requiring the services of but one man to guide the wire on to the new coil and insure even winding. At



PLAN AND ELEVATION OF CAR HOIST.

pieces are not required, and hooks are used which engage the lower edge of the main car sills.

Current for the motor is taken from the line current and is controlled by a rheostat box or controller on the car barn floor. The worm gearing gives a very powerful quick acting hoist. The whole arrangement, including everything except the motor, will cost, if built by an outside contractor, about \$1,000, but could probably be built in the company's own shops for considerably less than this, especially if timbers were substituted for the I-beams.

WIRE CLEANING AND RETAPING DEVICE.

The wire in burnt out or otherwise defective field coils is utilized by the aid of a machine which automatically takes the wire from the old field, scrapes off all the old insulation, retapes it with new insulating tape, and feeds it directly onto a new field.

The machine is mounted on a rigid stand. The wire as it leaves the old field first passes between two guide wheels and then comes in contact with a series of nine scraping knives set at different angles to insure that the old insulation will be broken off all the way around the wire. These scrapers are hinged at one end and

two points in its passage through the cleaning device the wire enters sleeves of felt which effectively remove any particles of insulation or dust that may escape the knives or tension wheels.

The tape used is a special make having an adhesive coating on one side.

A machine for doing about this same kind of work has been in use in Detroit and was described and illustrated in the "Review" for Mar. 15, 1900, page 175. The device at the Newark shops is believed to have fewer moving parts, requires less hand adjustment, and the scrapers come in contact with the wire at a greater number of points than in the Detroit machine.

HANDLING ARMATURES.

The shops are equipped with several pneumatic hoists running on overhead tracks which are found of great assistance in moving armatures from place to place about the rooms.

For removing armatures from under cars the master mechanic has devised a lifting contrivance for use in the pits. A regulation Barrett lifting jack, made by the Duff Manufacturing Co., of Pittsburg, Pa., was fitted with an elongated rack bar to give longer

range of action. The rack is mounted upon an iron pedestal as shown in one of the illustrations, and this pedestal is bolted to the platform of a low truck.

The upper end of the rack bar carries a cradle to receive the armature, comprising a frame supporting two rollers made of steel pipe upon which the armature rests.

DIPPING FIELD COILS

The scheme for dipping field coils is ingenious and effective and will be understood from one of the engravings. A short section of



ARRANGEMENT FOR DIPPING FIELD COILS.

single track is suspended from the ceiling and on this are placed a number of small trolleys having hooks at their lower ends. Passing up over the top of the track runs a rope one end of which winds upon a spindle, the other end carrying a large hook. The procedure is to hang the coil to be dipped upon this large hook. Then by means of the spindle and crank the field coil is lowered into the tank of insulating compound. When sufficiently covered with the compound the field is raised and transferred to one of the trolley hooks, where it is allowed to hang and air dry for a short time. A tin trough placed under the row of coils catches all excess of insulation that may drip from the fields and leads it back into the tank.

PRICES PAID FOR PIECE WORK AT REPAIR SHOPS OF NORTH JERSEY STREET RAILWAY CO.

CONTROLLERS.

General overhauling including replacing cylinder-wipers, spring caps, covers and handles, blowing and inspection of controllers,

canopy switches, fuse boxes and cut out box, \$35, for either Westinghouse or General Electric make.

Exchanging various parts, paid for according to regular schedule—ranging from \$.01 for changing a contact finger to \$.30 for changing cylinder.

- Assembling G. E. K. 10 controller \$2.40 each
- Winding and taping spark coil, complete, \$.60 each.
- Putting contact points on G. E. reverse cylinder \$.20 each.
- Wiring K. 10 connection boards, \$.90 each.
- Stripping and covering G. E. spark coils \$1 to each.

ARMATURES AND FIELDS.

	West. No. 3.	G. E. 800.	G. E. 1000.	G. E. 1200.	G. E. 57.
Replacing armature	\$.78	\$.85	\$.85	\$1.10	\$1.10
Replacing field coils (each) .....	.16	.16	.16	.20	.20
Replacing and adjusting brush holder and brushes.....	.05	.05	.05	.05	.05
Replacing and adjusting brush holder and yoke .....	..	.03	.03	.03	.03
Replacing brush spring .....	.01	.01	.01	.01	.01
Replacing connecting board .....	.05	..	..	..	..
Replacing dust fan and cover.....	.05	.05	.05	.05	.05
Stripping and cleaning cores.....	.45	.50	.50	.50	.50
Insulating and winding	2.00	4.00	4.00	6.50	5.00
Putting on commutator .....	.25	.25	.25	.30	.30
Connecting .....	.75	1.00	.90	2.00	1.25
Soldering .....	.40	.30	.25	.40	.50
Covering hoods, bands, etc.....	.80	1.00	1.00	1.25	1.25
Making hoods, 10 for.....	.08	.08	.08	.08	.08
Winding armature coils .....	.015	.013	.013	..	..
Taping armature coils .....	.01	.028	.028	..	..
Pressing, dipping, rolling and trimming, 100 coils for .....	..	.40	.40	..	..
Turning armature shaft on large lathe	2.30	2.00	2.00	2.30	2.30
Turning armature shaft on small lathe	2.60	2.25	2.25	2.60	2.60
Reconnecting, including retaping ends	1.85	2.50	2.00	3.00	3.00
Changing connections and soldering .....	.80	..	..	..	..
Turning commutator .....	.15	.15	.15	.20	.20
Slotting commutator .....	.20	.20	.20	.20	.20
Cleaning commutator .....	.10	.10	.10	.10	.10
Putting on jam nut .....	.05	.05	.05	.05	.05
Bushing armature shaft, pinion end .....	.50-.55	.35-.40	.60-.65	.60-.65	.60-.65
Bushing armature shaft, commutator end .....	.25-.30	.30-.35	.40-.45	.40-.45	.40-.45
Bushing both ends .....	.80	.70	1.00	1.00	1.00
Testing for short circuited coil....	.02	.02	.02	.02	.02
Testing for spring shaft .....	.05	.05	.05	.05	.05

FIELD COILS.

Winding new .....	.65	.70	.60	..	.70
Covering with mica (painting included) .....	.50	.40	.40	..	.50
Covering without mica .....	.40	..	..	..	..
Winding retaped fields .....	.80	.80	..	..	..
Taping G. E. 57 top field (spool)....	..	..	..	..	.15

BEARINGS.

Replace armature bearings .....	.65	.75	.75	.75	.75
Fit bearing on exchanged armature .....	.03	.03	.03	.03	.03
Fit axle bearings, new.....	.06	.06	.06	.06	.06
Axle bearings wicks, each.....	.06	.06	.06	.06	.06
Babbitting armature bearings, commutator end .....	.05	.05	.05	.05	.05
Babbitting armature bearings, pinion end .....	..	.07	..	.07	..
Finishing armature bearings, commutator end .....	.025	.025	.03	.025	.035
Finishing armature bearings, pinion end .....	.02	..	.035	.03	.04
Babbitting axle bearings, each half. ....	.03	.03	..	..	..
Finishing axle bearings, each half. ....	.01	..	..	..	..

BEARINGS (Continued).

	West. No. 3.	G. E. 800.	G. E. 1000.	G. E. 1200.	G. E. 57.
Finishing axle bearings, tops.....		.025	.03	.03	.03
Finishing axle bearings, bottoms..		.01	.02	.02	.02
Shaping axle bearing shells.....	.03				
Turning axle bearing shells.....	.45				

INSPECTION, MOTOR SHOP.

- Inspecting wheels, each, \$.04.
- Inspecting trolley, \$.05.
- Inspecting armature clearance, blowing, etc., \$.30 for Westinghouse motors, and \$.75 for G. E. motors.

TROLLEYS.

- Replacing worn out wheel and spindle, \$.03.
- Replacing worn out rope, \$.02.
- Replacing damaged pole, \$.11.
- Straightening pole with straightener, \$.07.
- Replacing trolley base, \$.08.
- Painting trolley pole, \$.02.
- Painting trolley pole and base, \$.04.

GEARS AND PINIONS.

- Replace pinion (armature in car), \$.32.
- Replace gear (under car), \$.62.
- Replace one-half gear case, \$.08.
- Replace whole gear fan, \$.16.
- Putting in gear, \$.52.
- Taking off gear, \$.10.
- Reboring gears, \$.30.
- Cutting off old pinion, \$.03 and \$.05.
- Pressing off good pinion, \$.10.
- Putting on pinion (removing old pinion not included), \$.10 for G. E. 800 motor, and \$.05 for others.
- Putting on pinion (removing old pinion included), \$.12 for G. E. motor, and \$.07 for others.

BRAKES.

	Brill Truck.	Peckham Truck.
Replace shoes (each)	\$.08	\$.08
Replace heads (each) .....	.05	.05
Replace hanger (each) .....	.02	...
Replace hanger castings (each) .....	.02	...
Replace slide castings .....	...	.03
Replace slide block .....	...	.03
Adjusting brakes per truck .....	.10	.20
Replace brake beam (each) .....	.25	.25
Replace brake rod (each) .....	.04	.04
Replace rod hanger staple .....	.03	...
Replace staff (each) .....	.13	.13
Replace brake chain, worn out.....	.03	.03
Replace release springs .....	.03	.03
Replace brake rod beam support .....	.015	.015
Replace turnbuckle, each .....	.09	.09
Replace equalizing bar .....	.05	.05
Replace side adjusting rod .....	.05	.05
Replace evener turnbuckle rod .....	.04	.04

JOURNALS.

Replace broken box .....	.05	...
Replace bra .....	.05	...
Replace cover and bolt .....	.02	...
Replace strap .....	.03	...
Replace spring and rubber .....	.03	...
Clean and oil box .....	.04	...
Replace wick .....	.05	...
Turning journal brasses .....	.04	...
Shaping journal brass .....	.01	...

WHEELS

Raising and lowering one end of car..	25	...
Replace 33" driver wheel	34	...
Replace pony wheel on max traction truck..	20	...
Raising car body with hoist	25	...

WHEELS (Continued).

	Brill Truck.	Peckham Truck.
Pressing off old wheels (per pair) including helper..	.09	...
Pressing on old wheels (per pair) including helper..	.10	...
Testing wheel for chill with drill .....	.025	...
Trimming each journal .....	.08	...
Trimming each bearing seat .....	.08	...
Fitting each wheel seat .....	.08	...
Turning each gear seat .....	.08	...
Turning each journal (new axle) .....	.25	...
Testing axles, each .....	.03	...
Roughing wheel seat .....	.03	...
Turning new hot rolled axles	1.00	...
Centering new axle .....	.00	...
Recentring old axle .....	.07	...
Straightening old axle .....	.25	...
Boring wheels, .....	.08	...
Facing wheels .....	.08	...

MISCELLANEOUS.

- Cleaning and painting trucks, per truck, \$.40.
- Wiring car for Westinghouse motors and controllers, \$.240.
- Wiring large open car not including resistances, \$.425.
- Painting overhead switch, \$.025.
- Painting heater fuse box cover, \$.04.
- Cleaning brass on 16 to 25-ft. box car, \$.150.
- Cleaning brass on 32-ft. box car, \$.112.
- Cleaning brass on open cars, \$.150.

BODIES.

- Stripping 16 ft. box car, \$.90.
- Stripping 18 or 20 ft. box car, \$.90.
- Stripping 20, 24 or 25-ft. box car, \$.100.
- Stripping 32-ft. car, \$.125.
- Trimming 16-ft. box car, \$.200.
- Trimming 18 or 20-ft. box car, \$.200.
- Trimming 22 or 24-ft. box car, \$.225.
- Trimming 25-ft. box car, \$.250.
- Stripping 9-bench open car, \$.60.
- Stripping 15-bench open car, \$.100.
- Extending 18-ft. box cars to 25 ft. cars by adding new section in center (including placing heaters) \$.05.85.

PAINTING CAR BODIES.

	16 ft.	18 ft.	20 ft.	22 ft.	24 ft.	25 ft.	25 ft.	32 ft.
Burnt off dashes.....	\$.50	\$.75	\$.50	\$.75	\$.50	\$.50	...	...
Cleaning inside .....	.80	.30	1.00	1.10	1.10	1.15	1.15	1.35
Washing blinds .....	.40	.46	.52	.58	.64	...	...	...
Cleaning all glass .....	.62	.66	.70	.74	...	.80	...	...
Burnt off car	2.50	3.00	3.50	4.00	...	4.00	2.50	6.50
Priming car	1.90	1.08	1.10	1.24	1.32	1.33	1.36	1.50
Putting car .....	.90	1.00	1.10	1.25	1.15	1.25	1.25	1.25
Sand papering .....	.95	1.00	1.10	1.10	1.18	1.18	1.18	1.50
Painting body (per cont.).....	1.08	1.16	1.24	1.32	1.36	1.36	1.36	1.50
Painting gate, each.....	.10	.10	.10	.10	.10	.10	.10	.10
Painting floor, per cont.....	.11	.16	.18	.20	.22	.23	.23	.25
Painting platforms and dash, per cont.....	.75	.75	.75	.75	.75	.75	.75	.75
Painting trucks, per truck .....	.40	.40	.40	.40	.40	.40	.40	.40
Painting roof, per cont.....	.52	.58	.62	.67	.72	.75	.75	.75
Scraping inside	1.25	1.40	1.40	1.50	...	1.75	...	...
Scraping ceiling .....	...	...	...	...	...	...	3.70	...
Stain and varnish sashes.....	1.00	...	3.00	...	...	...	...	...
Paint and grain sashes	6.00	6.20	6.65	7.10	7.10	8.50	8.50	...
Varnish ventilator, per cont.....	1.08	1.16	1.20	1.24	1.24	1.24	1.24	1.36
Varnish blinds .....	.75	.85	.95	1.05	1.15	...	...	...
16 ft. varnished car.....	1.20	1.30	1.40	1.50	1.60	1.65	1.65	1.80
Varnish inside .....	.80	1.00	1.05	1.10	1.15	1.18	1.18	1.50
Lettering and striping.....	5.00	6.00	6.50	7.00	7.50	8.00	8.00	9.00
Polishing .....	...	...	.75	...	...	1.00	2.50	1.25
Reputing Cars.....	...	...	...	...	...	...	...	...
Painting body, per cont.....	.75	...	...	...	...	1.00	...	...
Scraping inside	4.00	...	...	...	...	3.50	...	...
Lettering and striping .....	...	...	...	...	...	6.00	...	...
Miscellaneous.....	...	...	...	...	...	...	...	...
Painting wood signs, per foot.....	\$.005.	...	...	...	...	...	...	...
Painting dash single	\$.35.	...	...	...	...	...	...	...
Painting dash double	\$.65.	...	...	...	...	...	...	...

The Mahoning Valley Railway Co., Youngstown, O., on February 15th opened a new extension of its lines to New Castle, Pa., the first trip being made by President Miles, of Cleveland, Manager A. A. Anderson and a party of guests. The company now has a continuous route from Warren by way of Youngstown to New Castle, a distance of 32 miles, and expects soon to extend the route to Leavittsburg.

BROOKLYN COMPANY MAY MANAGE ITS OWN AFFAIRS.

An important decision as to the rights of a street railway company to determine for itself the routes and time-tables for the operation of its cars has been rendered by the Appellate Division of the Supreme Court of New York, Second Judicial Department. The title of the case is *People, on the relation of Linton, versus Brooklyn Heights R. R.*

An alternative writ of mandamus having been granted at the instance of Linton, the jury found that "public necessity or convenience require that the defendant operate its elevated road system from and between the termini at Brooklyn Bridge and Broadway Ferry and the terminus at Cypress Hills in the manner the same was operated prior to Apr. 1, 1900," and an order of court in conformity with this finding having been issued it was for the Appellate Division to determine whether there was a specific legal duty on the Brooklyn Heights Railroad Co. to operate its road in the manner prevailing prior to Apr. 1, 1900.

It is well settled that a writ of mandamus to compel a railroad to do a particular act in operating its road can only issue when there is a specific legal duty on its part to act and a breach of that duty; and if no such duty has been imposed by common law or statute it is not within the province of the courts to direct in what manner a quasi-public corporation shall serve the public. Such direction is the province of the legislature, and is always the proper subject for legislative consideration unless prevented by some charter contracts. With these propositions, and the fact that the court is not clothed with legislative power in mind, the court proceeded to consider some of the provisions of law in relation to corporations of this character.

It is found that subject to the limitations of the railroad law to run its cars at regular times, to be fixed by public notice, and to furnish sufficient accommodation for all intending passengers presenting themselves at the starting point, railroad junctions or regular stopping places, and to take, transport and discharge such passengers at, from and to, such places on the due payment of fare legally authorized, the legislature has specially delegated the power to regulate the time and manner in which passengers and property shall be transported.

The case of *Commonwealth v. Fitchburg R. R. Co.* (12 Gray 180) was cited with approval where it is said "the power to judge of what is necessary or reasonable in the premises is, except in those cases where the legislature has expressly intervened, in the first instance in the corporation. * * * It would seem to be therefore not only its right but its duty to exercise a sound discretion in the use of its capital, lest by exhausting it in running trains that were not required by the public wants, it should deprive itself of the means of running at reasonable rates those that were. * * * We cannot see that a beginning to run these trains rendered their continuance, at whatever cost or sacrifice, a legal duty. It might be more plausibly said that it was the duty of the corporation to make the trial of running regular trains for passengers and freight. * * * but when the trial had been fairly made and had proved disastrous, the duty would have been discharged."

The court says in part:

"Taking the facts to be as stated by the relator, he has been a resident of the 26th ward of the borough of Brooklyn for thirty years. During that time elevated railways have been constructed in Brooklyn by the Brooklyn Elevated Railway Co., the Union Elevated Railroad Co. and the Sea Side & Brooklyn Bridge Railroad Co.

In February, 1899, the system of elevated roads in the borough of Brooklyn passed to the ownership and control of the Brooklyn Union Elevated Railroad Co., and on or about April 1, 1900, the Brooklyn Union Elevated Railroad Co. leased all of the said railroads belonging to the system, with all of the structures, etc., to the Brooklyn Heights Railroad Co., the appellant in this proceeding. At this time there were two distinct and continuous lines which had their termini at Cypress Hills. One started from the Brooklyn Bridge and ran through Fulton St. to East New York, thence to Cypress Hills; the other started at the Broadway Ferry, ran through Broadway to Crescent St. and through Crescent St. to Cypress Hills. On both of these lines a continuous service from terminus to terminus was maintained up to about Aug. 15, 1900, when the de-

endant inaugurated a new system. The old station at Manhattan Crossing was torn down or remodeled, and a new station, known as the loop, was erected in its stead, and the arrangement was such that the two lines of railroad were connected at this point, trains being enabled to pass from one road to the other. On Aug. 15, 1900, the Brooklyn Heights Railroad Co. discontinued the direct service between the Brooklyn Bridge and the Broadway Ferry with Cypress Hills on Sundays and holidays, and upon week days between the hours of 10 a. m. and 4 p. m. and between the hours of 8 p. m. and 5 a. m. That is, during the days and hours named the trains of the Brooklyn Heights Railroad Co. ran only from the bridge or the ferry to the loop, and returned thence to the place of starting, passengers for Cypress Hills being transferred, without extra cost, to the street surface cars of the company, which are operated directly underneath one of the elevated lines, and by this surface line carried to their destination. The distance from the loop to Cypress Hills is about two miles, the surface line is operated by electricity, and there is no allegation that the defendant has not provided a sufficient number of cars to carry the traffic in a reasonable manner, or that it has not operated such cars upon a published schedule and in a regular and orderly manner. The effect of this arrangement is that at a point where the old lines converged, and from which they were closely paralleled to the terminus at Cypress Hills, the Brooklyn Heights Railroad Co. operates but one line of elevated railroad instead of two, and that during certain hours of the day and night it does not operate its cars over this one line, but transfers its passengers to the street surface railroad without extra charge; and the question presented is whether this is such an abandonment of the road, or such a misuse of its franchise, as to warrant the court in directing that the defendant shall go back to the system prevailing prior to Apr. 1, 1900. We are clearly of the opinion that it is not. There is nothing in the Railroad Law which makes it the duty of the defendant to operate its trains over the entire system during all hours of the day and night, nor yet upon Sundays and legal holidays; it is specially given the power to regulate the time and manner in which passengers and property shall be transported (subdivision 8, sec. 4, Railroad Law), and it is not disputed that during the "rush" hours it does operate its trains between the Brooklyn Bridge and Cypress Hills, as well as between Broadway Ferry and the same point, upon regular schedules, while at all times it operates an electric car, with free transfers, to connect with the trains at the loop. It operates its entire system, between all of the terminal points, so far as we are able to discover, in entire good faith, and with a view to an economical management of the property, and as the legislature has delegated the power to determine when passengers and property shall be transported over all railroads to the corporations owning the same, we are unable to discover any proof in the court to order the defendant to do any differently than it is now doing."

It was held in *People v. R., W. & O. R. R.* (103 N. Y. 95, 109) that where a railroad owns by consolidation two lines of road, and can substantially accommodate the people of the state by operating one line between the same points, it should not be compelled by mandamus to operate both lines at a great sacrifice of money upon the fanciful idea that the sovereignty of the state is wounded by its omission to operate both lines.

The court further says in discussing the Linton case, "we are convinced that no interest of the public requires the economic waste incident to the operation of two closely paralleled railroads, where one is abundantly able to take care of all the traffic."

A careful examination of the authorities discovers no case in which the courts have, in the absence of a specific legal duty, undertaken to prescribe the manner in which a railroad shall be operated.

The order should be reversed with costs.

TAPES AND WEBBINGS.

Companies that do their own coil taping and armature repairing will be glad to know that the Hope Webbing Co., of Providence, R. I., supplies tapes and webbings of any width, thickness or quality for this special class of work. The company has spent years in the making of fabrics needed in the construction and repair of motors and dynamos, and its plant is fitted with special machinery of its own design for turning out this class of goods. Samples and prices will be sent on application.

CANADIAN NOTES.

During the recent session of the Quebec Legislature, the following bills have been passed, and the companies authorized to commence operations in that province: St. Francis Water Power Co., Matane & Gaspé Railway Co., North Shore Power Co. (Montreal), Levis County Railway Co. (A. Collyer, Montreal), Canadian Electric Light Co., Beauharnois Light, Heat & Power Co. (W. L. Morency, Montreal), Beauharnois Light, Heat & Power Co. (W. L. Morency, Montreal), Provincial Light, Heat and Power Co., Kamoutem Littoral Electric Co., Shawinigan Falls Terminal Railway Co. (J. E. Aldred, Montreal), Sorel Electric Co., Power Pulp & Paper Company of North America, St. Lawrence & Megantic Railway Co.

The Toronto Suburban Electric Railway Co. (controlled by the Toronto Railway Co.) has secured a franchise from the township authorities of Etobicoke, to extend the line to Summerville, with the right to carry freight and passengers. The work on this new extension will be put in hand early this summer.

Capitalists interested in the Toronto electric railways and lighting companies have formed a company to build a transmission line from Niagara Falls to Toronto. As soon as the power is available, the existing electric lines will be extended along the lake shore from Toronto to Hamilton, a distance of about forty miles. Mr. William Mackenzie, president of the Toronto Railway Co., and Mr. Pellate of the Electric Light Co., are the chief promoters.

A very peculiar accident happened recently in Toronto. A motor car with trailer attached, was turning the corner of one of the busiest thoroughfares at a fair rate of speed. The motorman, endeavoring to stop suddenly at the corner, caused the trailer to bump into the motor car with such force that the drawhead broke, and one piece weighing several pounds flying to the sidewalk, seriously injured a pedestrian.

The Toronto Street Railway Co.'s assessment on rolling stock, tracks, etc., has been compromised, the company agreeing to an assessment of \$450,000.

The promoters of the new Hamilton & Caledonia Railway Co. have agreed on the terms under which they will construct the road. Among other things they are to provide street lights for the lighting of the village of Caledonia. It is expected that the council will, under these circumstances, grant the franchise.

Mr. James Battle of Thorold, and Mr. William M. German, M. P., of Welland, have secured a charter for the Niagara District, Wellandport & Dunnville Electric Railway Co., with power to operate an electric line between Thorold and Dunnville. Work on the construction of this road will be put in hand this summer.

Permission has been granted by the legislature to the Middlesex & Interurban Railway Co. to construct an electric line between Aylmer, St. Thomas and London.

The St. Thomas Street Railway Co. has been refused permission to extend its lines.

A franchise has been granted the Huron, Bruce & Grey Electric Railway Co. with permission to construct an electric line in the townships of Huron, Grey and Bruce.

The Paris Electric Railway Co. will commence construction of its proposed lines without delay. The line from Paris to Galt will also be built. Dr. Ickes of the Woodstock & Ingersoll Electric Railway Co., is the prime mover in this project.

The Sandwich, Windsor & Amherstburg Electric Railway Co. has secured privilege from this government to increase its bond issue by \$350,000, the money to be used in constructing the uncompleted portion of its road. Fifteen miles of road is to be built, the legislature stipulating that it must be completed this summer, or the charter will be revoked.

Power has been granted the Essex & Kent Radial Railway Co. to issue bonds to the amount of \$25,000 per mile for the purpose of building an electric railway from Windsor to Wheatley, and from Essex to Chatham, with the understanding that construction work will be commenced not later than May 1st.

Mr. T. A. Nelles of Hamilton is negotiating with the city council of Windsor for a franchise for the Windsor, Essex & Lake Shore Ry. Mr. J. W. Burke of New York, the owner of the Sherbrooke, Que. Electric Railway, is interested in this project.

The South Western Traction Co., of London, has been granted a franchise by the Ontario Legislature for the purpose of operating an electric railway in that vicinity.

Mr. Conmee, M. P., of Port Arthur, has secured a franchise for the construction of an electric railway from Wabigoon to the west end of Lac Seul, in the Rainy River District.

A franchise has been granted to the Huronian Mining Co. for the construction of an electric railway connecting the mines with the Canadian Pacific and other railways, within a radius of one hundred miles from the company's mines. The franchise also grants power for the construction of telegraph and telephone lines. The postmaster of Copper Cliff, Nipissing, Ont., has the matter of construction in charge.

A company is being formed at Rat Portage, Ont., to build an electric railway from the town of Rat Portage to English River, a distance of 40 miles.

A company is being formed at Winnipeg for the purpose of building an electric railway from the city of Winnipeg to Lac Bonnel, a distance of 58 miles. Mr. H. Burkholder of Chicago is the prime mover, and has just completed the survey, and estimates for the construction.

Permission has been granted for the construction of an electric railway between Winnipeg and Headingly, Man. The promoters have secured right of way from the various municipalities, and the line will be constructed this year as far as Sturgeon Creek.

The Velvet Mines, of Rossland, B. C., have applied for a charter to construct and operate an electric road from Rossland to connect with the Red Mountain railroad, a distance of 30 miles.

Mayor McGaw of Vernon, B. C., is promoting an electric railway between the towns of Lumby and Vernon, a distance of 16 miles.

The Dominion Statistics for the year ending June 1, 1901, show the following particulars regarding the electric railway companies operated in Canada: Miles of track operated, 675; capital invested, \$39,076,019; gross earnings, \$5,768,283; gross expenses, \$3,435,163; net revenue, \$2,333,120.

STERLING-MEAKER CO. AT NEWARK.

For several months the Sterling-Meaker Co. of New York City, has been looking for a factory site where increased space could be had with quick shipping facilities and all the requirements for growing and economical manufacture. A site was finally chosen on Ogdan St., Newark, N. J., close to the Lackawanna R. R. and on the Passaic River. The Pennsylvania, Erie, Lehigh Valley and Jersey Central roads are conveniently near, while two steamboat express lines connect daily with all points in New York.

A four-story brick factory, 47 x 145 ft., is being erected on the site and fitted up for the needs of the company, which will occupy the building on May 1st and be prepared by its enlarged and improved facilities to handle its growing business more promptly than heretofore. The city of Newark possesses many advantages and is rapidly becoming a great center of industrial and financial activities.

The Sterling-Meaker Co. makes the Sterling safety brake, six types of fare registers, the Sterling sand box and fender and the Earll trolley retriever.

IMPROVEMENTS IN FLOOD EMERGENCY BRAKE.

Mr. Patrick Flood, of Albany, N. Y., inventor and maker of the Flood emergency brake, which was described in the "Review" for last February, has brought out a new form of track shoe to be used with his braking device. The shoe is intended for roads having very steep grades or where quick stops are wanted and comprises a body of soft metal having in its face an insert of carborundum. There has also been added to the track shoe a lug along the side which will prevent possible derailment of the car when the brake is applied.

Mr. Flood states he has received several inquiries in relation to his device one of them from Paris, France.

The Baton Rouge (La.) Electric & Gas Co. has opened a new pleasure park on its street railway line in the outskirts of the city. One hundred and twenty trees of several varieties have been transplanted to this resort by a new method and are promising well. A music pavilion, baseball grounds and other attractions will be added.

PERSONAL.

MR. GEORGE J. KUHETS has been appointed chief engineer of the Los Angeles Railway Co., vice F. W. Skinner, deceased.

MR. GEORGE A. STANLEY has been appointed purchasing agent of the Cleveland Electric Railway Co., succeeding Mr. C. W. Wason.

MR. GORDON CAMPBELL, master mechanic of the Washington (D. C.) Traction & Electric Co., will add the duties of purchasing agent to those of his other position.

MR. A. G. MAISH, formerly secretary of the Des Moines (Ia.) City Railway Co., has been appointed superintendent, succeeding Mr. W. G. Owens, who has resigned to engage in stock raising.

MR. A. E. DAVIES, formerly superintendent of the Chicago Electric Traction Co., has been appointed general manager to succeed Mr. E. R. Gilbert; the appointment is effective April 15th.

MR. J. F. DUSMAN, who was recently elected general manager of the York County Traction Co. and of the Edison and Westinghouse lighting companies of York, Pa., was born in York county, near Hanover, in 1865. His connection with electrical work began in 1891 when he secured a position in the shops of the Baxter

Motor Works, of Baltimore; later he was with the Ries Electrical Specialty Co., of that city.

At this time the electric railways in and around Baltimore were being opened, and men experienced in repair work were in demand. Leaving the Ries company, Mr. Dusman was employed by the General Electric Co. to take charge of the repairing of the railway equipments during the trial period. His duties also included the direction of the same line of work at Washington.

While in this position Mr. Dusman had his headquarters at the Lake Roland Railroad Co's.

shops. He remained nearly two years at the Lake Roland shops, at first as electric repairman, later as general foreman of all repairs, until the sale of the road to the City & Suburban Railway Co., of Baltimore. Feb. 1st, 1895, Mr. Dusman was re-engaged by the General Electric Co. to assist in installing the plant and equipment for operating the Baltimore Belt Line Tunnel. The work was completed in about six months, and he remained with the company for four years, first as operator of the power house, later as foreman of the electrical department of the company. Aug. 1, 1899, Mr. Dusman became general foreman for the United Electric Light & Power Co., of Baltimore. March, 1901, he became the general manager of the Edison and Westinghouse Electric Light Co., of York, and on February 10th last the management of the York County Traction company was given to him in addition.

MR. GEORGE R. SIKES, of Buffalo, N. Y., has been appointed chief engineer of the Buffalo-Rochester extensions of the Williams-ville Electric Ry. Mr. Sikes' office is at 895-897 Ellicott Square, Buffalo.

MR. ANTHONY N. BRADY has been elected a director of the Sea Beach R. R., one of the lines operated by the Brooklyn Rapid Transit Co., filling the vacancy in the board created by the death last fall of Major John D. Keiley.

MR. E. R. GILBERT, who for several years has been general manager of the Chicago Electric Traction Co., popularly known perhaps as the "storage battery road" until the overhead trolley was substituted in 1900, has been appointed general manager of the Miami & Erie Canal Transportation Co. with headquarters in Cincinnati, the appointment taking effect April 16th. The Miami & Erie company expects to have its electric line in operation along

the bank of the Miami & Erie Canal from Cincinnati to Dayton by July 1, 1902, and contemplates an extension across the state to Toledo.

MR. E. C. FOLSOM, of Indianapolis, has been appointed manager of the Indianapolis & Logansport Traction Co., and will have charge of the extensive improvements which the owners of the interurban road contemplate making this spring.

MR. THOMAS FITZGERALD, JR., has tendered his resignation as manager of the Fairmont (W. Va.) & Clarksburg Street Railway Co., to accept a position as general manager of the Norfolk & Newport News Railway Co. of Norfolk, Va.

MR. J. C. WHITRIDGE, who for the past five years has been associate editor of the Railroad Gazette, on April 1st resigned that position and is now in the engineering department of the Buckeye Malleable Iron & Coupler Co., of Columbus, O.

MR. A. E. W. WELCH will be secretary and treasurer of the South Western Traction Co., which projects a system of electric lines radiating from London, Ont., to Ingersoll, Glencoe and Strathroy. Mr. Welch's office will be in the Masonic Temple, London.

MR. BAILEY WHIPPLE, recently connected with the Buckeye and Jandus Electric companies, of Cleveland, O., is now associated with the Sawyer-Man Electric Co., with headquarters at the general offices and works of the company, West 23d St., New York City.

MR. F. N. BAYLIES, who was formerly connected with the Metropolitan Elevated Railway Co., Chicago, has been appointed superintendent of the Rockford Railroad, Light & Power Co., and the Rockford & Belvedere Railway Co. The appointment took effect March 15th.

MR. E. KESSLER, who has been general manager of the Richmond (Ind.) Traction Co. and superintendent of the Richmond Street & Interurban Railway Co. for the last nine years, tendered his resignation to take effect April 1st, and will engage in the banking business at Milton, Ind.

MR. MARTIN KNAPP has resigned as general superintendent of the Wheeling (W. Va.) Traction Co. to accept a position as superintendent of construction with the Penn State Construction Co., of Philadelphia, which at present has a line under construction from Cumberland, Md., to Westernport.

MR. JOHN W. ALVORD has his office at 127 Hartford Building, Chicago, where he will continue his consulting practice in matters pertaining to water powers, water supplies and appraisements, sewerage, sewerage purification, and financial examinations and reports. By mutual consent the engineering firm of Alvord & Shields, sanitary and hydraulic engineers, was recently dissolved.

MR. AUGUSTUS M. MOORE has been appointed chief engineer of the Georgia Railway & Electric Co., which was recently organized to effect the consolidation of the street railway systems in Atlanta. Mr. Moore was formerly master mechanic of the Atlanta Rapid Transit Co. In his new position he succeeds Mr. Thomas Elliott, who resigned to accept a position with the Pittsburg, McKeesport & Connellville Street Ry.

MR. W. P. COOKE, chairman of the Port Arthur Electric Street Ry., has been identified with the rapid growth of that city since he first made it his residence in 1873. He has almost continuously served in the council, and has held several offices of public trust. The first telephones to be installed in Canada outside of Brantford were put in by Mr. Cooke in 1877; he also opened the pioneer office of the Canadian Pacific telegraph, and was the projector of the first street railway in Port Arthur.

MR. ALBERT E. McREEL has resigned as manager and superintendent of the Exeter (N. H.), Hampton & Amesbury Street Railway Co., a position which he has held for five years, and will remove his residence from Exeter to Boston. Mr. McReel was for the 10 years prior to his coming to Exeter engaged in the electrical



J. F. DUSMAN.

business at Athol, Mass. The assistant superintendent, Mr. Everett P. Weeks, will assume the management of the Exeter, Hampton & Amesbury road until Mr. McReel's successor shall be appointed.

MR. WALTER J. BRADY has been appointed superintendent of the Hudson County division of the North Jersey Street Railway Co., Jersey City, succeeding the late William W. MacCormack, who died last month. Mr. Brady was born in Jersey City 40 years ago, and has been in the service of the North Jersey company or its predecessors for 19 consecutive years, first as conductor, later in the capacities of starter, claim agent, and chief clerk in the division superintendent's office. In his new position Mr. Brady will have charge of all the company's lines in Hudson County.

MR. LOUIS MILTON ZAPP, a senior of Purdue University, is engaged in the performance of important tests which are being made by the Union Traction Company of Indiana with a view to determine the commercial efficiency of its system under ordinary operative conditions. The part of the work which has been entrusted to Mr. Zapp comprises tests to determine the essential factors in the rating and operating of the motor equipment. Mr. Zapp is a graduate of the Louisville (Ky.) Manual Training High School and will soon be graduated from Purdue with an enviable record.

MR. H. A. NICHOLL has resigned as superintendent of power of the Rochester Railway Co., to become assistant manager and treasurer of the Ithaca Street Railway Co., the Brush-Swan Electric Light Co. and the Cayuga Lake Railway Co., all of Ithaca, N. Y., and all operated under one management. Mr. Nicholl was formerly superintendent of construction of the Rochester & Sodus Bay Ry. and has held positions with electric railway companies in Chattanooga and other cities of the south, beside which he has had an extended experience in connection with the operating department of steam railroads.

MR. F. L. DAME has been chosen general manager of the Union Railway Co., of Dubuque, Ia., succeeding Mr. W. J. Brown, resigned. Mr. Dame assumed charge April 1st. Mr. Dame in 1890 was the engineer of the Portland, Ore., office of the Westinghouse company, and afterwards was with the Thomson-Houston and General Electric companies. From 1896 until Mar. 1, 1901, he was general superintendent of the Tacoma Railway & Power Co.; from that date till his appointment as general manager at Dubuque Mr. Dame was in charge of improvement work and the operation of the railway department of the company.

MR. JOHN DALY has been superintendent of the Yonkers (N. Y.) Railroad Co. for seven months. The Yonkers system, as stated elsewhere in this issue, is an extremely difficult one to operate, owing to the many grades and sharp curves, but thus far Mr. Daly has not had a single accident. He has been with this system for nearly ten years, first as line foreman, then as assistant superintendent and recently as superintendent. Mr. Daly has had a very substantial experience in both track and overhead work, having worked for some time with the Metropolitan Telephone Co. in the line department and with the West Shore R. R. in track work.

MR. J. L. MATSON, until of late assistant master mechanic of the Union Traction Company of Indiana, has been appointed general master mechanic, which office was recently vacated by Mr. J. S. Hamlin. Mr. Matson has had a varied experience in steam and electric railways, dating back as far as the early eighties, he having served his apprenticeship in the Chicago shops of the Illinois Central Railroad Co. He also served several years in an official capacity with the South Side Elevated Railway Co., Chicago, helping in 1896 to change the entire equipment from steam to electricity. He remained with the latter company until June 1, 1901, when he resigned to become Asst. Master Mechanic of the Union Traction Co.

MR. S. J. DILL, who for the past five years has been connected with the operating department of the Metropolitan Street Railway Co., of New York City, in the capacity of superintendent of the Forty-second Street, Manhattanville & St. Nicholas Avenue division, has resigned his position to accept that of assistant general manager of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway

Co. Mr. Dill has always held a high place in the esteem of his employes and business associates, who heard with regret of his intended departure. In leaving New York he takes with him the best wishes of many friends both in the business and social worlds. A farewell reception was given Mr. Dill on the evening of March 12th, at which time his friends presented him with a fitting token of their regard for his business principles and good fellowship.

OBITUARY.

MR. R. R. SWEPSON, who had owned the street railway system in Richmond, Va., during the civil war, died at Knoxville, Tenn., March 23d, aged 77. Mr. Swepson was a native of Virginia.

MRS. JOHN I. BEGGS, wife of the president of the Milwaukee Electric Railway & Light Co., died on March 13th at the family home in Harrisburg, Pa. Mrs. Beggs had but a short time previous returned from Europe, where she had traveled for the last five years in the hope of regaining her health.

MR. WILLIAM L. ELKINS, JR., a son of Mr. Elkins of the Widener-Elkins syndicate, died March 13th at his country home near Philadelphia, from a cerebro-spinal trouble with which he had been afflicted since last October. The deceased was president of the Pennsylvania Iron Works Co.; the Otto Coke & Chemical Co.; the Pittsburg Gas & Coke Co.; the United Coke & Gas Co.; the Hygeia Hide & Cold Storage Co.; the McKeesport Gas Improvement Co., and the New England Gas & Coke Co., and a director in the Allis-Chalmers Co. He was also a member of numerous clubs and fraternal organizations. He was 38 years old.

NEW PUBLICATIONS.

ENGINEERING PRACTICE AND THEORY FOR STEAM ENGINEERS, by W. H. Wakeman, New Haven, Conn., cloth, 180 pages, published by the author. The second edition of 1,000 copies of this book has just been published. It is written for the benefit of engineers in charge of steam plants who wish to improve their knowledge of engineering in order to pass examinations where a license is required. It is divided into 18 chapters devoted to the study of the various apparatus and machinery in use in steam plants and it is written in a simple style entirely within the scope of the average engineer. All the calculations in this volume are simple arithmetical ones, the use of higher mathematics being entirely avoided. The book is supplemented by a number of questions divided into groups, each group pertaining to a certain chapter, which the reader or student is supposed to answer after mastering the contents of each chapter. It also contains a well arranged alphabetical index of subjects. The contents of this book are too elementary to be of service to a technical student, but it contains considerable useful information for men engaged in the practical operation of a steam plant.

SPECIFICATIONS FOR ELECTRIC RAILWAY BRIDGES, by C. S. Davis, 48 pages, paper, published by the author, Toledo, O., price 50 cents. This work, which will prove a valuable aid to street railway engineers engaged in the design and construction of street railway bridges, contains a general form of specifications to be filled out for any particular case. The book opens with a description of street railway bridges which are classified in accordance with their capacities. The best type of bridge for various spans is prescribed as well as the kind of material desirable, the method of building, plans, stress sheets and other data. The book also contains some excellent tables and formulae for determining the strength and proper dimensions of the various members of a bridge for both wrought iron, soft steel or medium steel. The work is very complete in every respect and includes all the important points which should be considered in specifications for such work.

The Western Illinois Traction Co., projecting an electric line in Monmouth and interurban lines radiating from that city through the county, has applied for a charter, the incorporators being: W. W. McCullough, W. B. Young and S. S. Hallam. A franchise in Monmouth has been secured.

FINAL DECISION IN DETROIT 3-CENT FARE CASE.

During the first half of 1899 a very determined effort was made by the late Hazen S. Pingree to secure municipal ownership and operation of the street railways of Detroit, and the campaign was not abandoned until the Michigan Supreme Court on July 6, 1899, rendered its decision (St. Ry. Rev. 1899, p. 452), holding the McLeod act under which the Detroit Street Railway Commission was created, to be unconstitutional. July 14, 1899, a 48-year franchise was granted to the Detroit Municipal Railway Co. which was to purchase the existing lines for \$16,800,000 in 4 per cent gold bonds, and reduce rates to 6 rides for 25 cents and 8 rides for 25 cents during certain hours. Four days later the council reconsidered the passage of the 48-year franchise, and the interests controlling the railways thereupon withdrew their offer to sell.

The city council on August 8th passed an ordinance requiring all street railways (except the Detroit Railway Co., the 3-cent line) to sell tickets at the rate of 8 for 25 cents, good at all hours and entitling the holders to universal transfer privileges. This was approved by the then mayor, Mr. Maybury, Aug. 16, 1899. On the same day the Detroit Citizens Street Railway Co. filed a bill in the United States Circuit Court for the Eastern District of Michigan for an injunction restraining the city of Detroit, the mayor and the corporation counsel from enforcing this ordinance.

Mar. 19, 1900, the case was decided in favor of the company and a permanent injunction granted. This decision was published in full in the "Review" for April, 1900, page 218.

The city appealed to the United States Supreme Court and on Mar. 3, 1902, this court affirmed the ruling of the Circuit Court, leaving the outcome of the Detroit 3-cent fare case a complete victory for the company.

The principal points of the decision are:

Where the legislature authorizes a municipality and a railway company to agree upon rates of fare and other terms of a franchise and an ordinance is subsequently passed by the city council fixing the rate of fare the general power "to prescribe from time to time rules and regulations for the running and operation of the road" does not include the right to prescribe a lower rate of fare without the consent of the company.

Such an ordinance fixing the fare is a contract within the meaning of the Federal Constitution, and the obligations of this contract may not be impaired under the guise of regulations.

Equity has jurisdiction (in such a case as this) on the ground that if the company be left to its remedy at law, a multiplicity of suits would result from the attempt to enforce the low-fare ordinance.

place the company's securities as they need to be sold. The demand for such agents has of course led to the organization of firms which engage exclusively in the handling of public securities, and one of the well-known Chicago houses in this line, Stephen D. Demmon & Co., is making a specialty of street railway investments, while also acting as fiscal agent for municipalities, gas, electric light, and railroad companies, and private corporations engaged in manufacturing.

BRILL CARS FOR WESTERN AUSTRALIA.

The J. G. White Co., of London, which is largely interested in electric tramway systems in the rapidly growing cities of Western Australia, is sending to Kalgoorlie 25 cars built by the J. G. Brill Co. of Philadelphia. Situated about a hundred miles inland from Perth, in a rich gold district, Kalgoorlie has lately become one of the most important cities in the colony.

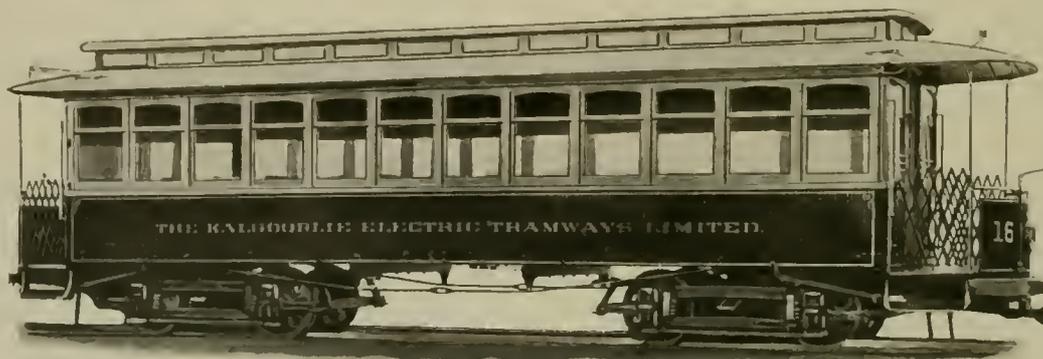
As will be seen by the accompanying illustrations, the cars are of two types; 10 of them are 41 ft. long over the crown-pieces, and 8 ft. 2 $\frac{3}{4}$ in. over the sills; the rest are 28 ft. long over crown-



SINGLE TRUCK BRILL CAR FOR AUSTRALIA.

pieces, and 7 ft. 9 $\frac{1}{2}$ in. over sills. The windows in both types are extra large and the window rails low, with the intention of making the cars suitable for summer, as well as winter, service. The upper sections of the windows are made stationary, while the lower portions slide into pockets in the walls. This arrangement includes end windows.

The large cars have a seating capacity of 52, there being 13 reversible-back seats to a side. The sides of these cars are of straight up and down construction, giving space for the sash-pockets, without much lessening the floor width. The shorter cars are seated



DOUBLE TRUCK BRILL CAR FOR AUSTRALIA.

FISCAL AGENTS FOR CORPORATIONS.

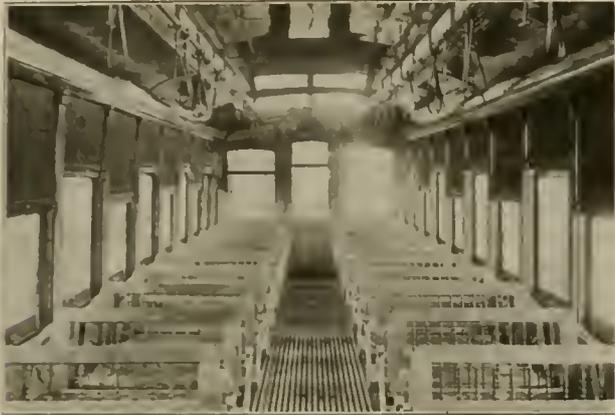
The modern method of building railways is to do the work piecemeal, only sufficient capital being provided at the start to build a short section of the line. Then follow successive sales of bonds which are salable by reason of there having already been work done, and the proceeds of each block of bonds thus sold are used to build the next section of the road. It is quite apparent therefore that after getting its franchises a company needs the services of fiscal agents who by reason of their business connections can readily

for 28; these have curved side panels, protected by a metal-shod guard rail.

The interiors are finished in natural ash, with white birch ceilings handsomely decorated. The windows are provided with roller curtains, the rollers of which are concealed.

The platforms, besides having supports re-enforced with angle irons, are strengthened and protected with Brill patent angle iron bumpers. Among other patented specialties which make the Brill cars singularly complete, are radial draw bars, "Dedenda" gongs and ratchet brake handles.

The long cars are mounted on Brill No. 27 trucks, for which it is claimed there is practically no limit as to the speed capacity, and their absorption of shocks and vibration and the well-cushioned



INTERIOR OF CAR FOR AUSTRALIA.

side motion in rounding curves, add greatly to the comfort of the passengers.

The four-wheelers have Brill 21-E trucks. Both of these Brill trucks are well known on account of their original and distinctive features; solid forged frames, spring arrangement and brake system.

EMPLOYEES' ASSOCIATION IN CONJUNCTION WITH Y. M. C. A.

The Brooklyn Rapid Transit Co. is carrying out a plan for organizing a mutual benefit and social association among its employees, but is going about the matter in a little different way than has usually been followed in other cities. After consultation with the officers of the Railroad Branch of the Young Men's Christian Association the officers of the street railway company have decided that better results can be obtained by availing themselves of the wide experience and facilities of the Y. M. C. A. workers in movements of this kind and the details of forming local branches, fixing up libraries, reading rooms, gymnasiums, etc., and arranging social features will be left largely in the hands of the older association, always of course under the supervision and with the co-operation of the street railway company. The mutual benefit features such as sick, accident and death funds, will be kept separate and directly under the jurisdiction of an Employees' Mutual Association, the secretary of which will be paid by the street railway company. The scheme has not as yet been worked out in detail, but it is believed that by working along these lines as indicated several advantages will accrue. By working with the Railroad Branch of the Y. M. C. A. the men will secure all the benefits of the facilities of that organization. They will at the same time retain control of all insurance and benefit funds, while the street railway company will have as it were parental oversight over the whole movement to prevent possible carelessness or mismanagement. The movement will be entirely unsectarian in character.

A NEW ELECTRIC CLUB.

The Electric Club is the title of a new organization composed of employees of the Westinghouse Electric & Manufacturing Co. A general meeting of the apprentices and members of the testing and engineering departments of this company was held March 19th to organize a new club of which Mr. C. F. Scott was one of the principal promoters. A committee of which Mr. Scott was chairman called upon the management of the company, who greatly favored the plan and stated that the company would actively co-operate by paying the rent and further assisting financially and otherwise in establishing and conducting the club. The constitution was considered and adopted at this meeting and the members who voted in the affirmative for it constituted the charter members of the club. The list of charter members includes 150 names.

According to the Constitution of the club its purpose is for social recreation, mutual benefit and improvement, and more particularly for the dissemination of electrical and engineering knowledge among its members. Reading rooms, class instruction and small societies or sections for the presentation and discussion of electrical engineering subjects, general lectures by engineers, and excursions to places of interest in and around Pittsburg will be within the scope of the club.

Three of the members of the board of directors are to be designated by the Westinghouse Electric & Manufacturing Co., and the remaining six members will be elected by the members of the club, two of which shall be selected from the permanent engineering staff, two from the apprentices who have been with the company for one year or upwards, and two from other departments. The six members shall hold office for two years, one man of each class retiring at the end of each year.

The headquarters of the club are at Hammett Hall, Wilkensburg, Pa., and the following officers have been elected: E. M. Olin, president; E. D. Townsend, vice-president; C. E. Downton, secretary; L. A. Osborn, treasurer.

NEW LINES IN PENNSYLVANIA.

The York County Traction Co. is planning to connect all towns and hamlets within a radius of 25 miles of York, Pa., by electric railways. The company's line will first be extended east to Wrightsville via Hellam and Stony Brook. The present line to Dover, 7 miles, will be extended to Mechanicsburg, via Rossville, Wellsville and Dillsburg. Another proposition is the extension of the North York line through Emigsville, Manchester, York Haven, and Goldsboro to Lewisberry, where connection will be made with the New Cumberland & Lewisberry Electric Ry. and thus an outlet from that section of the Cumberland Valley secured.

The Harrisburg & Mechanicsburg Electric Ry. is now operating to New Cumberland and it is reported that this company will make arrangements to use the new steel bridge to be built over the Susquehanna River between Steelton and New Cumberland.

The Harrisburg and Mechanicsburg electric railways are already operating a line to that town, and they are planning to improve their line. There are reports current that the Harrisburg Traction Co. is also making arrangements to use the new steel bridge to be built over the Susquehanna River between Steelton and New Cumberland, thus giving direct connection for five cents to Harrisburg.

The Cumberland Valley Traction Co., which has built from Carlisle to Shireman's Town, through Boiling Spring and Carlisle, has projected a line to New Cumberland, over a new route, parts of which will be over private rights of way. At New Cumberland the cars will meet those from Lewisberry and the New Cumberland Railway, which was chartered last year. This will also connect with the system of electric railways in York County, touching York Haven and intermediate points.

There is a movement on foot in connection with these projected railways to open a large park near Lewisberry.

Another branch of the York County system will be that west to Hanover, over the Gettysburg pike, taking in a number of the smaller towns and villages on the way, and connecting with the Baltimore, Westminster and Gettysburg electric railways.

SEATTLE-TACOMA INTERURBANS.

It is expected that the interurban railway line between Seattle and Tacoma will be put in operation about July 1st. This road is being built on the third rail system except where it lies within city limits and at grade crossings along the country highways. The road is to operate large coaches similar to those on most of the steam roads, which are to be equipped for high speed service. The company's right of way has been fenced in with especially strong fencing on account of the use of the third rail system.

Mr. P. A. B. Widener proposes to establish a home for crippled children at Logan, Pa., with an initial endowment of \$2,000,000. It will be not only a home, but an educational institution, and is designed to be a memorial to Mr. Widener's wife.

AMERICAN STREET RAILWAY ASSOCIATION.

A supplementary notice in regard to the Detroit convention of the American Street Railway Association has been issued by Secretary Pennington under date of April 1st.

The exposition will be held at the Light Guard Armory, Detroit, where all light, heat and power required can be furnished. The convention will also be held in the Armory, thus assuring the attention of all the delegates and visitors to the exhibits.

Applications for space should be made to Mr. John H. Fry, Detroit United Railway, 12 Woodward Ave., Detroit, Mich., who is chairman of the committee of exhibits. Applications for space should state the length and width of the space desired and the committee on exhibits will comply with the demands if possible. All articles intended for exhibition should be delivered at the Light Guard Armory by the agent or owner at his own expense, but the local committee have made arrangements with the Riverside Storage & Cartage Co. to haul all shipments made to the building if desired, at low rates. Goods should be addressed to the name of the exhibitor, care of the Riverside Storage & Cartage Co., accompanied by bill of lading or advice of shipment, and charges should be prepaid. Articles will be placed in exhibitors' space in the hall if the number of such space is marked on the boxes. Exhibitors will be advised of these numbers in ample time for shipment.

Space should be applied for by August 1st. Assignment will be made as promptly as possible and exhibitors will be notified of their location. Exhibits of like character will be grouped and space will be assigned in the order of application. The committee on exhibits will make contracts with carpenters, electric workmen and laborers at regular prices so that the exhibitors will not be overcharged for lumber, labor, etc.

Thursday, October 9th, has been set apart by the executive committee for the examination of exhibits. No session of the association will be made for that day and no entertainments of any kind will be given by the local committee, so all delegates will have ample time to call on exhibitors and examine the goods displayed.

The railroads will sell tickets on the certificate plan. Certificates should be left with the clerk on the first day of the convention at the time of registration. The certificates will be signed, vised and ready to return to members October 9th.

SOUTHWESTERN ASSOCIATION.

We have received from Mr. T. H. Stuart, secretary of the Southwestern Gas, Electric & Street Railway Association, a program of the convention which is to be held at San Antonio, Tex., April 18th to 21st. A good business program has been arranged and after this has been carried out the delegates will be presented with the social side of the program, a prominent feature of which is a trip to Mexico including visits to the principal cities of interest in that country. The itinerary for the Mexican trip contemplates leaving San Antonio at 9 o'clock on the morning of April 22d by special train, reaching Mexico City on the afternoon of April 25th. Stops will be made at Laredo, Monterey, Saltillo, San Luis Potosi, San Miguel, Toluca, Toluca. Two days will be spent in the City of Mexico and the return to San Antonio will be made on April 29th.

The approximate cost of the trip of seven days in accordance with this itinerary, including railroad fare, Pullman, hotels and meals will be \$50.00. An opportunity will be offered to those desiring to make the trip to Monterey only to return from this point to San Antonio. The cost of the latter trip will be about \$18.50.

ST. LOUIS TRACTION COMPANY PROVIDES FOR AGED EMPLOYEES.

A new rule has recently gone into effect on the St. Louis Traction Co., which provides for the employment of the men who have grown old in its service. The rule which was conspicuously posted in the different buildings of the company recently read as follows:

"Motormen or conductors will not hereafter be discharged on account of old age, but will be given other places as watchmen, switchmen and trolley holders, and will be required when on duty to wear full uniform. The rate of pay will be continued the same as if they continued in the service as motormen or conductors."

REPORT ON LIVERPOOL TUNNEL ACCIDENT.

A report on the fire which occurred in December, 1901, in the tunnel of the Liverpool Overhead Ry. has been made to the British Board of Trade by Colonel Yorke and Mr. A. P. Trotter, experts representing the Board of Trade.

Mr. Trotter's report states that from the evidence it appears that the insulated covering of one of the cables on a motor near the rear end of the train had become deteriorated, and broke down when there was an extra heavy demand for current. An arc formed and the excessive current caused the circuit breaker to open, stopping the train. The driver reset the circuit breaker several times and it is probable that he held it in place; the arc set fire to the woodwork of the car and the strong wind caused the flames to spread. The driver is censured for not having cut out the motor affected when the trouble developed. While the motor was an old one care had been taken to keep it in repair, and a motor of the modern iron-clad type would not have made an essential difference in this case.

Mr. Trotter's recommendations are as follows:

Flexible cables covered with india rubber or other combustible material are used unnecessarily in many cases in electrical work. They are used from habit and for convenience. This mode of construction does not commend itself to mechanical engineers. Combustible insulating materials should not be used in the main current conductors of electric trains, particularly in tunnel railroads. These conductors should be rigid, and might be bare, or enameled, or protected by incombustible ferrules in iron pipes. Flexibility should be restricted to necessary joints, and not used for convenience in arranging the conductors. Flexibility should be provided by pinned hinge or knuckle joints shunted by bare flexible links of wire gauze, or cable braided with wire, or by some other sound mechanical mode of construction. Little or no woodwork should be used in the construction of electric locomotives, or of the driver's cabs of motor coaches, and in the latter, the resistances and the controlled switches should be placed, if possible, in front of and outside the cab.

TROLLEY MEN APPEAR IN VAUDEVILLE.

The employes of the East New York division of the Brooklyn Rapid Transit Co., entertained their families and friends with a unique vaudeville performance on the evening of March 26th. The affair was given in the repair shops of the depot building on Jamaica Ave., which was temporarily transformed into a theatre, and the success of the occasion is generally ascribed to the harmonious relations existing between them and the superintendent of the division, Mr. John E. Webb. Music was furnished by an orchestra of railway men, and several of the men proved to be as clever and amusing as many of the entertainers on the professional stage. Refreshments were served after the performance and the employes were highly complimented by the guests on their skillful performance.

RAILWAY EXTENSION IN SEATTLE.

The Seattle Railway Co. intends to extend its line to the top of Queen Anne Hill, forming a new route which will do away with the counter-weight system at present employed. It will be a surface line for part of the distance, but near the top of the hill the grade rises so rapidly that it will be necessary to tunnel the hill reaching the level plateau on top by means of an underground route. After emerging on the plateau the line will traverse that district on a level grade and give service to a section covering an area of about three square miles which now lacks transportation facilities. The lines will run circuitously up the hill and at no point will the grade exceed six per cent. The line will be double tracked. The plans for the extensions have been completed and have been placed before the city council for its consideration. It has been understood between the members of the council and the management of the company that in the near future this line to the top of the hill would be constructed so as to do away altogether with the counter-weight system, and permission to construct the road will undoubtedly be granted.

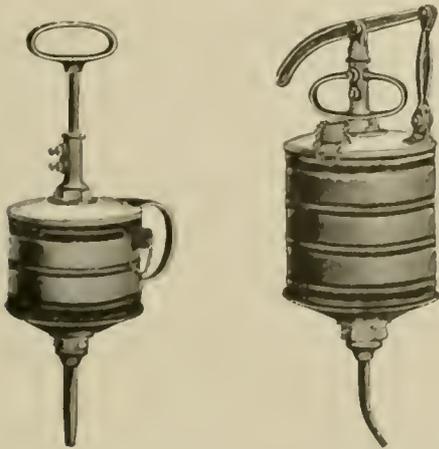
PENNSYLVANIA RAILROAD PENSION SYSTEM.

President Cassatt in his annual report for the year ending Dec. 31, 1901, gives some figures in regard to the voluntary relief, pension and employers' savings departments of that company. The total receipts of the employes' beneficial relief department for the year were \$1,176,206 which, added to the balance of \$337,331 from the previous year made an aggregate of \$1,553,537. Out of this, death benefits of \$376,274 were distributed and \$590,362 were paid out for cases of disability arising from sickness and accident. After meeting all obligations for the year there remained to the credit of the fund a balance of \$357,269, and in addition to this balance there is an accumulated surplus of \$751,256.

The employes' savings fund at the close of the year amounted to \$3,219,908. There were 229 employes retired during the year under the pension stipulations of the company. The amount paid these pensioners was \$236,648, and the total number of pensioned employes of the road is 1,105. It is the policy of the company to pursue a liberal course toward the employes between 65 and 70 years of age who are incapacitated for active service, and this, together with the extension of benefits to the Buffalo & Allegheny Valley division, which has become part of the Pennsylvania system since the pension department was first inaugurated, has considerably increased the demand upon this fund. For this reason an increase in the appropriation from \$230,000 to \$300,000 per year was asked.

TO SAVE OIL.

Engineers of power plants are quick to appreciate the waste of lubricating oils which follows the injudicious use of ordinary oil cans as well as some special forms of which the "squirt gun" type is a common one for a variety of applications, and they will be interested in the accompanying illustrations which show two forms



of a device for economically applying oil to the working parts of machinery. This is known as the Ironides improved Tormay patent oiler, and was first designed for oiling of mine car wheels; when used for this purpose its advantages were so apparent that it was adopted in other operating departments, and the report is that a saving of 50 per cent in the oil used has resulted from the use of the device by some of the larger coal mining properties.

The oiler consists of a central working barrel containing a plunger and surrounded by an oil reservoir; openings in the working barrel, sealed or unsealed, according to the position of the plunger, communicate with the oil reservoir. The adjustability of the stroke of plunger governs the quantity of oil forced at each operation. When not in use the contents are not only preserved from leakage, but are also protected from dust and other impurities. The Ironides Co., Columbus, is the maker of this oiler.

The People's Traction Co., Galesburg, Ill., has purchased two large interurban cars to be put in commission on its new extension to Abingdon. The cars were made at Niles, O.

PACIFIC COAST NOTES.

Mr. R. R. Colgate, one of the largest owners in the North Shore Railroad Co., is now in New York, completing arrangements for the conversion of this road to electric traction. The road at present consists of about 100 miles of narrow gage and is operated by steam locomotives. This is to be transformed into a standard gage electric line. A part of the equipment has just been ordered. Twenty-one cars have been purchased in the east and the 16 cars now in use will be remodeled into electric cars. The cars are to be run in trains of 4, 5 or 6 cars on a high speed schedule. The current for operating the road will be supplied either by the Bay Counties Power Co., or the California Central Gas & Electric Co.

The McAllister St. cable road, one of the recently acquired properties of the United Railroads of San Francisco, is being changed into an electric line. The new owners contemplate changing a number of cable lines into trolley roads.

The annual stockholders meeting of the Oakland Transit Co., which operates all the street railways of Alameda County, Cal., was recently held in Oakland. The old board of directors was re-elected and it was announced that the work of reconstructing the track of part of the company's lines would be commenced at once. The company will also begin work within a short time on three extensions of its lines in Berkeley, Cal., for which franchises have just been obtained.

March 25th the Merchants' Association of San Francisco addressed a communication to the board of supervisors asking that in all street railway franchises hereafter granted the stipulation should be made that within a prescribed area only grooved girder rails should be used, and that when any existing roads are reconstructed, grooved rails should also be used.

The Alum Lake Railway Co., operating between San Jose, Cal., and Alum Lake Park, is now transforming its steam line into an electric railway. All the poles are in place and it is expected that the road will be in operation within two or three weeks.

The Northern California Power Co., has been incorporated with a capital of \$2,000,000 for the purpose of consolidating several electrical properties in Shasta County, Cal. The company will control a large amount of power and it is stated that an electric railroad between Redding on the Sacramento River and Keswick in the copper mining district will be constructed within a short time.

IMPROVEMENTS IN WHEELING, W. VA.

The Wheeling (W. Va.) Traction Co., has been doing considerable reconstruction and general overhauling of its property. It has recently purchased fifteen 10-bench open cars from the St. Louis Car Co., which are to be mounted on McGuire trucks. It is also installing two 550 h. p. Stirling boilers, two 1,000-h. p. C. and G. Cooper engines and two 600-kw. Bullock generators with switchboards, new pumps, motors, etc., in its power house in 42d St. This plant will have a capacity when completed of about 3,000 kw. A new power house is also being built at Brilliant, O., which will be equipped with three 500-kw. generators and 1,000-h. p. engines with the necessary boilers, pumps, etc. This machinery has all been purchased. It is expected to deliver power from the new station in about 90 days. In the recent flood the company suffered considerable damage, having its tracks in some places 8 ft. under water.

STRIKERS MAY BE HELD RESPONSIBLE.

A precedent has been established by Judge Braley in the Supreme Court of Suffolk County, Mass., in the case of the R. S. Bryne Transportation Co., of Boston, against the Brotherhood of Teamsters and Helpers. The members of this brotherhood tried while on strike recently to interfere with the business of the plaintiff. The court made permanent its previous restraining orders preventing members of the union from interfering with the business of the transportation company by threats or violence. He also has established a precedent by ruling that the strikers' organization can be held responsible for the damage done by its members to the property of the plaintiff. The question of damages is to be heard by a referee.

NEW WORK OF THE COLUMBIA CONSTRUCTION CO.

The Columbia Construction Co., of Milwaukee, Wis., has received contracts for much new work which is to be undertaken during the coming season. This company is now completing the work on the Oshkosh & Omro Ry., and is about to commence on an extension for the Winnebago Traction Co., of Oshkosh, Wis., of 1½ miles. The new extension will reach the Northwestern railroad station and the Lake Shore Park. The rails are to be of the Shanghai type, 6 in. high and in 60-ft. lengths. The special work will be furnished by the Falk Co., of Milwaukee, Wis. Part of the line is to be paved with asphalt. This company is also prepared to commence work on the construction of the Fond du Lac & Oshkosh Ry. All the deeds for the right of way of this line have been obtained and the road parallels an existing steam line. The right of way is 50 ft. wide throughout. The road is to be built under the general law of the state which does not require a franchise from township boards. Four double-truck cars have been ordered for this line of the same type as are now in use on the Clark St. line of the Chicago City Ry., with the exception that a steam coach roof and a smoking compartment will be used. They will be mounted on St. Louis Car Co. 23 A trucks with 5-in. axles. The bodies are 34 ft. long and the platforms 5 ft. 6 in. long. The cars are to be equipped with Westinghouse No. 56 motors and geared to run at 45 miles an hour. The power for the road will be furnished by the Fond du Lac Street Railway & Light Co.

March 27th the Columbia Construction Co. began the work of rebuilding the 10th St. and Brooklyn Ave. line of the Metropolitan Street Railway Co., of Kansas City. This was formerly a cable road which is now operated electrically. The rails are to be 6-in. girders laid on standard white oak ties 8ft. long and the roadbed will have a foundation of 5 in. of crushed rock. The entire line will be paved with brick or asphalt.

This company is also about to begin the rebuilding of the Prospect Ave. and 19th St. lines of the Metropolitan company. The former line is 4 miles in length and the latter is 1½ miles; they will be laid with 106-lb. 9-in. girder rails and the Prospect Ave. line is to be paved with asphalt and brick. The 19th St. line will be paved with asphalt. All the rails on both of these lines are to be cast-welded by the Falk Co.

CONVICTION IN ST. LOUIS BRIBERY CASE.

Émil A. Meysenburg, an ex-member of the St. Louis City Council, has been convicted of accepting a bribe of \$9,000 from Philip Stock, financial agent in charge of the Suburban railway bill. A check for \$9,000 drawn by the president of the St. Louis & Suburban Railway Co., was paid to Meysenburg for 200 shares of stock in an old company, alleged to be absolutely worthless. The contention of the state was that this \$9,000 was paid to Meysenburg for his vote on the Suburban bill. Although the instructions of the judge were favorable to the prisoner, and the jury was instructed that unless it was satisfied that the defendant made an express agreement to vote for the traction bill he must be found not guilty, the jury returned a verdict of guilty as charged, and the punishment was fixed at three years in the penitentiary. A motion for an appeal was filed.

CEDAR OF THE GREAT LAKES DISTRICT.

The total number of telegraph, telephone, electric light and trolley poles now standing in the United States has been estimated by competent authorities as exceeding 20,000,000. Assuming that the life of these poles averages 15 years, it is estimated that the repair work necessary to maintain these lines, taken in connection with new construction, represents a total annual consumption of poles of over 2,000,000. Chestnut, red cedar, cypress and juniper are used to a limited extent, but chiefly in sections where these trees are indigenous, which comprises a comparatively small area. The territory east of the Rocky Mountains is being supplied principally from the white cedar swamps of the Great Lakes district, which comprises parts of Michigan and Wisconsin and the islands of the lakes. The Valentine-Clark Co., 234 La Salle St., Chicago, has its

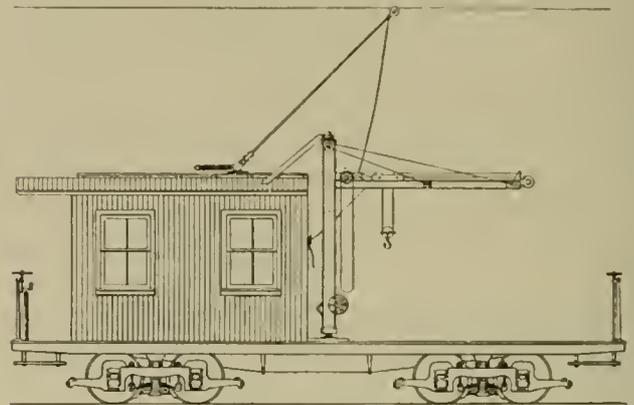
main yards throughout this region, and makes a specialty of cedar poles.

There has been a moderate movement of cedar from Idaho and Washington to the territory east of the Missouri River during the last few years, but owing to excessive freight charges this movement has been largely confined to poles 50 ft. and upward in length.

The value of the cedar stumpage now remaining is rapidly increasing in proportion to the decreasing supply and constantly increasing demand.

CONSTRUCTION CAR.

The accompanying illustration shows a general utility car, designed by the Ludlow Supply Co., 313 Electric Bldg., Cleveland, O., for use on trolley roads. The crane has a lifting capacity of from 5 to 20 tons, and can be built for operation by hand, electric or pneu-



CONSTRUCTION CAR.

matic power. The boom of the crane is about 10 ft. in length. The load is supported on a trolley and can be moved to any point on the boom, by the hand chain which hangs near the mast. The company is prepared to furnish cranes of any capacity or design, but does not furnish the cars.

A LIVE ELECTRIC RAILWAY SUPPLY HOUSE.

Porter & Berg, 309 Dearborn St., Chicago, carry a complete line of street railway supplies comprising nearly every article from a rail bond to a working set of United States electric signals. The firm has opened a new ware-room at 47 Plymouth Place, Chicago, in the building which after May 1st will be the home of the "Street Railway Review," and this in addition to its spacious offices and sample rooms on Dearborn St. gives it every facility for handling its increasing business promptly and conveniently. Porter & Berg represent the Ohio Brass Co., manufacturer of pole brackets, overhead material, rail bonds, etc.; the Cutter Co. of Philadelphia, I-T-E circuit breakers; the United States Electric Signal Co., Watertown, Mass.; Frank Ridlon Co., Boston, Mass.; Wilson trolley catchers; Ham Sand Box Co., Troy, N. Y.; New Haven (Conn.) Car Register Co.; Speer Carbon Co., St. Marys, Pa., manufacturers of carbon brushes; the Trolley Vestibule Shade Co., Bridgeport, Conn.; American Brake Shoe & Foundry Co., Chicago, and the Hunter Illuminated Car Sign Co., Cincinnati, O.

FIRE AT ANDERSON, IND.

March 14th a fire of unknown origin almost totally destroyed the machinery supply house and temporary machine shops of the Union Traction Co. of Indiana. None of the company's cars was burned but the fire interfered temporarily with the operating of the line. The loss in supplies and machinery is about \$15,000 and on the building \$5,000. This was partially covered by insurance. The building was erected by the Anderson Street Railway Co., and used as a power house previous to the purchase of this company by the Union Traction Co.

RIDLON'S REPRESENTATIVE.

The Frank Ridlon Co., of Boston, Mass., has always been a staunch believer in good advertising and its attractive displays in the "Review" have always occasioned attention and favorable comment. In the direction of supplementing and increasing the value of its advertisements in the trade papers the company has commenced publication of an interesting little pamphlet which is designed to give information concerning its many well-known specialties in greater detail than can be done in its monthly announcements in the paper.

The publication has been styled "Ridlon's Representative," and the issue for March contains among other things descriptions of the "New England" motor, the Weld babbiting device, and other of the Ridlon supplies.

Some of the "editorials" are worth quoting. The following are a few: A Wilson trolley pole catcher is better than an accident policy. Your conductor would collect more fares if he didn't have to watch his trolley. Lightning never strikes twice in the same place, because nobody can find the place. Sometimes it is worth more to keep down expenses than it is to increase your earnings. The nickel you get as fare is worth no more than the nickel you cut off from the expense account.

TICKET FRAUDS IN PHILADELPHIA.

A number of employes of the Union Traction Co., of Philadelphia, were arrested last month charged with using the mails to defraud the company. The plan of the men has been to trade exchange tickets in large bundles which were forwarded by mail between different conductors. The question of fraud hinged upon the trading of exchange tickets through the mails with a consequent loss of money to the company. The offense lies directly in the fact that the men used the mails in the furtherance of their scheme, which was fraudulent only because of their being employes. The trading of exchanges among passengers of the various lines is a common practice and one that meets with no protests from the railway company. Mr. James Bricker, superintendent of transportation of the Union Traction Co., testified that on an average of 250,000 exchange tickets changed hands each day. He stated that while the company had been victimized by employes on many occasions the present plan was the first one discovered in which the mails had been used. The general trading of exchange tickets keeps an enormous number of the slips in circulation and so long as the tickets are purchased by passengers there is no serious objection on the part of the company to their being exchanged, but when the conductors trade whole packages of tickets and turn them in as cash fares it nets them a profit of one cent on each ticket which the company loses.

SHADE ROLLERS FOR STREET CARS.

Among the many articles used in car building, one of nearly absolute necessity is the spring shade roller which finds its use for all fabrics from the lightest silk or bunting shade up to the heaviest rain curtains on open cars. This article has been steadily improved both in construction and form in the factories of the Stewart Hartshorn Co., whence it originated and attained under that make its reputation for being a standard article.

The latest change in Hartshorn shade rollers for cars is in the spring end bearing or spear which is now made of steel instead of malleable iron. The chief advantages of this spear are that it does not break as a defective casting sometimes will, and, being always of exact size and form, it obviates the irregularity or roughness which occurs in castings. With this spear the lengths of shade rollers from end to end of bearings are not subject to slight variations as heretofore, a fact of importance in car work, as there can be but a very small allowance for inaccuracy in the width of windows. All of the 1-in and 1¼ in. Hartshorn rollers which are used on closed cars have for some time been furnished with this new steel spear and now that they have been found to give satisfaction, the company has decided to put the same improvement on the 1½ in and 1¾ in rollers which are designed with extra strong parts in order to handle the long and heavy shade cloth used on open street cars.

The old form of round groove tin roller has also undergone improvement in the method of mounting, which consisted first of hemming wires or cord in the narrow strip of shade cloth sewed at the top of car curtains and then drawing them from end to end of the roller. The two chief dangers of this method consisted in the difficulty of hemming the cord or wire at right angles to the curtain so that it should roll up straight, and of sometimes tearing the cloth while pulling it into the groove. These disadvantages have been cleverly overcome in the Hartshorn "New Groove" tin roller. To mount a curtain on one of these rollers the strip sewed at the top of the shade must first be perfectly squared with the sides of the cloth as in any other method of mounting, then one of the fasteners furnished with the goods is placed upon it and pressed down perpendicularly into the groove until it turns under the fingers. It is only necessary to repeat this operation about every six inches along the roller barrel when the curtain will be rigidly fastened to it and still can easily be removed by pulling it out of the groove at either end. When once understood this way of mounting car curtains is even simpler than the description and in many cases operatives who at first could see no advantage in it have by its use increased their speed in turning out accurate work. The reasons are logical, for in the first place the tedious operation of hemming wires or cord at the top of the curtain and getting them square with the sides is eliminated, while again there is no danger of tearing the top strip while pulling it through the groove. Another thing claimed for the "New Groove" tin roller is that in shops which are in any way crowded, the shade mounting bench room can be reduced one half by the use of this form of roller, as the cloth is directly inserted into the groove by the use of fasteners instead of being first spread out with its width added to the length of the roller and then drawn into its place.

BRAKE SHOE COMPANIES CONSOLIDATE.

Announcement was made March 18th that the American Brake Shoe & Foundry Co., with temporary offices at 26 Cortlandt St., New York, had assumed control of the brake shoe output of the following plants:

Ramapo Foundry Co., Mahwah, N. J.; Sargent Co., Chicago; Lappin Brake Shoe Co., Bloomfield, N. J.; Corning Brake Shoe Co., Corning, N. Y.; Streeter Brake Shoe Co., Chicago. These concerns manufacture the following well known types of brake shoes: The Sargent skeleton steel, the "Diamond S," the skeleton steel insert, the Lappin steel back, the Streeter steel hack, the Corning and the Ross-Meehan.

CHANGES AT WAUPACA, WIS.

Mr. W. B. Baker, formerly secretary and a large stock holder in the Waupaca Electric Light & Railway Co., of Waupaca, Wis., has sold his interest to Mr. Irving P. Lord, the president of the company, and John D. Caughell of Embarrass, Wis. Mr. Caughell has been elected secretary and a member of the board of directors, and Mr. William Dressen, cashier of the National Bank of Waupaca, has been elected treasurer. Mr. Lord owns a majority of the stock, and will continue his duties as president and general manager.

The company is in most excellent condition, not owing a dollar to anybody outside of its bonded indebtedness of \$36,000. The capital stock is \$75,000, fully paid in, and the original bonded indebtedness three years ago was \$42,000, but the bonds are being retired at the rate of \$2,000 per year.

The Waupaca Electric Light & Railway Co. has a modern lighting system, and one of the best five mile electric railways in the west. The whole is operated by water power, of which there is an abundance, and those who are in a position to know state that the condition of the company is a very prosperous one.

The Western Ohio Electric Railway Co. ran its first car over the newly completed interurban line between St. Mary's and Lima March 9th. It was the first car ever run in Auglaize County.

The Manitowoc (Wis.)-Two Rivers Interurban Electric Ry. will be put in operation about May 1st. The power house at Little Manitowoc is nearly ready for the installation of machinery; the company contemplates a new bridge in the city of Two Rivers.

THE STRIKE AT SCRANTON, PA.

Under date of March 20th, Mr. Frank Silliman, Jr., general manager of the Scranton Railway Co., writes us as follows concerning the strike and boycott:

The strike is still nominally in force, although all that remains of it is a partial boycott which is still officially in force and affects a part of our business. The boycott, however, is lifting itself.

On March 12th inst., there was an outbreak of violence in Minooka, a village in Lackawanna Township, next south to Scranton, which resulted in driving the crew from their car, and the subsequent setting fire and total destruction of the car. Now and then other slight outbreaks of violence occur, which consist principally of stoning the cars. The strike has been on since Oct. 1st, 1901.

AMERICAN POLES FOR EGYPT.

W. C. Sterling & Son, of Monroe, Mich., have just heard from their first consignment of poles to Alexandria, Egypt; the company was well pleased and the second consignment will soon be shipped. Sterling & Son are probably the oldest cedar pole, tie and post firm in the United States, and are certainly one of the largest.

At the present time they have their cedar stock well out of the swamps and there are now at the main yard nearly 100,000 poles sorted and piled ready for shipment. The firm's tie business is also a very large one, and there is kept at all times a stock of 100,000 ties on hand notwithstanding continual shipments. The firm prefers that purchasers visit the yards and make their own selections, as they then can make sure of getting just what they want, although in most cases the buyer who takes the dealer's inspection gets the best inspection. The large stocks kept on hand gives time for the timber to dry and permits lighter shipping.

Sterling & Son report that the outlook for the coming year is good and as there will probably be a shortage in all cedar stocks because most of the producers were caught by the early spring with about 25 per cent of their stock still in the swamps and will be unable to get it out. Customers are therefore advised to place orders as early as they can.

MISUSE OF TRANSFERS IN KANSAS CITY.

The officers of the Metropolitan Street Railway of Kansas City are seeking to have a new ordinance passed making it a misdemeanor for any one to ride on a street railway transfer which has been secured by another. Mr. Saterlee, general superintendent of the company, explains that there are men in the two Kansas City who make a business of misusing street railway transfers. News dealers and newsboys have been in the habit of giving a transfer together with a morning newspaper for five cents.

Another practice which has been discovered is the exchange of transfers by working men in the wholesale houses and other establishments in the center of the city. A man who is living on the east side for example, goes to work in the morning getting off near the center of the city. He gets a transfer to the west side, and another man living on the west side procures a transfer to the east side. These two men exchange transfers during the day and ride home on them in the evening. Although the transfers have morning and evening sections which are punched the cars are so crowded during the morning and evening hours that in most cases the conductors overlook the fact that the transfers are intended for a morning ride instead of an evening one.

While the law would hardly be sufficient to stop this practice the officials of the company believe it will be the means of frightening many of those who misuse transfers, and a section is to be included in the new ordinance governing this point.

NEW ELECTRIC LINE FOR UTAH.

The Salt Lake & Utah Valley Railroad Co., has been incorporated to build a system of electric roads running from Salt Lake to Bingham and Provo which will pass through a number of intermediate towns between these places. The new company is a Colorado corporation and is headed by L. L. Munn, of Telluride, Col., manager of the Telluride Power Co.

Mr. Munn at present controls the West Side Rapid Transit Co., of Salt Lake City, which will eventually form part of the new road. The first work to be undertaken is to be the extension of these lines to Bingham. It will touch the suburbs to the South of Salt Lake and reach the different smelters in this neighborhood so that freight as well as passenger business can be built up. The directors of the new company are L. L. Munn, Trinidad, Col.; J. J. Munn, Provo, Utah; Wm. Story, jr., and A. M. French. The capitalization is \$250,000, but this amount will eventually be increased. There will be a bond issue to provide funds for the project.

NEW OHIO INTERURBAN OPENED.

Another link in the chain of interurban railways which is being built to connect Cincinnati and Toledo was completed last month and about 100 miles of new road belonging to the Western Ohio Traction Co. was put into operation. The portion of the road opened runs between Lima, Wapakoneta, St. Marys and Minster. The other extensions of this line are well under way, one being the northern extension from Lima to Findlay and the other the southern extension from Wapakoneta to Troy. When these are completed a continuous line between Cincinnati and Findlay will be formed, as Troy and Dayton are connected and Dayton and Cincinnati are connected by the Southern Ohio Traction Co. All of these lines largely represent the same financial interests, and while they have not been consolidated up to the present time it is generally admitted that a consolidation will be brought about when the other service is ready to be established.

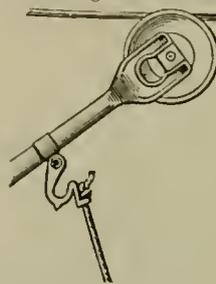
BUFFALO, SPRINGVILLE AND CATTARAUGUS.

The Buffalo, Springville & Cattaraugus Railway Co., of Cattaraugus, N. Y., has secured the necessary franchises and is now at work getting rights of way. The company will have 34 miles of its line through or over private property and will have to erect a bridge 209 ft. high and 666 ft. long, and it is not contemplated to have the line in operation before the summer of 1903. The contract for construction has been let and calls for 70-lb. rails and bridges to carry 700 tons. The equipment will comprise 6 passenger cars, 10 freight cars and 2 electric locomotives of 40 tons each.

The officers of the company are: President, H. L. Moench; vice-president and general manager, U. L. Upson; secretary, Theodore Truby; treasurer, W. A. Oakes.

INGENIOUS WATER SHED.

The American Street Railway Paving & Improvement Co., Springfield, Mass., has recently placed upon the market a device for deflecting water from trolley ropes. This is the invention of



TROLLEY WATER SHED.

Seth J. Buckland, of Springfield, and is well shown in the accompanying illustration. The advantages claimed for the water shed or deflector are that it will prevent water containing rust from the pole from coming down the cord and thence being thrown over signs, windows and passengers' clothing, and that the oil from the trolley wheel is prevented from reaching the car and causing it to drop off at the end.

The Twin City Rapid Transit Co. is remodeling its principal car house in Minneapolis, and will build an addition to the present structure, 123x330 ft., at a cost of \$60,000. Beside accommodations for new cars the addition will include bath rooms and lockers for employes.

Citizens of Washington have submitted a bill to the District Commissioners providing that no street railway company operating within the city limits shall be permitted to run cars exceeding 10 tons in weight; a restriction as to the fares and a provision requiring that schedules, routes and transfer arrangements shall be submitted to the Commissioners are contained in the bill.

FINANCIAL.

METROPOLITAN STREET RAILWAY.

The stockholders of the Metropolitan Street Railway Co., of New York, approved the proposed 999 year lease of that company's properties, rights and franchises to the Interurban Railway Co., by more than two-thirds majority. The stockholders also approved the proposed issue of \$65,000,000 to take up the \$54,000,000 of bonds outstanding and to pay off certain indebtedness connected with the equipment of the Third Avenue road. There was a strong minority opposition to the leasing of the property and immediately after the meeting of the stockholders Mr. Isidor Wormser, jr., filed a suit for an injunction on the ground that the lease and merger proposed was unlawful. In the brief submitted by defense in the Wormser suit the statement was made by the company that the Metropolitan Street Ry. could not earn the 7 per cent dividends paid last year which was to be guaranteed by the lease during the time that the reconstruction of its 100 miles of horse railway was taking place. The company claims that with accruing dividends on the Third Avenue road and increased charges, only the proposed 7 per cent guaranteed protects the present dividend rate. A temporary injunction which was granted preventing the consummation of the lease was discontinued April 8th by Judge Gildersleeve in the Supreme Court and the lease of the Metropolitan to the Interurban company was executed and filed immediately after the decision was rendered.

BROOKLYN RAPID TRANSIT.

At a meeting of the stockholders of the Brooklyn Rapid Transit Co., on March 20th, the raising of \$150,000,000 by mortgage on the franchises and property of the company was authorized. This was in accordance with the unanimous recommendation of the directors who some time ago recommended the issue of bonds to that amount. The report of the operations of this company for the months of January, 1902 and 1901, and for the seven months ending January 31st has been published, as follows:

	1902.	1901.	Increase.
Gross receipts	\$996,824.71	\$917,750.17	\$ 79,074.54
Expenses, including taxes.....	784,350.90	663,893.13	120,457.77
Net receipts	212,463.81	253,857.04	*41,393.23
For Seven Months Ending January 31.			
	1902.	1901.	Increase.
Gross Receipts	\$7,533,752.43	\$7,955,706.62	\$498,045.81
Expenses, including taxes..	5,300,232.02	4,565,944.80	734,287.13
Net receipts	2,233,520.41	2,489,761.73	*256,241.32

*Decrease.

It will be seen from these figures that the gross earnings are steadily increasing which clearly indicates the steady growth of the company's business. The net earnings, however, show a decrease because of President Greatsinger's policy of spending every possible surplus dollar in improvements and equipments. It is probable that hereafter the cost of extraordinary improvements will not appear in the monthly statements and the new bond issue will supply ample funds for all charges outside of those that legitimately come under operating expenses. This will make a great difference in the company's financial reports as it will then be able to show a fair dividend earned.

METROPOLITAN ELEVATED, CHICAGO.

The annual report of the Metropolitan Elevated of Chicago, presented by President McAllister at the annual stockholders' meeting held April 4th shows that the increased taxes and accidents during the severe fog of last November decreased the net earnings quite materially for the fiscal year ending February 28th. The company's taxes payable this year amounted to \$149,335 and the cost of an accident on November 19th was \$17,976. The gross earnings for the year were \$1,753,313, as compared with \$1,628,737, an increase of \$124,576. The payment of this extraordinary expense made the net earnings less than the dividend requirements on the preferred stock and as a result the company was forced to draw on its surplus, reducing that item by \$22,251. The cost

of the accident, however, is considered properly chargeable to the surplus and if so charged the earnings would show 3.17 per cent on the preferred stock.

The traffic reported for the year is as follows:

Number of passengers carried for the fiscal year ending February 28, 1902	33,910,790
Number of passengers carried for the fiscal year ending February 28, 1901	31,656,972

Increase.....	2,253,818
Per cent of increase.....	7.12

During the year the company carried on the construction of two extensions, the Douglas Park and Garfield Park branches. These two extensions will add 2.35 miles to the lines. There are seven additional stations on the Douglas Park branch and one on the Garfield Park branch at 52nd Ave. with improved terminal loops at the end of both lines.

The financial statement for the fiscal year is as follows:

Earnings.	
Passenger	\$1,695,243
Miscellaneous	58,069
Total.....	\$1,753,313
Expenses.	
Maintenance of ways and works.....	\$ 45,931
Maintenance of equipment	80,057
Conducting transportation	527,086
General expenses	84,135
	737,209
Surplus earnings.....	\$1,016,103

Income Account.

Credits.	
Balance from previous year.....	\$ 54,089
Surplus earnings	1,016,103
Interest on balances and other credits to income.....	4,640
	\$1,074,833

Charges.

Rental, Pennsylvania Company (crossing).....	\$ 11,900
Rental, Union Consolidated	20,351
Rental, Union Elevated (loop).....	169,869
Taxes	149,333
Interest on bonds	392,320
	743,776
	\$331,057
Accident November 19, 1901.....	37,976
	\$293,081
Dividends Nos. 4 and 5 (3 per cent).....	261,243
Balance.....	\$ 31,838

The general balance sheet as of Feb. 28 shows:

Assets.	
Cost of road and equipment.....	\$26,018,669
Bonds in treasury (turned over by Purchasing Committee for improvements and betterments).....	192,000
Preferred stock (turned over by Purchasing Committee for improvements and betterments).....	291,900
Securities in hands of Purchasing Committee for completion of reorganization	26,461
Cash	331,736
Material (fuel and supplies)	21,727
Due from individuals and companies.....	34,677
Due from agents	5,188
Other assets (unexpended insurance, etc.).....	15,095
Extensions	\$1,290,580
Less amount received from trustee on engineer's certificates	1,190,375
	100,205
	\$27,037,662

Liabilities.

Balance profit and loss	\$ 31,838
Preferred stock ..	9,000,000
Common stock	7,500,000

Bonds	10,000,000
Coupons unpaid	107,500
Interest accrued, not due	32,693
Dividends uncalled for	87,167
Pay checks	25,582
Audited vouchers	85,246
Due individuals and companies	7,813
Taxes accrued, not due	129,874
Unused insurance	29,276
Unearned passenger balances (tickets sold, not used) ..	671
	<hr/>
	\$27,037,662

The only change in the board of directors of the Metropolitan was the election of Frederick A. Delano, general manager of the Burlington road, to succeed President George B. Harris of that road. The Burlington is still keeping its representative on the Metropolitan board which indicates that arrangements will be made eventually for handling the Burlington's suburban business over the elevated line.

MONTREAL STREET RAILWAY CO.

The statement for the Montreal Street Railway Co. issued for the month of February shows the total earnings for the month to be \$133,644, an increase of \$6,032 over the same month last year. The comparative statement of earnings and expenses for February, 1902 and 1901, is as follows:

	1902.	1901.	Increase.
Passenger earnings	\$132,159.00	\$126,998.82	\$ 5,160.18
Miscellaneous earnings	1,485.69	613.44	872.25
Total earnings	133,644.69	127,612.26	6,032.43
Operating expenses	103,915.30	87,854.48	16,260.82
Net earnings	29,729.39	39,357.78	*10,228.39
Fixed charges	14,580.68	8,774.27	5,806.41
Surplus	15,148.71	31,183.51	*16,034.80
	<hr/>	<hr/>	
Operating ratio	78.63	68.94	9.69

*Decrease.

The decrease in the earnings for the month are attributed to the excessive amount paid for the removal of snow from the tracks.

PHILADELPHIA CO., PITTSBURG.

The report of the Philadelphia Co. and its affiliated corporations among which are the street railways of Pittsburg and the surrounding district, has been issued for the month ending Feb. 28, 1902. The report is as follows:

	1902.	1901.
Gross earnings from operation.....	\$1,150,514.61	\$1,008,124.02
Operating expenses and taxes.....	532,134.55	485,067.68
Net earnings from operations	627,380.06	523,056.34
Other income	287,917.93	227,853.09
Total earnings and other income.....	915,297.99	750,910.33
Deductions from income	68,903.18	32,564.15
Total income	846,394.81	718,346.18
Fixed charges	321,287.14	263,797.11
Net income	525,107.67	454,549.07

ST. LOUIS TRANSIT CO.

This company which is the operating company of the United Railways Co., of St. Louis, held its annual meeting March 12th at which the officers and board of directors of the previous year were re-elected. The president's report showed that the power houses of the different companies had an aggregate capacity of 24,000 h. p. On the completion of the new station of the St. Louis Transit Co., it will have a total capacity of 150,000 h. p. and the total mileage of track operated is 361.7 miles. The financial statement for the year was considered very satisfactory and is as follows:

Gross earnings for the year 1901, \$5,777,599; increase over last year of \$1,314,705; operating expenses and taxes, \$3,692,400; increase, \$45,913; net earnings, \$2,085,199; other income, \$6,313; total, \$2,091,512, or an increase of \$1,268,792 for the year. Interest and dividends, \$2,617,142; deficit, \$525,630. Percentage of operating expenses and taxes to gross earnings, 63.91, a decrease of 8.69 per cent.

Assets—Securities Owned.

Common stock	\$17,261,300
United Railways	2,852,158
Preferred capital stock	3,137,233
Capital stock Louisiana Purchase Exposition company ..	210,000
	<hr/>
Total	\$23,360,692

Current Assets.

Cash, \$123,696; securities due from United Railways company, \$263,535; Transit company 5 per cent notes reserved for future requirements, \$1,392,000; discount on bonds sold to be proportional over term of lease, \$275,000.

Liabilities.

Interest on funded debt	\$1,767,541
Dividends on preferred capital stock.....	576,210
Collateral trust note interest	18,560
Organization expenses	1,000
Miscellaneous interest	253,830
	<hr/>
Total fixed charges	\$2,617,142

Construction Expenses.

Track and roadway	\$ 680,512
Equipment	401,039

The report showed that the total number of passengers carried during the year was 117,546,811, an increase of 26,920,430 or 29.1 per cent over the previous year. A feature of the report was the material decrease in the operating expenses which had occurred under the management of General Manager Du Pont.

NORTH JERSEY STREET RAILWAY CO.

The annual stockholder's meeting of the North Jersey Street Railway Co., which controls the trolley lines in northern New Jersey, was held March 24th, at which the old board of directors and officers of the company were re-elected. The president's report for 1901 shows the receipts from passengers were \$4,151,410, and from other sources \$21,235. The operating expenses were \$1,994,987, making the net earnings \$2,177,658. From this was deducted \$2,063,899, leaving a surplus of \$113,768. President E. F. C. Young also announced that the company proposed to spend \$1,000,000 in improving the property within the next 12 months.

ALBANY & HUDSON RAILWAY & POWER CO.

The Albany & Hudson Railway & Power Co. is to be reorganized under a committee consisting of Clinton L. Rossiter, of Brooklyn; Foster M. Voorhees, of Elizabeth, N. J., and Horace Andrews, of Cleveland. The plan calls for a deposit with the Colonial Trust Co. of its existing securities and the creation of the following new securities: First, a new series of bonds aggregating a total authorized amount of \$1,800,000 of 4½ per cent 40-year gold bonds of which \$1,500,000 par value are to be issued for the purpose of this plan and the remainder to be reserved for future extensions and betterments.

Second, the capital stock now \$2,500,000 par value, all of which is common stock, is to be divided into approximately \$1,800,000 of 5 per cent non-cumulative preferred stock and \$700,000 of common stock.

Third, the \$700,000 in common stock to be divided pro rata among the holders of the present capital stock. In case the new bonds are not marketed by the committee the present stockholders will receive in new bonds 57.92 per cent of their present holdings. Payment for the remaining 48.08 per cent being in preferred stock. In case the bonds are marketed by the committee the present bond holders will receive for each \$1,000 principal of old bonds \$487 cash and \$522 preferred stock. This agreement will become operative when in the judgment of the committee, enough bonds and shares of stock shall have been deposited.

The United Railroads of San Francisco have been organized following the purchase of the Sutro, Sutter St. and San Mateo car lines by the Baltimore syndicate. The purchase price, \$17,599,675, was paid by Brown Bros. on March 18th. The sale was authorized under the civil code of California and passed March 22, 1899, authorizing the sale of any railroad company owning any railroad company in that state of its property and franchises to any other railroad company whether organized under the laws of

that state or any other state. The purchasing syndicate did not expect to take possession of the property for some time, but a clause in the act which provides that such lease conveyance and transfer shall be made within three years from the date of the act left only a few days in which to make the conveyance legal.

The Capital Traction Co., of Washington, D. C., has issued its annual report showing gross earnings for the past year to be \$1,231,863; operating expenses, \$560,171; net earnings, \$671,512; total net, \$691,189; surplus for charges and 4 per cent dividends, \$99,389.

MASSACHUSETTS STREET RAILWAY ASSOCIATION.

The regular monthly meeting of the Massachusetts Street Railway Association was held at Young's Hotel, Boston, Wednesday, April 9th, and was largely attended.

Ex-President John R. Graham, now fully recovered from his recent severe illness, was present and gave an interesting account of his experiences in Mexico, where he spent the greater part of the winter.

Mr. George B. Francis, chief engineer of the Union Railroad Co. of Providence, R. I., was the guest of the evening, and read a paper on "Improvements in Street Railway Construction."

Mr. Francis was formerly resident engineer of the Boston Terminal Co., and went with the Union Railroad Co. after an experience of more than 15 years in steam railroad engineering, and it was especially interesting to street railway men to learn how the problems which always confront them, were worked out by a steam railroad man.

Since Mr. Francis has been with the Union Railroad Co. much important work has been done, much new track has been built, and old track rebuilt in the most approved manner. The Cranton St. repair shops and the Elmwood Ave. carhouse, both of the most substantial character, have been completed, and a new power station is well under way.

The improvements in track, under way or contemplated, include the following: Placing concrete beams under the rail and thus avoiding of ties altogether, in some instances. Placing at least a foot of gravel ballast under the ties in all track work, instead of using any convenient material. Decreasing the spacing of ties to possibly 22 in. c. to c. Increasing width and length of ties, to not less than 7 in. in width and 8-ft. length. Placing guard rails on all curves of less than 600 ft. radius. Placing the switch tongue on the opposite side from usual practice, in a good many cases, so that the main track will be free from the tongue. The adoption of a lock for switch points as soon as a suitable method can be found for the various conditions.

Some peculiarities of street railway work which impress a steam railroad engineer, were these: The greatest cost of street tracks per mile, under city conditions. The fact that under street railway charters tracks are laid under the supervision of highway surveyors who are generally quite unfamiliar with the requirements. The elevation of outer rail; street conditions sometimes require a depression instead of an elevation. Loose switch points; nothing of this kind is found in steam railroading and it will be a relief to street railroad men when a reasonable method is found to fasten the points while they are run over. The small flanges in street car wheels and the trouble had with chipped flanges due to running over special work.

Mr. Francis also described the car house and repair shops recently completed and the power station now building, and exhibited blue prints and photographs showing the construction.

Mr. Elwin C. Foster, of the Massachusetts Street Railway Association, and Mr. Charles S. Clark, 70 Kibby St., Boston, secretary.

The Youngtown (O.) Park & Falls Street Railway Co. has increased the wages of its employes from 18 to 20 cent an hour. The new scale was effective April 1st.

A bill has been introduced in the Massachusetts Legislature requiring all double truck cars more than 20 ft. in length to be equipped with automatic brakes before Oct. 1, 1902.

TOUR OF NEW YORK RAPID TRANSIT OFFICIALS.

A tour of inspection was recently made by a number of officials of the New York Rapid Transit Subway Construction Co., which included Chicago, Milwaukee and Pittsburg, for the purpose of inspecting railroad shops, materials, methods of operation, etc., preparatory to installing the system in New York. The party included Messrs. August Belmont, president of the company; E. P. Bryan, general manager; George Gibbs, consulting engineer; S. L. F. Deya, chief engineer; L. B. Stillwell, J. Van Vleck and W. Scott Bryan. The party spent considerable time in investigating the systems of the Chicago elevated roads and at the close of their visit were entertained at an informal dinner at the Auditorium Annex, given by the officers of the local transportation companies.

NEW CANADIAN CAR SHOPS.

The British Columbia Electric Ry. announces that it will soon commence the erection of car shops at New Westminster, B. C., and all of this company's cars will be built here in the future. The company operates lines in Vancouver, Victoria and New Westminster as well as a large interurban system at Vancouver. The company recently secured an important water concession from the government at Coquitlam Lake and intends to generate power for the road by means of the water falls at this point.

MAGNETIC BRAKES IN ENGLAND.

The corporation of Huddersfield, Eng., which operates the street railway there has been making a test of the Westinghouse magnetic brake, which has been found entirely satisfactory. This form of brake is automatic and the power is applied both to the shoe on the car wheel and to a slipper brake resting on the track. The brake acts automatically so that the power is always proportional to the speed of the car and the pressure on the track is applied so that the weight of the car on the wheels is not reduced. The car on which this brake was tested was allowed to descend a steep grade, the power being turned on until it attained a good speed; it was then allowed to run away and the brake was applied, after which it was stopped in a remarkably short distance. The grade where this test was made was about 10 per cent. The brake was also tested with the trolley pole taken from the overhead wire, and under these conditions the brake showed equally good results.

The tests were watched by a number of members of the city council, some of whom stayed upon the car and others watched the tests from the sidewalks. The experiments were entirely satisfactory to the members of the council and it is probable that all the cars of the company will be equipped with these brakes.

ELECTRIC STREET CAR SPRINKLER.

For rapid and economical sprinkling of streets nothing can surpass electric cars fitted with a tank and sprinkling device. In the "Review" for November, 1901, page 851, there was described and illustrated a combined track and street sprinkling car built by the Studebaker Brothers Manufacturing Co., of South Bend, Ind. Two very similar cars have been built by this company for the Colorado Springs & Suburban Railway, Denver, Col. The spray is thrown from two sprinkling heads located on either side of the car near the center of the truck and the water is forced from these heads by two force pumps run by a 30 h. p. motor which is located at one end of the car. The amount of water used as well as the width of the spray is governed by levers on either end of the car. An emergency brake is so supplied for quickly stopping the spray in case of passing a vehicle.

A third sprinkler head is located at the front of the car for flushing the tracks and space between them. In a test with the car standing still, a spray of water was thrown from both sides of the car covering a width of 120 ft., from "curb to curb." The tanks located on these cars are made either of wood or steel and of any capacity desired. This company also furnishes gravity sprinkling cars depending upon the pressure of the water for the width of the spray. These cars flush the rails and from 12 to 15 ft. on either side of the track.

THE "PERFECTION" RAIL BOND.

Our readers will be interested in a new rail bond known as the "Perfection," which has just been placed upon the market. This bond has been designed upon the principle that in order to make a perfect contact between the terminal and the rail, the terminal must be expanded from its center towards its surface, and the pressure be uniform throughout the entire length of the hole. The

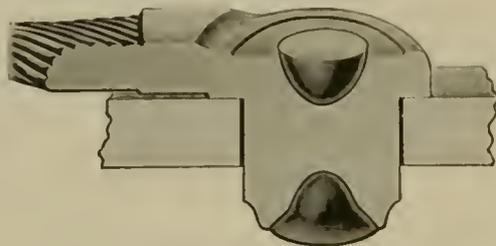


FIG. 1—"PERFECTION" BOND IN PLACE.

"Perfection" bond is made by casting into each terminal two hardened bronze plugs, P, P, in Fig. 2, the one on the inside having a flange which when the plug is pressed home turns over the protruding end of the terminal.

When the bonds are in place the two plugs are pressed towards each other preferably by a hand compressor of convenient size. A movement of the plugs $\frac{1}{4}$ in. nearer together enlarges the bond

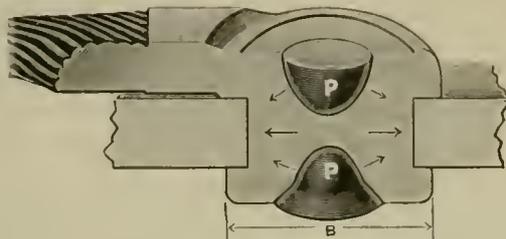


FIG. 2—"PERFECTION" BOND AFTER COMPRESSION.

terminal 3-16 in. and forms a rivet head on the terminal projecting $\frac{1}{8}$ in.

The claims of superiority made for the "Perfection" bond are: Greatest possible pressure between rail and bond; best rivet head formed on the bond terminal; elimination of electrolytic action between the bond and its plugs; elimination of electrolytic action between the bond and the rail (no air space exists after the plugs are pressed home); ease of application; attainment of perfect contact even if the hole is considerably larger than the bond terminal; limited pressure required in applying the bonds; the bond cannot be turned after being pressed in position; it cannot be driven out

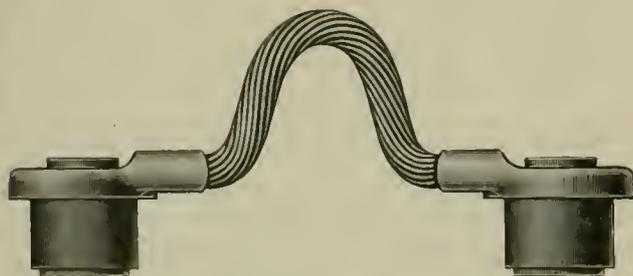


FIG. 3—"PERFECTION" ELEVATED.

after being pressed in place; long life due to great flexibility of the connecting cable and freedom from crystallization.

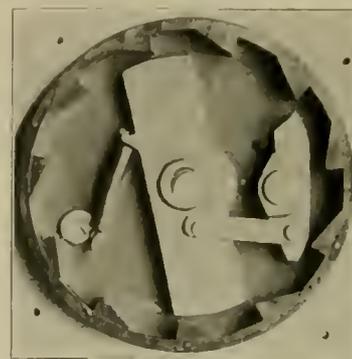
The connections between the two terminals of a bond are made by flexible copper cable specially designed to meet the requirements of strength, elasticity and carrying capacity, and which are made integral with the terminal by a special process, giving a point of ample carrying capacity to conduct the current for which the bond is intended.

Fig. 3 shows a 4-in. bond now ready for the market. The "Perfection" is made in any length from 4 in. up, and the standard cross-sections for $\frac{7}{8}$ -in. terminals are No. 00, No. 000, and No. 0000. Special sizes of greater section or with larger terminals are made in order.

The "Perfection" elevated bond is shown in Fig. 3; other styles are straight, with two cables parallel, waved, or bent to form short or long eyes. These bonds are made by the Protection Rail Bond Co., for which F. B. Badt and G. M. Willis are general sales agents, with headquarters at No. 1504 Monadnock Block, Chicago.

HAM TROLLEY CATCHER.

The accompanying illustration shows the arrangement of the locking device which is used on the Ham trolley catcher to catch and hold a trolley rope when the trolley jumps from the overhead wire. The device consists of a drum on which this rope winds and unwinds automatically as the position of the trolley requires, and no change in its position or rate of speed will cause the bar and pawl



LOCKING DEVICE—HAM TROLLEY CATCHER.

shown in the cut to change their positions, but a jerk of the trolley rope will lock the reel against rotation. The spring shown in connection with this device is not under tension except when the rope reel is locked against rotation, as for instance when the trolley jumps from the overhead wire. There is no adjustment of the spring required and it is loosely connected and inoperative when the trolley catcher is working normally. The use of the spring in this manner was designed to overcome the trouble and annoyance liable to occur in spring operating devices that require a certain strain to which they must be adjusted. This device is made by the Ham Sand Box Co., of Troy, N. Y., and is said to be very effective for preventing damage to trolleys and overhead wires in case the trolley jumps the wire.

TRADE PAPERS AT THE AMERICAN EXPOSITION IN LONDON.

The American Exposition which is to take place in London next summer and which has been previously announced in the columns of the "Review" will undoubtedly be the largest and most important exposition of exclusively American products, arts and industries which has ever been seen abroad. One of the interesting features to be shown at the exposition is a collection of American class publications which have developed remarkably in the past few years. As the difficulty and expense of properly exhibiting such papers individually would be prohibitive, the Le Roy Publishing Co., of New York, has rented a large space at the exposition hall and the commissioner for the United States has given this company entire control of the exhibit of American trade journals which will form a composite exhibit in charge of this company. Mr. Dyett of this company will go to London early in May to take charge of this exhibit and all papers represented will be exhibited under his care without favor. He will take subscriptions and contracts for advertising, make reports of all business done and of all moneys collected and will forward lists of those to whom sample copies have been given and any other information which may be desired.

A MODERN AIR BRAKE EQUIPMENT.

The introduction of heavy cars and high speeds made an imperative demand for power brakes and one of the remarkable things in connection with electrical railway development is the extent to which air brakes have been applied in this service. Various forms of friction, hydraulic, electric and air brakes, many of which had been tried and discarded by the steam roads, were tried on electric cars. Few of these reached the stage of extensive use in service.

A number of different forms of air brakes, in which the axle driven compressors were used were brought out between 1880 and 1895, including the one invented and patented by Mr. N. A. Christensen. The Christensen equipments were installed and operated with entire satisfaction on cars of the Citizens Railway Co., of Detroit, Mich., in the summer of 1893, and, later, on cars of other roads. Mr. Christensen believed that something better than axle driven compressors were necessary and in April, 1896, his first independent motor driven air compressor was put in operation on one of the cars of the Metropolitan West Side Elevated Railway Co., in Chicago. An automatic governor was also supplied which was arranged to open the circuit of the motor as soon as the pressure reached a predetermined maximum and to close it when the pressure was reduced to a predetermined minimum. This first equipment was a complete success and other installations of similar apparatus were made in various parts of the country.

The Christensen Engineering Co. was organized in 1897 and it found it necessary to increase its manufacturing facilities from time to time. Finally in 1899 the company decided to secure a new site and erect a complete new plant. The works are located near River Park, Milwaukee, between the Milwaukee River and the Chicago & Northwestern Ry., affording convenient facilities for shipping. No expense was spared in installing the most modern equipment obtainable and the plant is such that the constantly increasing demands can be promptly met.

The Christensen Engineering Co. states that over 95 per cent of all the electric roads that have adopted power brakes of any kind, are equipped with the Christensen apparatus, and that there are now over 5000 equipments in daily service.

The following detailed description of the compressor used with these equipments will be of interest to many of our readers. The motor and compressor combined, as shown in Fig. 1, consists of a series wound motor and a duplex, single acting compressor

armature bearing at the pinion end is so arranged that it is constantly lubricated by the oil within the casing of the compressor and is provided with an automatic overflow arrangement. The brush holder of the motor is of the simplest possible construction and is provided with an instantaneous adjustment. The armature bearings are so designed that it is impossible for oil to get into the armature. The combined machine is of extreme simplicity, and there are only two places for oiling, one being the main casing of

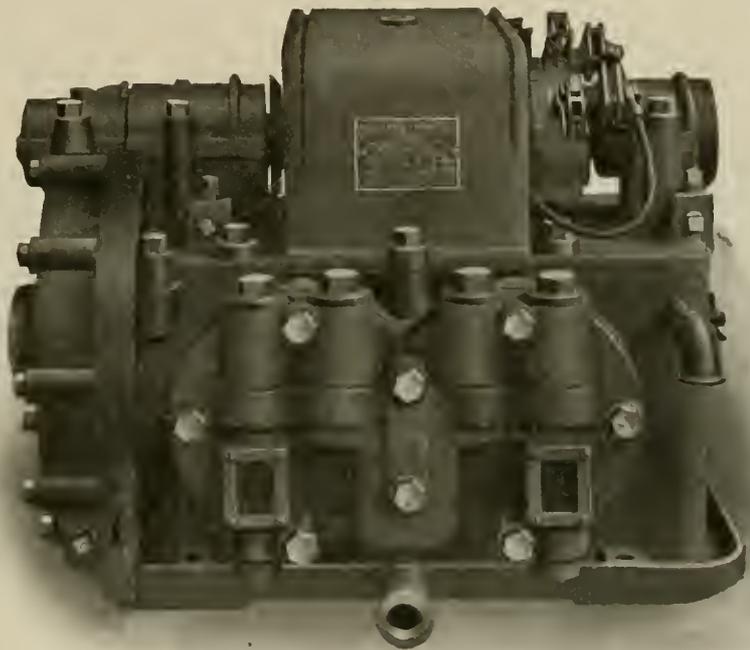


FIG. 1—CHRISTENSEN MOTOR DRIVEN COMPRESSOR.

the compressor and the other being the oil well on the armature bearing at the commutator end, both of which need replenishing only at long intervals. The helical gear is very much more durable than ordinary gears and practically eliminates noise.

The Christensen governor, shown in Fig. 2, consists of an ordinary Bourdon pressure gage mechanism with a special hand, which upon coming in contact with a conducting stud at the position of minimum pressure, allows current to flow through a magnet coil which is provided with a plunger, to which the contact pieces for the motor circuit are attached, thereby starting up the motor. As soon as the hand strikes the maximum stud, current will pass through a second solenoid magnet, thereby pulling the magnet plunger in the opposite direction and opening the motor circuit. By this mechanism it is possible to get a close margin between maximum and minimum pressures. This margin is readily adjusted by moving the contact studs away from, or towards each other.

The details of the accessory apparatus have been as carefully designed and accurately constructed as the compressor and governor.

To show the economy of the air brakes the company cites a test made upon two cars of equal weight and size, operating on the same road, at the same time under similar conditions, excepting that one was equipped with a Christensen motor driven compressor air brake and the other with hand brakes only. The result showed that the former used from 10 to 18 per cent less power than the latter. This was caused by the motorman dragging his brake shoes and was due to the almost universal practice of motormen holding their brake handles in such a position that they can quickly apply the brake when approaching curves or running through crowded streets.

The policy of the Christensen company has been not to place any device upon the market until it has been perfected and proved to be reliable and durable by long and severe tests under the conditions to be met in actual service; in other words the company and not the customer has paid for the experimental work.

It is reported that since the first of the present year orders have been received for more than twice as many Christensen equipments

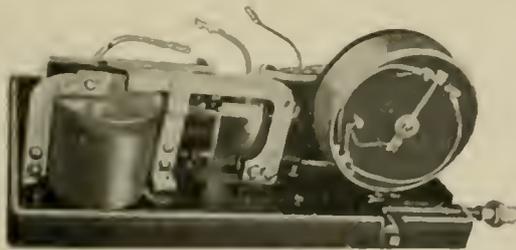


FIG. 2 GOVERNOR

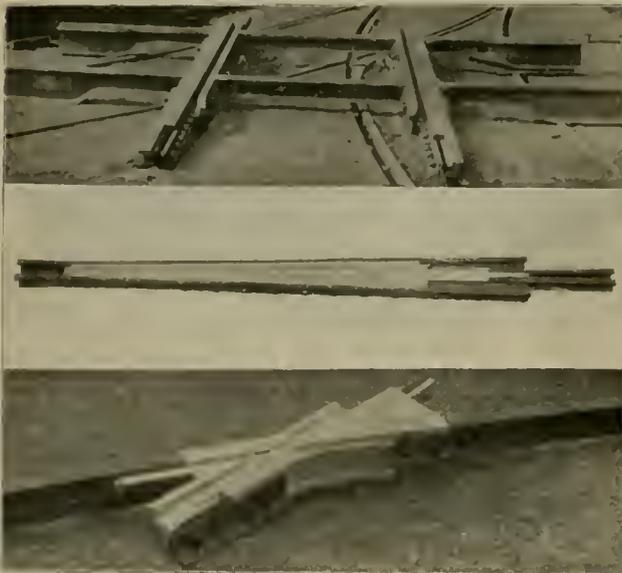
provided with two pistons which are connected by wrist pins to the connecting rods engaging with the crank shaft. This crank shaft is mounted in bearings provided in the case, the extended end of the crank shaft carrying a helical gear which engages with a helical pinion mounted on the extended end of the armature shaft of the motor. The latter is mounted directly above the compressor, the motor lobe forming a top cover for the compressor. This arrangement enables all the working parts to be run in oil. The suction and discharge valves are of the seamless cold drawn steel and are interchangeable one with the other and separately accessible. The

as were ever sold before in an equal period of time. The Christensen equipments are in use in England, France, Germany, Sweden, Norway, Russia and Africa. One of the orders recently received was for 50 motor-driven equipments to be installed on cars belonging to the Government Tramways in Sydney, Australia; previous to this the same road had 127 Christensen equipments in operation.

INTERESTING MANGANESE SPECIAL WORK.

The accompanying illustrations show some interesting examples of special track containing parts of manganese steel, with which William Wharton Jr. & Co., Inc., has had great success. The company has overcome the difficulties of casting this metal in complicated shapes and can therefore use it more extensively in T-rail work.

The top view shows a steam and street railway crossing made by the Wharton company under the Nichols patents, in which the usual combination of running rail, case rail, guard rail, and filler on the steam railroad track has been united into one single manganese steel casting, which is usually made 16 ft. long overall. The illustration shows a good end view of this rail and shows also how the connection is made with the steel rail in the steam railroad track. The street railways rails in this crossing are made of



MANGANESE SPECIAL WORK.

ordinary steel castings of the height corresponding to the steam railroad rail, where they rest on the ties of the steam railroad and shaped on the extreme ends to match the girder rail of the street railways track, thereby avoiding the usual combination joints. As the steam railroad rail with the cross grooves of the street railway is all of manganese steel, the points of greater wear are protected by this metal, and there is a further advantage in the reduction of the number of pieces and number of bolts which are usually found in steam railroad crossings of ordinary types. The remarkable ductility of manganese steel, although at the same time it is very hard, permitted the introduction of this material into steam tracks. The skepticism of the steam railroad engineers in that respect was easily overcome by the Wharton company by a number of very severe tests on manganese steel castings, of the character used, under drop weights, etc., before engineers of the Pennsylvania R. R. and Philadelphia & Reading Ry., and many of these crossings are now in use in places where street railways cross the tracks of these two roads and also several others, where they are subjected to the heaviest traffic with trains running at high speeds.

The company is also at present doing a large business in manganese steel frogs for steam railroad tracks proper, after having demonstrated through several years' tests the ultimate economy of the use of this expensive metal in place of ordinary steel rails.

We are told that the company has had some of these frogs in use for over two years in places where ordinary frogs used to wear out in three months. The second view illustrates one of these frogs, with a very long angle, made for the Pennsylvania Railroad Co.

For street railway special work in T-rail track the Wharton Company usually furnishes frogs cast solid out of manganese steel as illustrated in the lower view. The demand for first class work in T-rail track of electric roads is constantly increasing and the Wharton company is furnishing large amounts of this solid work to all parts of the country. Where tongue switches and mates are used in this class of work, the mates and the tongues are also solid manganese steel castings.

The main products of the Wharton company is of course still the regular girder rail special work for electric roads with manganese steel centers, the value of which seems to become more and more appreciated.

TO RELIEVE THE CHICAGO UNION LOOP.

In addition to the purchase of a new down town terminal for the Metropolitan Elevated, the South Side Elevated has taken 14 trains a day off the Union Loop during the rush hours in order to avoid the congestion of traffic upon the loop. These trains are now being diverted to the old Congress St. terminal station, which has not previously been used for several years. The lease of the Union Loop with the connecting roads provides that if cars or trains do not enter the loop because they cannot be accommodated the charge of $\frac{1}{2}$ cent a passenger for every one in the cars so excluded shall be waived. Whether the capacity of the loop has been reached is a question which will probably have to be arbitrated. The Northwestern Elevated, which now owns the loop, claims that its capacity has not been reached within 25 per cent. The traffic on the loop, however, is very much congested at times and much time is lost if any of the outlying roads are late in delivering their trains to the loop. The lease provides that this question shall be settled by arbitration.

NILES CAR WORKS BUSY.

One result of the opening of the car works of the Niles Car & Manufacturing Co., at Niles, O., has been a great demand for dwelling houses on the part of workmen engaged in the plant, and the Niles Board of Trade has decided to at once build 50 new houses. The Niles Car company is extremely busy and is confining its work to steam passenger cars and heavy cars for suburban and inter-urban electric railways; orders are now in hand for several months ahead.

NEW POWER PLANT FOR MILWAUKEE.

The Milwaukee Electric Railway & Light Co. is preparing plans and specifications for the erection of a large new power house in the city of Milwaukee. It is the intention to furnish power from the new plant for the operation of the entire street railway system in Milwaukee, Racine and Kenosha. The street railway power plant in Racine will be abandoned for the use of the railway company, but the boiler plant will be kept intact and the company will seek a franchise from the city for public steam heating for both business houses and private residences.

MARCH ACCIDENTS.

March 16th, at 8:30 p. m., a Howell Ave. car on the lines of the Milwaukee Electric Railway & Light Co. was struck by the Pioneer limited train at the Kinnickinnie Ave. crossing and slight injuries and bruises to several of the passengers in the electric car resulted. It is alleged that the engine of the train had no headlight burning.

A head-on collision between a passenger car and a work car on the Chicago & Joliet Electric Ry. occurred at 7 a. m., March 28th, near Sag Bridge, resulting in the death of three persons and injuries to several others. The accident was due to the dense fog and the fact that one of the two tracks was damaged by a washout so that all cars were using the same track and a failure to obey orders by the crew of one of the cars.

BOCH'S "GLAZE-FILLED" INSULATORS.

In comparing the relative merits of porcelain and glass insulators for high-tension transmission lines it is generally conceded that the former is the stronger mechanically, and the efforts of manufacturers have been to secure porcelain insulators uniformly free from flaws.

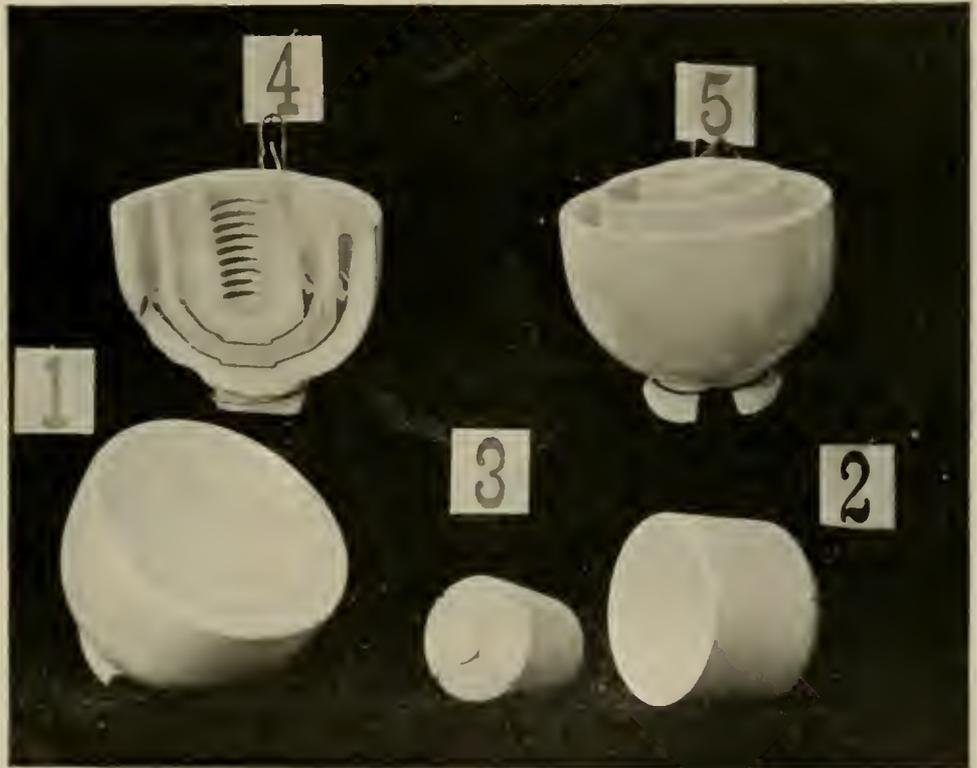
The R. Thomas & Sons Co., of East Liverpool, O., is making a "glaze-filled" insulator, for which the two advantages of great strength and superior insulating qualities are claimed. This insulator is made under a patent issued to Mr. J. W. Boch, superintendent of the company, and the success met with by the insulator during the past few years has led to litigation recently decided in favor of the Boch patent.

A thin piece of clay will mold and vitrify better than a thick one, and in consequence the Boch insulator is built up of two or more shells nested together.

The engraving shows separately at 1, 2 and 3, the three shells of the triple petticoat insulator. The inner piece 3 is moulded with a suitable threaded socket (see 4) for the usual pin. The outer shell 1 is provided with the usual notched head for the conductor and like the intermediate part 2 is made bowl-shaped, so that the three are relatively thin shells, to be nested into each other.

In the practice usually followed by the R. Thomas & Sons' Co. in making these insulators, these separately-molded parts are first dried out separately, preferably in an oven or kiln in the usual manner of drying clay articles by the process known as "biscuit firing." The separate parts are then coated with glaze all over, as by dipping into liquid glazing material, and they are then fitted into each other and stood upside down, that is, petticoat uppermost, as in the position shown at 5. Extra glazing material is supplied at the joints, that is, in the annular channels between the petticoats.

The parts thus put together and supplied with extra glaze at the joints are then put in the sagger with the petticoats of the insulator uppermost and placed in a kiln, in which under great heat the clay shrinks and becomes vitrified as usual and the glazing material melts and becomes of a glass-like character, flowing down into and filling all the space between the parts, such spaces either being there by lack of correct fit of the parts or arising during the shrinkage of the clay by the vitrification. The separately molded shells are thus welded together by seams of glass-like glaze, and this welding has been found to be of so tenacious a character that the insulators can be broken less easily along the lines of the "glaze-filled" seams than elsewhere. The completed insulator is shown at 5, while at 4 it is shown broken in two. This section clearly illustrates the three shells and the intermedate "glaze fillings," which, besides to say, add to the electrical insulating qualities of the insulator as well as its mechanical strength.



THE STRIKES.

The strike at Norfolk, Va., was settled March 29th. The militia guarding the property of the Norfolk Railway & Light Co. were withdrawn March 12th and there followed many acts of violence, car crews being assaulted by the strikers, cars derailed, etc. On the 29th 97 of the 162 strikers petitioned for reinstatement, the arbitration committee having ruled that the men should work with non-union men; the 97 were placed at work and the strike declared off.

The Terre Haute (Ind.) Electric Co. has continued to have trouble with its striking employes, and on the Brazil line found it necessary to place an armed guard of five men on each car.

The strike against the Kansas City Leavenworth Railway Co., of Leavenworth, Kan., was settled March 28th, the outcome being a complete victory for the company. A serious incident of this strike was the attempt to blow up two cars with dynamite on March 14th.

GERMANTOWN-FRANKFORD INTERURBAN.

A new line had been built between Germantown and Frankford, Pa. near Philadelphia and the opening of the road occurred on March 16th. Previously the only connection between the two places was only possible by a very circuitous route, but with the new line the round trip between these places can be made in an hour and a half.

The Birmingham Railway, Light & Power Co. is considering proposals for twenty seven 20 ft. closed cars. These cars are to be used on the city lines and are to have double trucks and two motors. It has not yet been announced to whom the contract will be awarded. When these 27 cars have been received, with the 20 large double truck, four motor cars recently built, the company will be well equipped with rolling stock as it was two years ago when it sustained a disastrous fire in which over forty cars were burned.

STREET RAILWAY PATENTS.

This list of patents furnished by I. Reed Clift, Patent Attorney, Washington, D. C.:

No. 604,346, March 4, Wm. N. Best, Los Angeles, Cal. Coach equalizing suspender.

No. 604,359, March 4, Hiram G. Farr, Winchester, Mass. Device for reducing noise in elevated railroad structures.

No. 604,483, March 4, Wallace M. Kelch, Dayton, O. Fare register and recorder.

No. 604,741, March 4, George G. Guenther, Los Angeles, Cal. Automatic switch operating device.

No. 604,825, March 4, Sanford S. Boyd, Laurens, S. C. Speaking tube for trains.

No. 604,843, March 4, Leon Dion, Boston, Mass. Electric traction road.

No. 604,883, March 4, James J. McGarity and George R. Hoff, Pittsburg, Pa. Car fender.

No. 605,144, March 11, Frank E. Case, Schenectady, N. Y. Electric brake.

No. 605,355, March 11, Charles A. Wheeler, Harlesden, Eng. Washing apparatus for railway or tramway carriages.

No. 605,277, March 11, Walter L. Clark, Everett, Mass. Overhead switch.

No. 605,340, March 11, William Philipson et al, Bolton, Eng. Life saving mechanism for tramways.

No. 605,498, March 18, Laurent Semat, Cairo, Egypt. Means for operating signals automatically at level crossings, etc.

No. 605,908, March 18, John W. Cap, Newark, N. J. Revolving indicator.

No. 605,953, March 25, Cyrus E. Smith, Fall River, Mass. Electric trolley.

No. 605,997, March 25, Arthur D. Barton, Ravenna, O. Trolley wheel retainer.

No. 606,248, March 25, Wm. H. Martin, San Francisco, Cal. Life saving device for street cars.

No. 606,313, March 25, Robert V. Cherthan, Louisville, Ky. Electrically controlled railway switch.

NEW RIDLON CATALOG.

The new catalog of the Frank Ridlon Co., of Boston, Mass., is now ready for distribution, and this edition surpasses in value, size and typographical appearance anything ever before attempted by this company, which is saying a great deal. The new edition contains 432 pages, and is bound in vellum de luxe. It is devoted exclusively to street railway supplies and its a useful working catalog, as it contains only such articles as are made by the Ridlon company or controlled by it as agent, and purchasing agents may rest assured that practically anything found in the catalog is carried in stock and can be furnished on telegraphic order if necessary. The work is printed on heavy book paper and is fully illustrated. A valuable feature is the carefully prepared index with cross references which enables any article to be found easily and quickly.

The Wilson trolley tender, which has become such a necessary part of the up-to-date street railway equipment, is of course given a conspicuous location in the catalog.

DEMAND FOR PROVIDENCE FENDERS.

The Consolidated Car Fender Co., of 39 Cortlandt St., New York City, had one of the busiest months during March that it has ever had in its history. During that period it finished fenders for 27 different electric roads and in addition filled orders from several of the car builders.

To take care of the growing business in France, Germany and Austria, Mr. Leo Linder has been appointed representative for these countries and will carry a large stock of Providence car fenders. Mr. Linder will make his headquarters at 6 Rue Boudreau, Paris, France.

Among other large companies, the St. Louis Transit Co., St. Louis, Mo., is making a thorough test of the "Providence" new model "C" fender which is claimed to be the best fender ever

attached to an electric car. The Consolidated Car Fender Co. is also doing a large business in the sale of the Millen car step lifter, which it makes in large quantities.

COPPER CASTINGS.

The users of copper castings will be interested in the work of the Sterion Copper, Brass & Bronze Co., of Chicago, which has made a commercial success of the manufacture of pure copper castings, and whose leading specialty is known as "Sterion" copper.

These castings are being largely adopted by the leading manufacturers of electrical instruments and street railway companies. The "Sterion" castings are guaranteed absolutely solid and free from blow-holes and other imperfections so common to cast copper; chemical analysis shows the metal is 99.6 per cent pure, and it has from two to three times the conductivity of ordinary cast copper.

The company's specialty is the manufacture of different electrical castings such as terminals, contact nuts and copper castings used



by manufacturers of switches, circuit breakers and switchboards. It carries a complete line of standard terminals and contact nuts, and also manufactures copper splicing sleeves and contact fingers for street railway controllers and copper rivets for special bonding purposes.

The accompanying illustrations show the malleability and toughness of "Sterion" copper; these rivets were forged cold under a drop-forge hammer. The copper can be forged hot or cold into shape without cracking or splitting off on the sides.

The company also manufactures commutator bars rolled by special machinery to an accurate taper and gage. The bars being harder, wear evenly with the mica insulation and prevent the high ridges so common in commutators. The office and plant of the Sterion Copper company are at Nos. 63-67 N. Ashland Ave., Chicago.

THE FOUR-TRACK NEWS.

"The Four-Track News," an illustrated monthly magazine of travel and education published by the passenger department of the New York Central & Hudson River R. R., compares to its advantage with many of the best modern periodicals of a purely literary character. The March issue contained 30 articles, departments and poems, and a full quota of charming half-tone illustrations. Among the features of this number were articles entitled: "The Three Oregons," by Alfred Holman, of the Portland Oregonian; "The Botanical Bronx," by Dr. N. L. Britton, director-in-chief of the New York Botanical Garden; "Midst Peaks and Chasms," by Col. P. Donan, and "The Up-to-Date Locomotive," by A. M. Waitt, superintendent of motive power and rolling stock of the New York Central R. R. There were beside poems and sketches of a high order of merit, and a general fund of information regarding lake and mountain resorts, railroads, new books of the day and affairs theatrical. "The Four-Track News" is edited by John K. Le Baron; its price is 50 cents per year. Sample copies may be had for five cents by addressing George H. Daniels, G. P. A., Grand Central Station, New York.

ECHOES FROM THE TRADE

THE J. G. BRILL CO. is now building 50 cars for the Union Traction Co., of Philadelphia; 35 of these cars will be mounted on Brill No. 27-G trucks.

A. O. SCHOONMAKER, dealer in mica, will remove on May 1st from 158 William St., to 221 Fulton St., New York City, where he will have more room for handling his increasing trade.

THE STERLING-MEAKER CO. will on April 30th remove its office and factory to Nos. 420-422 Ogden St., Newark, N. J., and all mail and shipments should then be directed to this address.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. is mailing a post-card bearing on the reverse side a half-tone illustration of the Westinghouse polyphase induction motor operating a 122-in. lathe in the works of the Westinghouse Electric & Manufacturing Co.

THE MCGUIRE MANUFACTURING CO., 122 North Sangamon St., Chicago, presents its friends and patrons with a calendar of an original and appropriate design. The reproduction in gold and several colors of a motor starting box makes an effective decoration for a calendar.

THE CENTRAL ELECTRIC CO., of Chicago, is distributing among its customers attractive pamphlets, descriptive of the Wurts and Garton lightning arresters. Those interested can obtain this printed matter upon request, from the above company, who will also be pleased to quote prices.

THE CENTRAL ELECTRIC CO., 264-270 Fifth Ave., Chicago, has published an illustrated folder giving a list of revised prices on its H-G pull sockets and a description of the different patterns, including the pendent pull socket, fibre lined, 250 volts, and the pull wall socket, fibre lined, 250 volts.

AMONG the recent installations of the Gould Storage Battery Co., 25 West 33rd St., New York City, is that of the Amherst & Sunderland Street Railway Co., Amherst, Mass., which consists of 216 cells, type O 513, in lead lined tanks, having a capacity of 100 kw. to be used as a floating battery on the system.

"GRAPHITE" for April contains a number of good technical articles, an interesting description of the mills and mines of the Joseph Dixon Crucible Co., and a word to the wise concerning the merits of Dixon's graphite productions. "Graphite" is published monthly by the Dixon company at Jersey City.

THE CRANE CO., of Chicago, owing to an increase of business has found it necessary to establish a branch office at Duluth, Minn., known as the Crane & Ordway Co., and another office at Seattle, Wash., known as Crane Co. A full stock of Crane goods, plumbing supplies, wind mills and pumps, are to be found at these branches.

THE CHASE SHAWMUT CO., of Boston, has been awarded the contract for rail bonds for the entire system, 27 miles, of the Wilkesbarre & Hazleton R. R., of Wilkesbarre, Pa. As this road is being constructed in an exceptionally substantial and efficient manner, the selection of the Chase Shawmut flexible bond must be regarded as a high tribute to its efficiency.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia, manufacturer of chloride accumulators, has published its bulletin No. 70 for February, 1902, concerning the application of storage batteries to railway plants. The bulletin contains diagrams showing a comparison of results obtained on lines with and without fine batteries for voltage regulation; and a half-tone cut showing the Chestnut Hill battery of the Union Traction Co., Philadelphia: 248

cells, type G 13, operating as a line battery. This plant, which was installed in July, 1896, is one of the six batteries of chloride accumulators in use on the Union Traction Co.'s system. Upon request, the Electric Storage Battery Co. will submit a report showing results to be obtained from the operation of a battery of chloride accumulators.

THE GREEN FUEL ECONOMIZER CO. will install a large Green economizer in the new power house of the Boston & Worcester Street Ry. now building at South Framingham, Mass. The Benedict & Burnham Manufacturing Co., of Waterbury, Conn., has also ordered the Green economizer in connection with 4,000 h. p. of boilers which are to be put in its new boiler house.

THE BULLOCK ELECTRIC MANUFACTURING CO., Cincinnati, O., has issued a new folder containing two half-tone illustrations, one showing the company's 5-kw. type "N-1" generator and gas engine; the other, the finely appointed lunch room in the works at Cincinnati for the use of heads of departments. A complete list of the domestic and foreign branch offices of the Bullock company is also given.

THE SILLS EDDY MICA CO. is sending out a folder containing a sample of new Imperial varnish cloth which it makes by an improved method. The insulation is made up either with varnish or linseed oil as desired. The sheets are coated with two coats applied lengthwise of the sheet in a manner insuring absolute uniformity in thickness. This material may be had in any length desired or cut in strips of any width.

THE MAYER & ENGLUND CO., of Philadelphia, has taken the agency in its territory for the "Universal" safety car tread, a device for application to car steps, stairways and any place where it is desirable to have an absolutely safe and reliable foothold for pedestrians or passengers. The construction is such as to positively prevent persons from slipping in rainy or snowy weather. The device was described in the "Review" for January, 1902, page 47.

B. M. JONES & CO., of Boston, announce the removal of their office to 159 Devonshire St., where they will be ready in future to welcome their friends and business acquaintances. They are the sole representatives in the United States of Samuel Osborne & Co., Sheffield, Eng., and Taylor Brothers & Co., of Leeds, Eng. Their specialties are Mushet's special and titanic steel and Osborne's crucible spindle steel, stay bolts, iron axles, piston rods, crank pins and other forgings.

THE NICHOLS-LINTERN CO., of Cleveland, O., has met with marked success in introducing its pneumatic track sander. This sander is used by the Cleveland, Elyria & Western; Elyria, Grafton & Southern; Cleveland & Chagrin Falls; Cleveland, Medina & Southern; Cleveland & Eastern; Toledo & Western; Western Ohio Traction Co.; Union Traction Co. of Indiana; Chicago, Harvard & Geneva Lake, and numerous other interurban roads and on several large city lines.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, will, within a few days, ship to Seattle, Wash., four batteries of "Chloride Accumulators." One of these will be installed in the power station of the Seattle Electric Co. for use with the railway machinery as a regulator of the fluctuating load and as a reserve. The three remaining batteries are for use on the Seattle & Tacoma Interurban Ry., and are to be used for regulating the great variations in load on this system.

THE BUDA FOUNDRY & MACHINE CO. is making a specialty of automatic gates for interurban and other railway crossings as well as highway crossings. These gates are one of the most

effective protections at crossings and they may be made so as to interlock with the switches and signals thus insuring their always being in the proper position. The ease with which they are operated makes their use very economical, as one or several pairs of gates may be operated from a conveniently located tower at a considerable distance if necessary. They also have the advantage of occupying a minimum of space when raised to the normal position.

C. J. HARRINGTON, of 15 Cortlandt St., New York City, dealer in machinery and general supplies for electric and steam railways, telephone and electric lighting companies, reports that his firm has made arrangements and purchased facilities for making a complete line of overhead railway line material. Factory sites have been secured in New Jersey and in Connecticut, and the firm will keep a large stock of overhead material, cars, pull-offs, insulators, etc., at its New York office.

AJAX PLASTIC BRONZE, which the Ajax Metal Co., of Philadelphia, began marketing about two years ago, is meeting with most widespread approval, as shown by orders now in hand amounting close to 2,000,000 lb. of finished bearings. This bronze is guaranteed to give longest life and fullest satisfaction. It is used by many of the largest steam and electric roads. The company states it is receiving most flattering reports from all sides, relative to performance of these brasses in service.

THE GOULD STORAGE BATTERY CO., of 25 West 33d St., New York City, reports the following among recent contracts: An installation of 255 cells, with a capacity of 100 kw., and a tank capacity of 140 kw., for the Kutztown (Pa.) & Fleetwood Street Railway Co., the battery is on a line fed by a booster from the power station; also a battery of 244 cells, having a capacity of 100 kw., with a tank capacity of 125 kw., to be used as a floating battery for the Allentown & Kutztown Street Railway Co., of Allentown, Pa.

THE LUDLOW SUPPLY CO., 313 Electric Bldg., Cleveland, O., advises us that it receives the following orders for Gore track drilling machines, mounted on carriages manufactured by it, during the month of March: Cleveland Construction Co., 6; Springfield & Xenia Traction Co., 1; Indianapolis, Greenwood & Franklin Ry., 1; Townsend, Reed & Co., 1; Worcester & Southbridge Street Ry., 1 carriage. Also that it has a great many inquiries for drills and that the prospects are good for a large number being sold in April.

THE GARTON-DANIELS CO. has issued its catalogue No. 35, dated Mar. 15th, 1903, which describes the latest models of the company's well known lightning arresters. It contains also a practical statement of the methods in use today for the protection from lightning, of electric railway, light and power circuits. It is the most complete publication of this character that has been issued in the history of the electrical business, and should be in the hands of every one interested in the subject. It will be mailed without charge, on request to Garton-Daniels Co., Keokuk, Ia.

SALES OF GARTON LIGHTNING ARRESTERS are reported to be 40 per cent greater this year than ever before, and to accommodate its rapidly increasing business the Garton-Daniels Co., of Keokuk, Ia., has secured the building next adjoining its present location, and is now occupying this in addition to the old quarters. With such largely increased facilities the company expects to be able to handle orders more promptly than ever, which is saving a good deal, as it claims never to have had an order cancelled in its ten years of business on account of delay in filling it.

THE GENERAL ELECTRIC CO. has issued the following new publications: "Small Motors"—a handsomely printed and artistically illustrated pamphlet of 64 pages showing the construction and application of small motors. "Fan Motors"—a 50-page booklet on fan motors. Bulletin No. 4270—illustrating the General Electric rail bond. Bulletin No. 4280, "Two-Rate Meter." Bulletin No. 4281, "The General Electric Type M Control System." Bulletin No. 4282, "Thomson Polyphase Recording Wattmeters." Bulletin No. 4283, "The Box Frame Type of Railway Motors." Flyers Nos. 2004-5-6, "Direct Constant Current Enclosed Arc Lamps." "Rack

Insulators, Form B," "60-Ampere Plug Cut-Outs." Price List No. 5097, Thomson Recording Wattmeters.

THE GREEN ENGINEERING CO., Chicago, reports having recently received orders for its traveling link chain grates from the following concerns: the American Tin Plate Co., 6,000 h. p.; the Union Steel Co., 6,000 h. p.; the American Steel Foundry Co., St. Louis; Crane Co., Chicago; Ballard & Ballard Co., Louisville; Emery, Bird, Thayer & Co., Kansas City; Cleveland Worsted Mills; the Norwood Water Works, and Armour & Co., at Kansas City, East St. Louis and Chicago. Repeating orders have been received from the Cudahy Packing Co., of South Omaha, and the Danville (Ill.) Street Railway & Light Co.

THE THOMAS S. CLARKSON MEMORIAL SCHOOL OF TECHNOLOGY, Pottsdam, N. Y., has issued a catalog for 1901-1902 giving the history of the foundation of this school, a description of its equipment and the organization of its courses. Especial attention is called to the announcement of the course in electrical engineering which has been extended to include telegraphy, telephony, alternating current machinery, electrical distribution, transmission, lighting, traction, power plants and electric design. The course is also supplemented by special experimental study in the electrical engineering laboratory, which is equipped with every facility for testing and experimental electrical work. The school is under the direction of Prof. William S. Aldrich, M. E.

THE LIBERTY MANUFACTURING CO., Pittsburg, reports a wonderful increase in recent sales. In addition to its regular trade, one firm has ordered 42 of the company's turbine cleaners; another 100; another 180, and one company has just placed on order for 500 cleaners to be used during the current year, this last being doubtless the largest order ever placed for cleaners of any kind for water tube boilers. The company also reports heavy sales for the "Famous" oil filter and refiner. This is claimed to be because the "Famous" is the cheapest for the same size, weight, filtering and storage capacity, and because it is sent on approval, or in competition with the understanding that the customer keeps whichever best meets his requirements.

FRANCIS BEIDLER & CO., who are well-known in Chicago as among the largest producers and wholesalers of lumber, lath and shingles in that city, and one of the largest in the world, prior to Apr. 1, 1901, confined their business to the product of saw mills, leaving the white cedar to be taken up later. On that date, however, the firm added a cedar department under the management of Mr. M. B. Cross. The success of the first year's business was so gratifying that last fall arrangements were made to double their output of cedar trolley poles, street railway ties, piling and fence posts, and they are now prepared to fill orders promptly and satisfactorily from their yards at Cloquet, Minn., Escanaba, Mich., and Menominee, Mich.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has within the last few weeks closed the following contracts for storage batteries to be used for trolley regulation: The Altoona & Logan Valley Railway, Altoona, Pa., Allegheny County Light Co., Pittsburg, Pa., Pittsburg Railway, Pittsburg, Pa., Sandusky, Monroeville, Bellevue & Norwalk Traction Co. (2 batteries), Sandusky, Ohio, Parkersburg & Interurban Railroad, Parkersburg, W. Va., United Electric Co., Newark, N. J., Pueblo Traction & Lighting Co., Pueblo, Col., Boston & Maine Railroad, Concord, N. H., Camden Inter-State Railway (2 batteries), Huntingdon, W. Va., Seattle Electric Co., Seattle, Washington, Seattle & Tacoma Interurban Railway (3 batteries), Seattle, Washington.

ARNOLD BULLETIN NO. 5, has just been published by the Arnold Electric Power Station Co., of Chicago, and contains a description of the track work of the Lansing, St. Johns & St. Louis Ry., which was built by this company. The bulletin is well illustrated with views along the line showing apparatus and various incidents in connection with the construction work. The bulletin also announces a new engineering feature which has been adopted on this road and which was designed by Mr. Bion J. Arnold. This feature consists in the use of alternating current throughout from the power station to the motors under the car, and while no details

of the system have yet been published the operation of the line under this new system gives the road a special interest to electrical engineers.

THE STANDARD TRACTION BRAKE CO., of 120 Liberty St., New York City, is establishing branch offices in all the leading cities of the United States. Among the places where branch agencies have been or are about to be appointed are Buffalo, Boston, Cincinnati, Chicago, St. Louis and Pittsburg. These offices acting in conjunction with the home office at New York will give exclusive attention to the interests of the Standard Traction Brake Co., which company attends to the sales department of all power brakes made by the Westinghouse Air Brake Co. for electric traction cars. The types handled include straight and automatic air brakes and magnetic electric brakes. After May 1st, the main offices of the Standard Traction Brake Co. will be in the Havemeyer Bldg., 26 Cortlandt St., New York City.

DETAIL CATALOG NO. 300 is the title of a new catalog for 1902 just published by the Westinghouse Electric & Manufacturing Co., of Pittsburg, Pa. The work consists of a well bound volume in leather and cloth, containing 650 pages of illustrations, descriptive matter and price lists. The work covers all kinds of auxiliary apparatus, switches, instruments, etc., required in electrical installations of every character and is supplemented by excellent indices of headings and materials as well as of style numbers by which orders should be designated. Many of the individual types of apparatus are more fully described in separate circulars, which are furnished upon application, as the scope of catalog No. 300 precludes an elaborate description of the numerous articles which it includes. The typographical style of the book is thoroughly in keeping with all publications of this company.

"ARTISTIC ADVERTISING" may well be applied to the new souvenir mailing card, issued by the Joseph Dixon Crucible Co., Jersey City, N. J. The ability of the American engineer to design steel structures of great strength and pleasing architectural effect is well illustrated in the eight half-tone engravings on this folding card, and at the same time the good qualities of Dixon's silica-graphite paint which protects these structures from corrosion, is pointed out. This paint has been very extensively used in the South, West and sea-coast sections of the United States, also in Mexico, Australia, China, Japan, India, West Indies and Philippine Islands, and has proven its protective and wearing qualities in all climates. The card referred to will be mailed free of charge to anyone mentioning the Street Railway Review in writing the Joseph Dixon Crucible Co., Jersey City, N. J.

FRANCIS C. GREEN, general superintendent of the Consolidated Car Heating Co., of Albany, N. Y., has just returned from Europe and reports that "Consolidated" apparatus is meeting with much favor both in England and on the Continent, particularly in Scotland and the North of England, where the rigorous weather makes a good electric heater almost a necessity. A year ago this company furnished the French Thomson-Houston Co. about 400 electric equipments which are giving excellent satisfaction, and numerous orders have been received as a result of the advertisement thus obtained. The Consolidated company has shipped more than a freight car load of heaters per month for the Manhattan Elevated contract and has to date shipped something over a car-load of equipments for the new cars of the Brooklyn Rapid Transit Co. The company's new catalogue will be sent on request.

THE H. W. JOHNS-MANVILLE CO. has recently issued a complete set of bulletins on Sach's "Noark" enclosed indicating fuses. These bulletins describe and illustrate "Noark" fuses and cut-outs for 500 volt circuits, "Noark" car cut-out equipments, various types of contact in which "Noark" fuses are furnished, fuse and service boxes and special fittings for mounting the fuses on switch boards or panels. The company reports several thousand installations of "Noark" car cut-out equipments and an increasing demand for fuses of all voltages which recently necessitated doubling its manufacturing facilities. Fuses for all potentials can be promptly furnished and the company will be glad to take up any special protective problem presented. The main office of the company is at New York, with branches at Milwaukee, Chicago, St.

Louis, Boston, Philadelphia, Pittsburg, Cleveland, New Orleans and London, Eng.

THE JOHN A. MEAD MANUFACTURING CO., of New York City, is engaged in filling a number of important contracts for coal and ash conveying machinery. This company has just completed and turned over to the government a complete coal and ash handling plant for the Bureau of Engraving and Printing at Washington. Among other orders in hand are conveying plants for the St. Louis, Belleville & Suburban Street Ry.; the Cleveland City Railway Co. for its old Viaduct power house which is being remodeled and enlarged; the Sandusky (O.) Portland Cement Co., this being a duplicate order for machinery installed by the Mead company some time ago. The Edison Electric Illuminating Co., of Topeka, Kan., has also ordered a complete coal and ash plant of the latest Mead design. One of the engineers of the Mead company is now in Sydney, Australia, erecting a complete conveying plant at the power house of the New South Wales Tramway & Power Co.

THE PROTECTED RAILBOND CO., 10 South 10th St., Philadelphia, announces that the J. M. Atkinson Co., Chicago, has withdrawn as western agent for the "Protected" bond and that this territory will hereafter be in charge of the Mayer & Englund Co., Philadelphia, thereby making the Mayer & Englund Co. general sales agents for the entire United States. Arrangements will be made within a very short time for the establishment of sales offices at various points in the western territory, and in the meantime orders should be sent to Philadelphia. The volume of the company's rail bond business during the past year was double that of any previous year, and this, the company believes, shows conclusively that it makes the best rail bond in the world, and one that meets with the approval of all high class engineers and railway managers. A new, complete catalog of bonds and bonding tools is in the hands of the printer and will be ready for distribution early in April.

THE UNDER-FEED STOKER CO. OF AMERICA, with general offices in the Marquette Building, Chicago, was recently awarded a contract to supply Jones under-feed mechanical stokers aggregating 15,600 h. p. to the Citizens' Electric Lighting & Power Co., of St. Louis. The merits of the Jones stokers were recognized and the award of the contract made against the strongest competition. Within the past 30 days Jones under-feed mechanical stokers have been installed as follows: in the Arcade, Permanent and New England Buildings, Cleveland, and by the Cleveland Crane & Car Co. and the Muncie, Hartford & Fort Wayne R. R. The Ohio Farmers' Fertilizer Co., of Columbus, and the Superior Steel Co., of Carnegie, Pa., have also installed Jones stokers. Second orders have been supplied to the La Grange (Ill.) Light & Water Works Co., the Montreal Mining Co. of Hurley, Wis., and the Niles & Scott Co., of La Porte, Ind. In addition, sales of Jones stokers aggregating 7,450 h. p. have been supplied to Canadian patrons through the Toronto office of the Under-Feed Stoker Co.

THE SPRAGUE ELECTRIC COMPANY reports among very recent sales the following orders for split-pole generators: E. L. Epperson Construction Co., St. Louis, 200-kw. engine type, 200 r. p. m., 550 volts; Chillicothe Street Ry., Chillicothe, O., 300-kw. belted type, 450 r. p. m., 550 volts; Cosmopolitan Power Co., Chicago, 75-kw. belted type, 600 r. p. m., 250 volts; Ohio Powder Co., Youngstown, O., 100-kw. belted type, 585 r. p. m., 500 volts; Keystone Leather Works, Camden, N. J., 200-kw. engine type, 200 r. p. m., 230 volts; Providence & Danielson Ry., Providence, 400-kw. belted type, 400 r. p. m., 575 volts; Board of Education, Chicago, two 150-kw. engine type, 225 r. p. m., 115 volts; E. W. Bliss Building, New York, four 150-kw. engine type, 225 r. p. m., 250 volts; Lackawanna Iron & Steel Co., Buffalo, 500-kw. engine type, 100 r. p. m., 250 volts; St. Joseph Railway, Light, Heat & Power Co., 150-kw. engine type, 150 r. p. m., 200 volts; Otis Elevator Co., Yonkers, 50-kw. engine type, 290 r. p. m., 250 volts; Wm. Tod Co., Youngstown, O., 175-kw. engine type, 200 r. p. m., 230 volts; Railroad Construction Co., Princeton Junction, two 400-kw. belted type, 400 r. p. m., 575 volts; Sturges, Cornish & Burns, Chicago, 200-kw. belted type, 425 r. p. m., 250 volts; American Electrolytic Co., Rock Glen, N. Y., 200-kw. belted type, 550 r. p. m., 250 volts; Alfred F. Moore,

Philadelphia, 75 kw. belted type, 600 r. p. m., 125 volts; Arlington Co., Arlington, N. J., two 75-kw. belted type, 460 r. p. m., 230 volts; one 62½ kw. belted type, 470 r. p. m., 230 volts, and one 37½ kw. belted type, 500 r. p. m., 230 volts; Adams & Westlake Co., Chicago, 125 kw. engine type, 250 r. p. m., 250 volts.

THE MICA INSULATOR CO., of New York, Chicago and London, is now putting on the market its well known "Empire" brand of oiled cloths and papers in rolls of 50, 100 and 500 yards length. It is also prepared to furnish it in any length desired. An entirely new and original process enables the manufacturer to coat the material with two very evenly distributed coats of pure linseed oil. Experience has proved that pure linseed oil refined and treated by the M. I. C. process is far superior as a coating for cloths and papers, than any linseed oil substitutes, which usually contain adulterations, and which in a very short time will harden and crack. "Empire" cloth will retain its high finish and rubber like flexibility indefinitely and may be kept in stock a long time without any deterioration either mechanically or electrically. It is thoroughly dried before leaving the factory, and does not contain nor does it need any wax paper between the sheets to prevent them from sticking together. The manufacturer will be pleased to furnish samples, circulars and prices to any who may be interested.

MR. HAROLD P. BROWN, of New York, informs us that the Baltimore & Ohio R. R. Co., has recently placed additional orders for plastic plug bonds to be used in re-bonding joints on its belt line. This is doubtless the severest electric service in the world, as hundreds of heavy trains, including freight service, are handled by electric locomotives every day, and the return current varies from 1,200 to 2,400 amperes. The track is new 100-lb. T rail with very heavy angle plates and the joints have to be very carefully maintained. Some time ago plastic plug joints were put in on several sections of the Baltimore & Ohio belt line in competition with ordinary copper bonds. When first applied the plastic plug bonds had a conductivity equal to one-half that of a 100-lb. rail, and Mr. Brown states these still hold the same as when put in, without a single failure. The new plastic plug bonds that are being installed are 1½ in. in diameter, which will give practically the full conductivity of the rail. The experience of this road clearly indicates that the Brown plastic plug bond is extremely well suited for heavy traffic and tunnel work. Mr. Brown has found it necessary to put in new boilers and engines at his plant in Montclair, N. J., and also to add new buildings in order to meet the increasing demand for the Edison-Brown bonds.

TRAVELING ELECTRIC HOISTS, is the title of a bulletin which is about to be published by Pawling & Harnischfeger, of Milwaukee, Wis., makers of traveling cranes, etc. This bulletin, No. 7 L, contains 28 pages and 14 half-tone illustrations of hoists in service which are both of standard and special designs. It also contains a number of drawings which indicate clearance dimensions and tables of speeds, etc. The method of splicing I-beams is shown and the several types and sizes of hoists made is given. The bulletin also contains a concise description of the mechanism. These hoists are built to operate on either straight or curved I-beam run-ways which permits service to any part of a plant or central station. As these hoists travel as well as do hoisting they differ from many electric hoists which operate a hoisting drum only. They contain many of the features that appear in this company's traveling cranes and the utility of the hoist and cranes is about the same except that the hoists are naturally built for smaller capacities. Among the users of these hoists may be mentioned the Carnegie Steel Co., of Pittsburgh, Pa.; Allis Chalmers Co., Milwaukee; Jones & Laughlin, Pittsburgh, Pa.; American Bridge Co., Milwaukee, Wis.; New York Ship Building Co., Camden, N. J.; Robert W. Blackwell & Co., Ltd., London, Eng., and American Tin Plate Co., Newcastle, Pa.

PAWLING & HARNISCHFEGER, Milwaukee, Wis., advise us that the demand for electric traveling cranes continues satisfactory in every way. They have recently booked orders for 45 cranes and hoists, among which are those from representative firms as follows: Henry Vogt Machine Co., Louisville, Ky., one 5-ton, two 10-ton, one 15-ton; Oil Well Supply Co., Oil City, Pa., one 2-ton; Wheeling Steel & Iron Co., Wheeling, W. Va., one 7-ton; Allis-

Chalmers Co. (Fraser & Chalmers plant), Chicago, one 20-ton, with 5-ton auxiliary; Allis Chalmers Co. (Gates plant), Chicago, one 50-ton with 5-ton auxiliary; Bradley Manufacturing Co., Allegheny, Pa., one 6-ton; Fairbanks, Morse & Co., Beloit, Wis., one 15-ton; Colorado Fuel & Iron Co., Bessemer, Col., one 10-ton, one 20-ton; Newport News Shipbuilding & Dry Dock Co., Newport News, Va., two 20-ton; Whitney Iron Works Co., New Orleans, La., one 10-ton, one 20-ton; American Bridge Co., Philadelphia, one 20-ton, double trolley; Pittsburg Plate Glass Co., Pittsburg, two 3-ton; American Sheet Steel Co., McKeesport, Pa., two 5-ton; Structural Steel Car Co., Canton, O., one 12-ton; American Well Works, Aurora, Ill., one 10-ton; Norton Emery Wheel Co., Worcester, Mass., one 10-ton; Lackawanna Iron & Steel Co., West Seneca, N. Y., one 3-ton; Follansbee Bros. Co., Pittsburg, one 5-ton, one 10-ton, with 3-ton auxiliary, and one 25-ton; Vulcan Works, Chester, Pa., one 15-ton, with one 5-ton auxiliary; Northern Central Railway, York, Pa., one 25-ton; Midvale Steel Co., Philadelphia, Pa., one 10-ton jib; Standard Steel Works, Burnham, Pa., five 5-ton and one 15-ton; American Sheet Steel Co., Wellsville Works, Wellsville, O., one 30-ton with 5-ton auxiliary; Trenton Iron Co., Trenton, N. J., one 3-ton; Wm. B. Pollock & Co., Youngstown, O., one 20-ton riveter with 5-ton auxiliary.

THE GOULD STORAGE BATTERY CO., 25 W. 33rd St., New York City, has recently installed a storage battery plant for the Amherst & Sunderland Street Railway Co., of Amherst, Mass., consisting of 216 cells, type O. 513, in lead lined tanks. The battery has a capacity of 100 kw. and is used as a floating battery on the system.

THE AMERICAN BRAKE SHOE & FOUNDRY CO. has appointed Mr. Joseph D. Gallagher, formerly president of the Lappin Brake Shoe Co., second vice-president, and Mr. Joseph B. Terbell, formerly president of the Corning Brake Shoe Co., general sales manager.

EXHIBITS AT THE MAINTENANCE OF WAY MEETING.

The exhibits at the convention of the American Railway and Maintenance of Way Association were shown on the parlor floor of the Auditorium Hotel and were more extensive and complete than at previous meetings of the association. There were nearly 80 firms represented and many of the exhibits were of unusual interest. Among this number may be mentioned the following:

American Steel & Wire Co., represented by George P. Rider. Samples of fence.

Atlas Railway Supply Co., Chicago, represented by J. G. McMichael, R. B. Kent, C. D. Porterfield and B. H. Rogers. Atlas rail joints.

Buda Foundry & Manufacturing Co., Harvey, Ill., represented by F. A. Ingalls, J. McKinnon, and E. S. Nethercut. Buda and Paulus track drills, Wilson track drills, wheels and crossing gate models.

Continuous Rail Joint Co. of America, Newark, N. J., represented by L. F. Braine, S. P. McGough, and H. M. Montgomery.

Joseph Dixon Crucible Co., Jersey City, N. J., represented by D. M. Howe.

Kinnear Manufacturing Co., Columbus, O., represented by A. S. Beymer. Steel rolling doors.

Ludlow Supply Co., Cleveland, O., represented by W. E. and James B. Ludlow. Rail joints, rail braces and tie plates.

Paige Iron Works, Harvey, Ill., represented by F. A. Ingalls, John McKinnon and E. S. Nethercut. Photographs of frogs, crossings, switches and other track material.

Ramapo Iron Works, Hillburn, N. Y., represented by F. W. Snow and Arthur Gemunder. Models of frogs, switches and automatic switch stands.

Scherzer Rolling Lift Bridge Co., Chicago, represented by E. H. Heald and C. L. Keller. Photographs of bridges in use.

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Weber Rail Joint Manufacturing Co., New York, represented by F. A. Poor and W. T. Smetten. Insulated, compromise and standard Weber rail joints.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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MAY 20, 1902.

NO. 5

The Windsor & Kenfield Publishing Co. has removed its general offices and printing plant from their former location to Nos. 45-47 Plymouth Place, Chicago, to which address all future communications for the company should be addressed.

Beginning with this number the regular publication date of the "Street Railway Review" will be the 20th. of the month instead of the 15th as heretofore.

Practically no progress has been made towards a settlement of the street railway franchise question in Chicago. On May 8th the United States Circuit Court sustained the demurrer of the City of Chicago to the bill brought by Mr. Elkins, as stockholder of the Chicago Union Traction Co., to determine the validity of the "99 year act." The court held that the complainant had not show facts sufficient to give the court jurisdiction, and its rulings did not go to the merits of the case at all. Permission was given to file amended bill, and it is possible that the Federal courts will pass upon this act. Some decision must be had on the "99 year act" before the negotiations for franchise renewals can be carried to a successful conclusion—that is, unless the city should adopt a more equitable basis of settlement than that heretofore proposed.

From a report of Consul General Mason, printed elsewhere, it appears in the absence of any official information that the high speed electric railway experiment between Berlin and Zossen have fallen considerably short of the expectations of the company which was organized to carry on this work. It is a significant fact that after a lapse of five months, no official report of these experiments has been published and what has come to light in regard to them has been gathered from private sources. It may be readily surmised, however, that as the avowed object of these experiments was to reach a speed of from 125 to 150 miles an hour they were not a success, as at the time the experiments ceased, a speed of somewhat less than 100 miles an hour was the highest that had been

attained and at this speed the side motion of the cars became very uncomfortable, and the tracks needed repairs at the close of each run.

As far as the question of building a car capable of reaching the speed desired is concerned, there was very little question in the mind of electrical engineers that this could be easily accomplished. The weak point in these experiments appears to have been the track, which is laid with rails weighing less than 70 lb. per yard. The practice in electric railway work in this country has tended constantly towards the use of heavier rails and on many suburban roads where comparatively high speeds are attained the practice is to lay rails weighing in the neighborhood of 100 lb. per yard.

The stability and rigidity of the roadway practically limits the speed which may be attained upon it and for this reason it seems strange that experiments of this character should have been undertaken upon any except the most solid and perfect roadbed which can be built. While these tests have proved that the speeds desired are impracticable for adoption on the German state railway lines they are by no means conclusive as to the inability of the electric motor car to reach the speed desired. The entire trouble appears to have been with the track and roadbed and had this been constructed of heavier rails, with a firmer foundation, better joints, etc., there is little question but that the cars could have considerably surpassed the record made.

The value of the rolling lift type of draw bridge in preventing a very serious class of railway accidents was most forcibly demonstrated in Chicago on May 15th, when a train on the Metropolitan elevated collided with the bridge over the Chicago river while the bridge was being opened for a passing boat. The train had run past the danger signal and the front end of the motor car ran some distance up the bridge in its inclined position; the only damage resulting was to the projecting roofs of the first and second cars in the train, these coming in contact when the front of the motor car ran upon the incline. With a draw bridge of the swing type the train would undoubtedly have gone into the river; as it was the delay to traffic was but twenty minutes.

To realize how serious the results might have been on the Metropolitan one has only to recall the other fatalities due to electric cars running through open draw bridges, four of which have occurred during the last ten years. At Portland, Ore., in 1893, 6 persons were drowned; at Milwaukee in 1895, 3 persons; at Cleveland in 1895, 17 persons, and at Saginaw, Mich., in 1897, 7 persons were drowned. In each of these cases only one car went into the river.

The United Traction & Electric Co., of Providence, was called upon, a few weeks ago, to consider a proposition presented by a number of its employes, which contained several unusual provisions in addition to the ones ordinarily included in agreements as to the terms of employment. The draft of the agreement submitted by the men called for a recognition of the labor union with all the restrictions incident thereto, such as membership in the union being made compulsory after 30 days' service with the company, questions as to the discharge of men being submitted to arbitration and suspension by the company of men under discipline by the union.

Besides these there was a clause given that would give the men practical supervision of the time-tables and schedules, and a stipulation that with every complaint filed against any motorman or conductor there should be deposited an amount equal to the man's pay for one day, to be paid to the man if the complaint proves ill-founded.

The company declined to consider these proposals on the broad ground that if accepted they would place the operation of the road in the hands of the labor union. The objections to giving the two agencies by which a street railway is operated—the time tables and schedules and the trainmen—into the control of any persons or association who are responsible to neither the public nor to the stockholders are of course vital, and could not be accepted, but the minor point of requiring deposits when complaints are made against employes is also worthy of notice.

Such a regulation, if adopted, would do a company more harm in the way of antagonizing the public than almost anything else that could be imagined. If any doubt is entertained as to how the public and the daily press would look upon a rule requiring de-

posits when complaints are made, reference may be made to the "Review" for December, 1901, page 888, where are given some examples of the abuse directed at the Rochester Railway Co., because a similar request for such a rule by the employes had been taken under advisement by the manager.

The adaptability of trolley lines for handling both freight and passenger business in suburban districts is so well known that it is not surprising to hear from time to time, reports of the competition which is gradually increasing between the steam and electric roads for traffic of this character. While in many places the suburban service of steam roads does not reach paying proportions there are many cases where, by reason of their far more economical rates of fare, the trolley lines have made serious inroads upon the business of their rivals.

Numerous instances of severe competition of this kind can be mentioned and a number of rate wars have recently been inaugurated between steam and electric railways in which, however, the latter have a very decided advantage. As an example, trolley competition between New Castle, Youngstown and Sharon, Pa., has driven the railroads connecting the places to consider the reduction of local fare. The distance between Youngstown and New Castle is 21 miles and the steam road fare is 65 cents. The electric railway which recently began operating between these cities charges a fare of 20 cents. The Detroit, Ypsilanti, Ann Arbor & Jackson Ry. has increased its freight business to such an extent that the Michigan Central, which heretofore monopolized the business in this territory, has cut its freight rates 50 per cent. The competition for freight between the Hudson Valley Ry. and the Boston & Maine Railroad Co., sometime ago became so keen that the steam road refused to receive freight from the trolley company. The Hudson Valley, Ry., however, appealed to the courts with the result that the steam road was obliged to accept freight from the electric lines.

These examples are sufficient to show the feeling with which the electric lines are regarded by many of their steam competitors. On the other hand, investigations by a number of Chicago railroads as to the effect of trolley competition have developed the fact that strictly suburban business has been practically lost by steam roads, but for longer distances the trolley lines have served to build up hitherto struggling suburbs and the business of the steam roads has been considerably increased. The Chicago, Burlington & Quincy has decided to abandon the greater part of its Chicago suburban service as soon as the extension of the Douglas Park branch of the Metropolitan Elevated, of Chicago, is completed. The short distance suburban traffic of this road for some time past has hardly been sufficient to pay the running expenses of the suburban trains.

In some places the policy of the steam roads has been to improve their suburban service by putting on additional trains and reducing fares with a view to either forcing their trolley competitors out of business or making them glad to sell out to the steam roads. The fact is that from the very nature of their equipments the steam railroads are not in a position to compete with the trolleys for short distance runs where frequent train service is required. It is not entirely a question of the relative cheapness of operation of steam and electricity, as the difference in cost of the two motive powers, even if considerable, would be but a comparatively small item of the total cost of operating the cars or trains. The real difference between the two systems is the cost of train service. The electric car is operated by a crew of two men, a motorman and conductor. The steam railroad train on the other hand engages the services of an engineer, a fireman, a conductor, a brakeman and a baggage man. Not only is there this great discrepancy in the number of employes, but the wages of the steam railroad crew are very considerably larger than those of the motorman and conductor. This high cost of train service on a steam road necessitates the number of trains being kept down to a minimum, especially on lines of comparatively light traffic, and the infrequent running of these trains naturally causes passengers to patronize competing electric lines on which the cars are run at far shorter intervals.

A number of attempts to provide self-propelled cars suitable for frequent service on interurban and branch lines has been made at different times but these cars have never met with any great success and have practically all been abandoned after various periods

of trial. One car of this character was built for a division of the New York, New Haven & Hartford; an old 60-ft. dining car was used and one of the trucks was removed. The body was altered so as to receive a "steam truck" and one end of the car was partitioned off to form an engine room; the passenger compartment had a seating capacity for 60 passengers. This car was put in service in December, 1897, and was used in several places. It was recently, however, taken out of service for the purpose of being repaired and will probably never again be used. It soon became apparent that the car was not a success in the service for which it was designed, and it was used for the greater part of its life for switching and transferring over a two-mile branch.

Another car of this general description was built for and operated by the Erie Railroad. This car was only 50 ft. long and had a baggage compartment and accommodations for 30 passengers. It made 14 trips a day over a four-mile run for about three months. It was found to be unsuitable for passenger service for the reason that when the engine was in operation the jar transmitted to the passenger compartment made it so uncomfortable as to be quite impracticable in operation. The capacity of the boiler was also insufficient to propel the car for any great distance and this defect has been common to all cars of this type. In order to economize space a vertical boiler is required, as the use of a horizontal boiler leaves but little room for passengers on a car of ordinary length, and the size of vertical boilers for this use is practically limited on account of the minimum height which must be observed in order to pass under bridges and through tunnels, etc.

Another self-propelled car was built for the Cincinnati, Hamilton & Dayton Ry. It had an engine room at the front end, a baggage room 6 ft. long and a passenger compartment seating 24 passengers. On a trial trip the machine made a run of 38 miles at from 30 to 40 miles per hour carrying a loaded box car and the fire was given no attention during the trip. The fuel used for this car was anthracite coal which was fed from a hopper on the car by means of the jarring of the engine. The feed was facilitated by a vertical rod passing up through the center of the fire box, which was operated by a lever. The roof of the car contained a surface condenser for disposing of the exhaust steam when running over city streets. This car made 168 miles a day for a few months, but like its predecessors proved unsatisfactory and its use was soon discontinued. The car had neither boiler or water capacity sufficient for the service required and the loading of the coal magazine through the roof was a source of considerable trouble.

A car similar to this was built for the Detroit Southern Railway and also one for the Pittsburg, Cincinnati, Chicago & St. Louis, but in both of these cases the boilers proved deficient as the steaming capacity was entirely insufficient to meet the requirements.

The foregoing examples are sufficient to show the difficulty of producing a suitable self-contained motor for this class of service and it may be mentioned that in most cases where cars of this character have been operated the companies running them were obliged in order to avoid labor troubles to pay the wages of a fireman who merely rode on the car with the engineer but performed practically no service whatever. It would seem, therefore, that in the special field of suburban and interurban work that it is impossible for the steam road to compete with any degree of success with trolley lines as the latter can be operated at a profit on passenger traffic only at rates which the steam roads cannot possibly afford to adopt even with the help of their freight and express traffic.

We believe, however, that there should be no feeling of animosity between these two classes of railroads for the reason pointed out, that what the steam roads lose through short distance trolley competition they undoubtedly more than make up by the increased volume of traffic which results from the building up of the neighborhoods through which the trolleys operate. There can be no defence for the rate wars which have been inaugurated in several parts of the country for the reason that such action merely reduces the profits of both parties and is felt much more by the steam roads than by the trolley. It is probable that in some cases where rate cutting has been resorted to it has been with the ultimate object of absorbing the trolley lines by the steam roads which cannot fail to recognize in the former not only highly desirable properties from the standpoint of an investment, but useful auxiliaries as feeders to steam trunk lines.

New Repair Shops at Providence, Rhode Island.

Details of Building Construction—Application of the Card Index System to Keeping Shop Records—Some Shop Methods—Armature Oven—Methods in Vogue for Making Paint and Painting Cars.

By far the greatest proportion of the total street railway mileage in the state of Rhode Island is controlled by the United Traction & Electric Co., of Providence, which is not an operating company but controls, through stock ownership, the Union Railroad Co., of Providence, the Pawtucket Street Railway Co., the Rhode Island Suburban Railroad Co. and the Interstate Consolidated Street Railway Co. These properties are at present in independent operation, but will undoubtedly be brought together under one operating company some time in the near future.

All the repairs to equipment for the properties controlled are made at the recently equipped shops on Cranston St., in Providence. These shops are the third or fourth largest street railway repair shops in this country.

The buildings occupy a triangular tract and have a frontage of 390 ft. on Cranston St. and an extreme depth of 370 ft. The general layout of the yards, tracks, pits and various shop departments is shown in one of the accompanying illustrations. The buildings are entirely of brick, with stone trimmings. The roof is steel girder

The apparatus and ducts for the indirect hot blast heating system were furnished complete and installed by Westinghouse, Church, Kerr & Co.

The boilers are located near the rear of the building and the fans and radiators, which are of cast iron, are on the second floor, near the center of the shop. The fan apparatus is in duplicate, and the fans are driven by electric motors wound for efficient operation at two speeds, and thus four variations in the intensity of the heat are readily made. The galvanized iron pipes for distributing the hot air vary in diameter from 5 ft. near the heaters to 6 in. at the outlets. This piping is carried under the roof trusses, where it is out of the way of the shop work, and the outlets are arranged about 12 ft. apart and 7 ft. above the floor.

The fact that there are four virtually independent companies having repairs made at these shops introduces a number of complications in the accounting and storekeeping methods, as all labor or material has to be charged to the separate company for which it is intended. The records and bookkeeping system are therefore more



EXTERIOR VIEW OF NEW SHOPS UNITED TRACTION & ELECTRIC CO., PROVIDENCE.

construction throughout, with monitor roof down the center of the main bay, giving ample light in all parts of the building. The front part of the building has no basement, but the general grade of the property gives a good sub-cellar at the back of the plant, which is utilized to excellent advantage for storing heavy stock and other supplies.

Everything is as nearly fireproof as modern building material and method can afford. The floors are of granolithic. The pits are constructed of brick piers on concrete footings with a 4 in. brick arch between the pier as shown in the cross section. The pit tracks consist of 60-lb. T rails, A. S. C. E. standard, laid on 8 x 12 in. stringers, reinforced by channel irons along the inside of the stringers with 7/8 in. tie rods about every 6 ft. The stringers rest upon brick piers with granite blocks 1 ft. 4 in. square between the top of the piers and the stringers. The pit floor has a 6-in. bed of portland cement concrete. The tracks in the general equipping shop are continuous for the full length of the shop, but there are cross tracks in the center upon which travels a Taunton transfer table with apron approaches. The paint and carpenter shops are unusually well lighted and ventilated and are connected with each other by curves and switches, so that a car from the carpenter shop or wood working shop passes directly into the paint room, and when painted and varnished goes directly into the equipping room, where the final equipping and inspecting are done. The entire plant is protected by an automatic sprinkling system in addition to numerous fire hydrants and stand pipes and is heated and ventilated by an elaborate system of blowers and piping.

complicated than would be required were there but one operating company.

Much of the difficulty arising from this source is met by the application of a card indexing system, and as a matter of fact the cards have almost entirely supplanted book accounting in these shops.

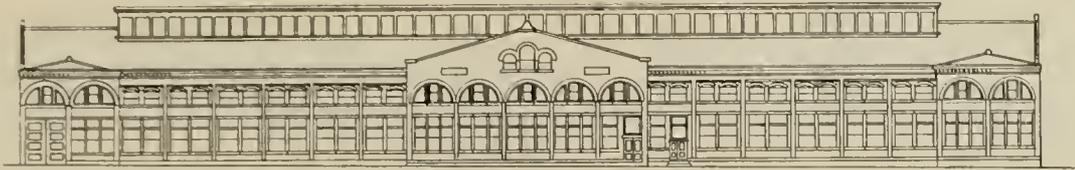
When the stock is received into stores it is immediately entered in the daily receiving sheet, and from these sheets is entered on cards 4 in. by 6 in., which are filed alphabetically. These cards give the dates and the quantity of each lot of each material as it is ordered and received, and the amount used for a given period, which information is of value in placing new orders.

The stores are kept in bins, which are unusually well arranged. These bins are placed in sections at either side of the aisle and the material is classified as far as possible according to the work for which it is to be used. The bins are in two tiers, access to the upper tier being had from an iron grating floor reached by a stairway. The floor is made of open iron grating work so that no dust will accumulate. This brings all of the bins within reach of a man of ordinary height. The bins are not numbered, but, as before stated, are classified, so that any stock can be readily found. The arrangement for lighting the store room is interesting. The incandescent lamps are arranged in different circuits so that the storekeeper as he enters the store room first turns the switch which lights the main aisle but none of the side aisles. As he enters the side aisle in which is the particular stock he desires, he turns a switch and lights the lamps in that one section. There is therefore no needless burning of lamps.

The materials are charged out of stores at the price at which the purchase was made, and for determining this amount a separate index of price cards is maintained. Another set of cards, called the stock record, has spaces for each day for 40 weeks, and gives the amount charged into stores and the amount charged out, and also

repairs for each of the four companies, requiring that a large number of the different forms be always kept on hand. If the companies are merged under one operating head this branch of the business will be greatly simplified.

Exact account of all scrap material is kept, and the price obtained



CRANSTON ST. ELEVATION.

the balance on hand at the end of each week. These cards are watched by a clerk and when the amount of any material on hand drops to a certain predetermined minimum he makes a note of the fact for reference to the purchasing agent, who immediately orders a new supply of the stock required; at the same time the amount in the stock room is checked with the card.

When goods are received they are all charged to the Union Rail-

road for it as scrap is credited back to the account to which the material was originally charged. Portions of the price and stock cards are reproduced on pages 258 and 259.

Records of all cars, trucks and snow plows, with the sub-equipment on each, and the repairs made during their life, are kept on cards 5x7 $\frac{1}{8}$ in. These cards are four in number, Equipment Record, Repair Record, Truck Record, and Snow Plow Record.



INTERIOR OF WINDING ROOM.

road Co. and when used for any of the other companies the fact is noted on what are termed credit slips, from which the proper charges to the individual companies are made up. The goods are delivered on requisitions which are 5 in. by 6 in., these requisitions comprising the storekeeper's receipt. The requisitions are made up in pads, there being a separate form for each of the different classes of

In order to readily distinguish the records for the different classes of equipment the four cards are of different colors. The Equipment Record card is orange, that for the Repair Record straw color, the Truck Record drab and the Snow Plow Record card blue.

The headings for these cards are given in the tables which follow on page 258.

EQUIPMENT RECORD	CAR No.	STATION
Builder	Controllers	
Date in Service	Resistance	
Length Over All	Heaters	
Length Body	Register	
Seats	Trolley Catcher	
Signs	Summer Winter	
	Truck No. Truck No.	
Light Circuit	Brake	
Headlight		

TIME KEEPING.

The time of all employes in the shops is kept by means of a recording system furnished by the Simplex Time Recorder Co., of Gardiner, Mass. There are five recording instruments in the different parts of the building, on which the men check themselves in and out for both morning and afternoon hours.

USE OF COMPRESSED AIR.

The shops are fitted with a complete air compressing plant, consisting of a Christensen water-jacketed combined pump and storage tank having a capacity of 75 cu. ft. of free air per minute. The air is piped to all parts of the building and is used in pneumatic tools, pneumatic hoists and pneumatic jacks; also for cleaning cars and in combination with a gas jet for burning off cars. This use of compressed air is found to be of the utmost convenience and it is believed has resulted in reducing the expense of all classes of repair and cleaning work. For cleaning cars a nozzle is placed at the end of the lead from the compressed air main and cushions, curtains and mats are thoroughly cleaned by this air blast in one-fourth the time it formerly took several men to do the work. It is also found

REPAIR RECORD. CAR No. STATION
 (Blank ruled to give space for date, description and amount.)
 (Reverse side of card the same as front.)

No. TRUCK RECORD.

Builder
 Type
 Wheel Base
 Type Wheel
 Size Wheel
 Size Axle
 Gearing
 Motors (Winter)
 Motors (Summer)
 Car No. (Winter)
 Car No. (Summer)
 (Reverse side for Repair Record.)

RECORD OF SNOW PLOW: No. STATION
 Builder Repairs:
 Date in Service
 Type
 Type Wheel
 Size Wheel
 Size Axle
 Gearing
 Motors
 From
 Resistance
 Controllers
 From
 (Reverse of card for further record of repairs.)



SHOWING HEATING PIPES.

that the dust can be kept out of corners and inaccessible places in a car with much less effort than by any other means.

One of the novel applications of compressed air is made in the painting room. By the use of a special nozzle a jet of compressed air is combined with a jet of gas from the city gas mains, and the blow torch so formed is used with the most satisfactory results for burning off cars, trucks, etc., prior to repainting. The nozzle is made of brass and consists of a 1/4-in. tube inside of a 1/2-in. tube, the smaller pipe being for the gas and the larger one for the air.

11/32" Twist Drills		Cost	Unit	Min.
Bal.				
N. S.				
M.				
T.				
W.				
Th.				
F.				
S.				
Total				
Bal.				
N. S.				
M.				

PRICE CARD.

The air pressure and the supply of gas are regulated by stop cocks, giving any intensity of flame desired. The one possible objection to this is the lack of flexibility, as the air and gas pipes are necessarily limited in length and the car to be burned off has to be brought to one place in the shops. This difficulty is overcome by reserving one

the supervision of the company's master painter. The colors are bought in bulk and are made up as required. For this purpose there are two grinding mills and four 80-gallon mixers driven by a small motor. The master painter uses his own formulas for mixing paint. From records kept for several years it is estimated that by

No. or Size		Article—		Unit		Max. <u>100</u>	
<u>3 3/4 67T</u>		<u>G. E. 800 Axle Gears</u>				Min. <u>25</u>	
Requisition		Received		Delivered		Balance	Value Balance
Date	Amt.	Date	Amt.	To Date	Amt.		
						\$	

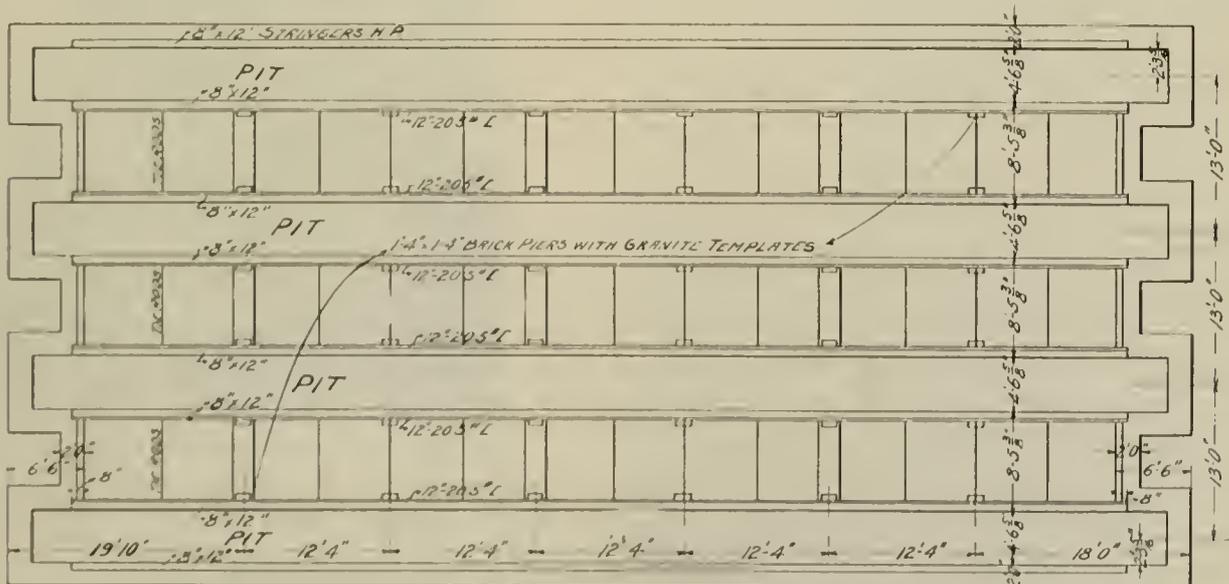
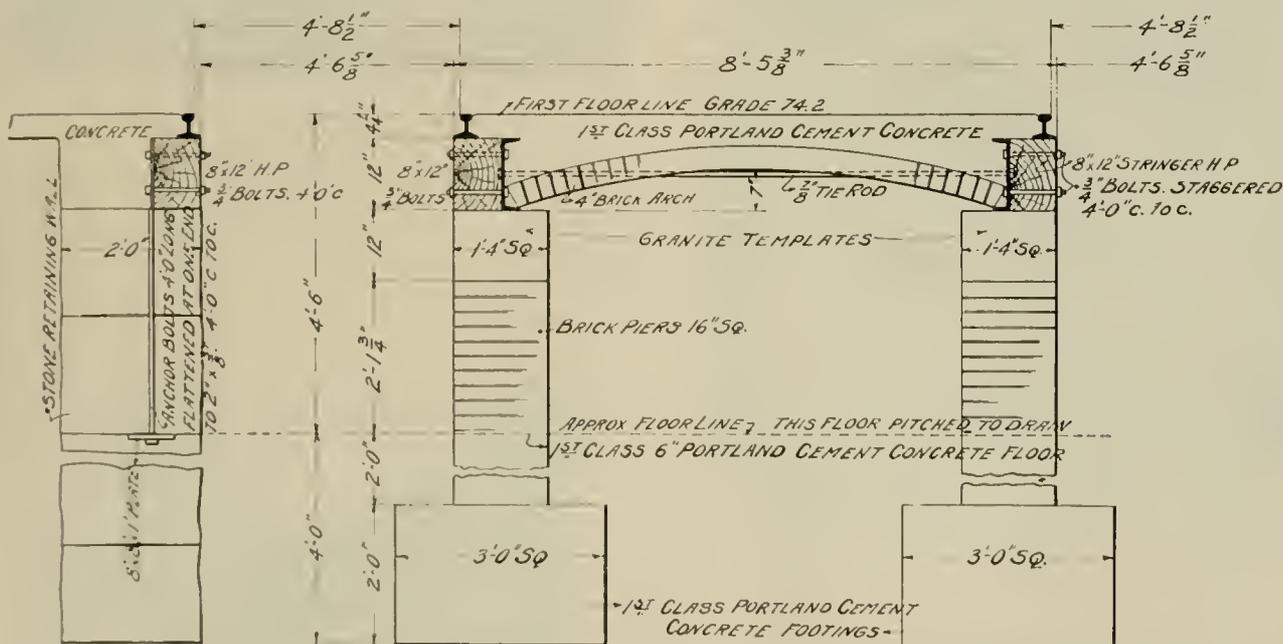
STOCK CARD.

track for this one purpose. The same form of burner is also used in the winding room.

PAINT SHOP METHODS.

These shops are somewhat unique, in that all the paints and insulating compounds are ground and mixed on the premises, under

making its own paints in this way a great saving in cost has been gained by the company, with the added advantage that the painter knows just what he is getting in his paints. The body colors are usually mixed by hand in comparatively small quantities in order to keep them from becoming tough or stale. Paints of which large quantities are used are mixed in the 80-gallon mixers and com-



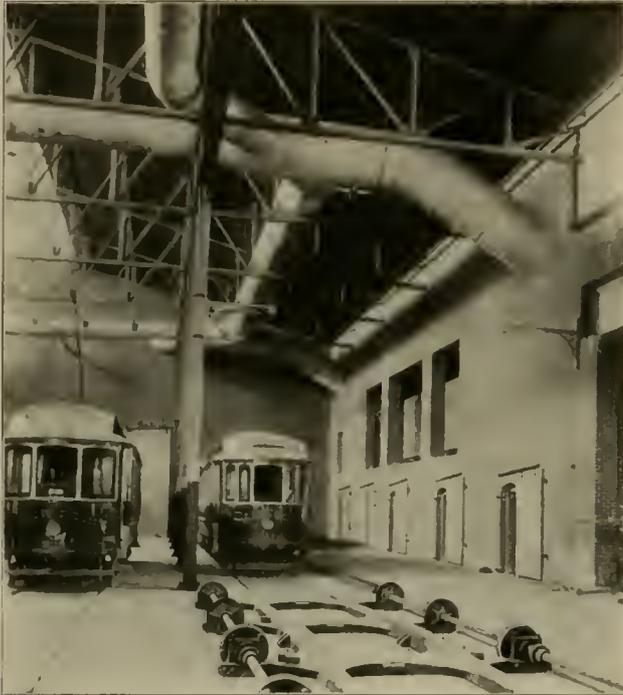
PLAN AND SECTION SHOWING DETAILS OF PIT CONSTRUCTION.

paratively large quantities are kept on hand, especially of white paint for roofs and metallic paint for poles, floors, etc.

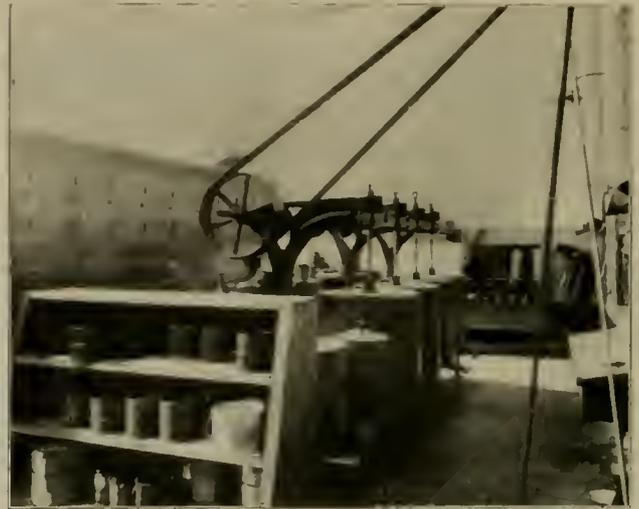
Speaking of the comparative cost of making paints over the cost of buying them ready made, it is pointed out that, although the regular paint dealers may be able to buy their rough colors at a better figure than the smaller consumer, the street railway company can effect a saving in the cost of labor, as the men who do the mixing and attend to the mixing apparatus can put in their spare time setting glass (all the glass setting is done in this room), keeping charge of the paint store room, etc., and are men who would probably be required any way to take care of this work. The cost of power for operating the apparatus is small, as a 2-h. p. motor taking current from the trolley circuit is all that is required. Only the best oils and colors are purchased and the formulas are made by an experienced paint mixer, so that a high grade of paint is assured. It is estimated that a saving of practically 20 per cent is effected over

pulled forward. This is done not only to give access to the contents but also to enable the space behind the barrels to be kept clean and free from rubbish.

It is the custom in these shops to save all scraps that result from burning off cars, and this scrap finds a ready sale to jewelers for



INTERIOR VIEW.



PAINT ROOM.

the sake of the particles of gold leaf contained therein. All paint skins and residue paints are also kept for use on floors and other odd jobs.

Car signs are painted with the aid of perforated patterns made of manila paper and the use of pounce for outlining the letters. The colors are then filled in by hand. These patterns are perforated by the use of a tracing wheel, similar to the small wheel used by harness makers for making perforations. Stencil designs are used to

the cost of the same grade of paint if bought from the regular dealers.

The company also makes insulating compounds and shellac, using for this purpose a churn which consists of a 50-gallon barrel fitted with castings at the ends to receive the bearings.

The paint shop and store room, which are under the charge of Mr. H. Arnold French, master painter, are models of cleanliness and neatness. In the store room everything has its proper place and must be kept therein.

For taking care of brushes long, shallow, copper-lined tanks are used. Ordinary brushes are kept in water and are suspended in racks placed across the tops of the tanks. A simple device keeps these tanks free from paint scum. The water enters the tank from the bottom and passes out through an outlet pipe which has its opening at the surface of the water, so that the circulation in the tank is always from the bottom to the top, and all scum or other accumulations on the surface immediately pass out through the outlet pipe. At the back of the brush tank are fastened sheets of iron, which are used for rubbing purposes, and it is against the rules to clean out brushes anywhere except on these sheets. The sheet iron is in sections, held in place by screws, and can be taken down and readily cleaned by means of the gas blower pipe already described. The varnish brushes are kept in varnish in a large tin box having nails projecting on the inside for holding the brushes at the proper height. Camelhair brushes for the body colors are kept in a mixture of oil and turpentine in separate cans. All barrels of powdered colors, etc., are mounted on small wheels so that they may be easily



LADDER WAGON IN USE.

some extent for decorating, but these are always finished up by hand, giving a peculiar shaded effect that cannot be gained by hand alone or by stencils alone.

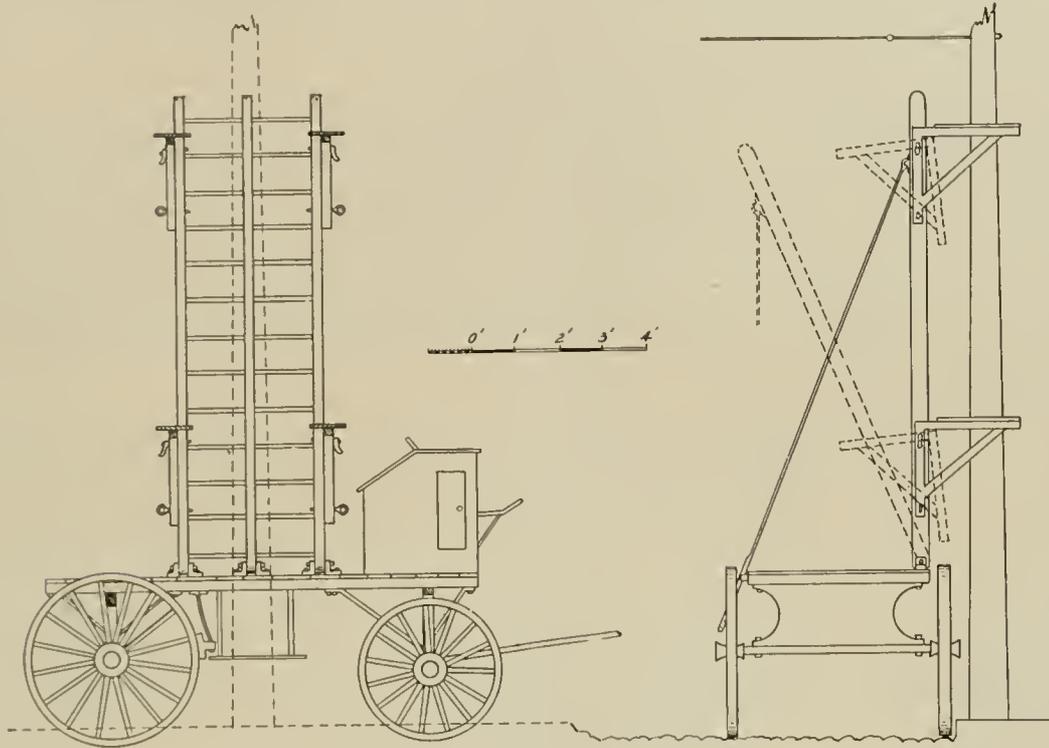
The amount of care exercised in all parts of the paint room is illustrated by the fact that even the sand paper is cut into con-

venient lengths and kept in a rack according to grade. These pieces of sand paper are given out by the store keeper just as any of the more expensive materials.

Old glass is cut up and utilized for putting into headlights. The

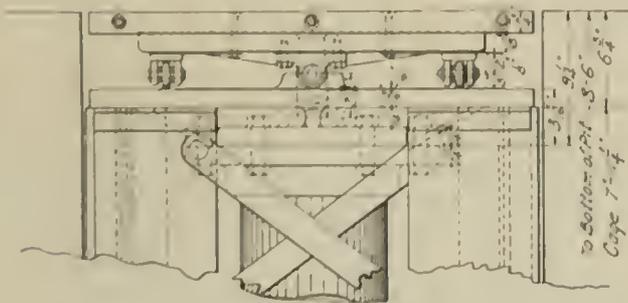
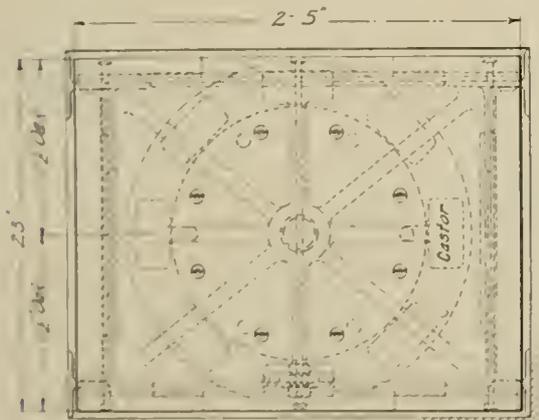
scratch the glass. The diameter of the disk is regulated by placing the cutter at any desired position on the swinging arm.

Window sash are painted on a revolving table which has raised bevelled edges, so that but one edge all the way around the sash

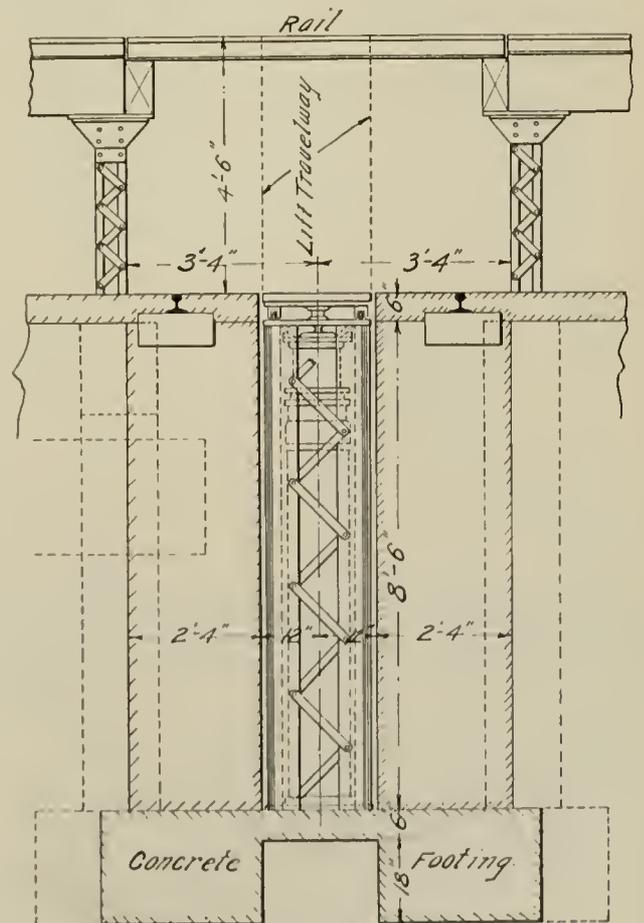


LADDER WAGON USED FOR PAINTING POLES.

disks of glass are cut to the proper size by means of a small steel wheel cutter mounted on an arm which swings from a small wooden pedestal. The base of the pedestal is lined with felt and cannot



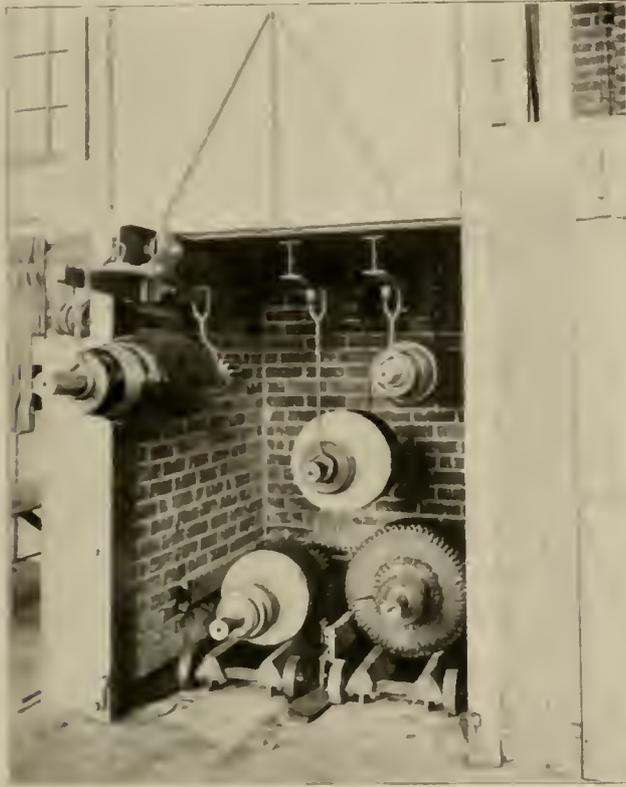
TOP OF LIFTING JACK.



ELEVATION OF JACK.

brought to the oven by the hoist and the casting mentioned is slipped over the 5-in. I beam, after which both the beam and the casting are pushed back until the armature is wholly within the oven and the sliding door may be closed. Each compartment has three of these overhead trolleys and space on the floor for two armatures on trucks, making room for five armatures in each compartment.

There are three "Simplex" electric heaters in each division, one on each of the sides. It is found possible with a 525-volt current to



BAKING OVEN FOR ARMATURES.

maintain a temperature of 160 degrees F. with 3.2 amperes of current, or a temperature of 180 degrees F. with 4.75 amperes of current.

All the departments of these shops are in general charge of Mr. W. D. Wright, superintendent of equipment, and many of the devices and methods in vogue were devised under his direction.

THE LANCASTER RELIEF ASSOCIATION.

The Lancaster County Railway & Light Co.'s Relief Association, comprising employes of the Lancaster, Pa., electric lines, held its annual dinner and reception at the Eagle Hotel, Mechanicsburg, April 22d, the trip from Lancaster being made in a special car, with Frank S. Given, general manager of the company; H. B. Riddle, superintendent, and S. I. Charles, superintendent of transportation, among the guests. After an enjoyable repast Mr. Given addressed the diners, promising them the support and co-operation of the company in the fraternal and charitable work of the association. Mr. B. F. Zook, financial secretary, read the report for the year ending April 1st, which showed \$8,146.00 to have been paid out for sick benefits and \$200.00 for death benefits, while the association has the sum of \$911.00 securely invested. The organization has 161 members and is rapidly spreading its influence. The entertainment included with a musical program and the return to Lancaster. Mr. Zook invites correspondence from similar associations of other companies.

The Grand Rapids (Mich.) Railway Co. expect to be in possession of its new office in the Godfrey Building, 38 North Iowa St., Grand Rapids, by June 1st. The new executive quarters are centrally located and are large and commodious.

EFFECT OF THE BOSTON ELEVATED ON TRAFFIC.

The elevated railway in Boston has now been in operation a sufficient length of time to make it possible to form a reasonably accurate estimate of the value of the service, and to demonstrate in what particulars it may be regarded as an entire success, as well as to indicate what further improvements are necessary in order to attain the perfection in operation at which the management aims. The service upon that portion of the elevated system extending along the water front is not as yet completely installed owing to the heavy demand of the subway traffic, which is so far in excess of the volume of business anticipated that nearly all of the elevated cars at present owned by the company are required on this main line, which is partly elevated and partly underground.

Perhaps the most striking feature of the situation, and one that causes the operating department serious concern, is the unanimity with which those passengers who have a choice between the surface and the elevated lines for reaching their destinations, forsake the slower going surface cars, which are seldom overcrowded on lines that parallel the elevated, and pack themselves into the overburdened elevated trains which are so densely filled with passengers that, during the rush hours, it is frequently difficult to close the platform gates. If patronage is a fair gauge to popularity, the elevated road may be set down as the most popular institution in the city.

In the first estimate of the number of cars needed for the service, 60 cars were thought to be an ample provision for all the business that could reasonably be expected to seek the elevated lines, but in order to provide abundant accommodation for any travel in excess of the estimate, 40 additional cars were ordered, making a total equipment of 100 cars at the time of opening the road. It was very soon demonstrated that nearly all of these cars would be required for the service on the main line alone, running between the terminal by way of the subway, and 50 more cars were ordered, some of which have been received and will shortly be placed in commission, which will enable the company to install an additional through service by way of the water front, as originally intended.

From the standpoint of the public, the most important result which the elevated has accomplished has been the reduction in the running time into or through the city. Upon the surface lines 45 minutes were allowed for a trip between Dudley St., Roxbury, and Sullivan Sq. in Charlestown, the terminal points of the elevated road, and it was frequently impossible for the cars to make their trips within a quarter of an hour of this time. The running time between the same points on the elevated is 21 minutes, or less than one-half the former running time, and the trip from the center of the city to the suburbs has thus been shortened by ten or fifteen minutes. In effect it has brought the suburban territory two or three miles nearer to Boston with all of the incidental advantages accruing therefrom.

Another important benefit to the city has been the removal from Washington St. of the congestion of cars and people that formerly blockaded the street and sidewalk of that main thoroughfare. In order to fully appreciate the extent of the improvement and the methods by which it has been accomplished, it should be called to mind that all the surface traffic through the city is necessarily borne by Washington St., there being no other thoroughfare available for that purpose. Into this single main artery it was formerly necessary to pour all the cars from the northerly and southerly suburbs.

At the Dudley St. station on the south, and the Sullivan Sq. station on the north, the suburban lines diverge in various directions, connecting with numerous places beyond. Upon these radiating lines trips are frequent and cars are numerous. Before the elevated was put into operation it was necessary to run all suburban cars into or through the business center, and as a result the number of cars was disproportionately greater than the number of passengers. There were so many cars that they were in each other's way and progress was slow. Added to the congestion of cars was a congestion of people occasioned by large numbers of persons standing upon the sidewalks waiting for their particular cars to arrive.

It was largely the purpose of the elevated road to provide a service that would overcome this situation, and supply, as a substitute for many of the surface cars, a means more speedy and certain of covering that portion of the trip included between the two points at which the suburban business radiates from the main line

of travel. This was accomplished by making these two points the terminals of the elevated line and by running a large portion of the surface cars between the outlying districts and these elevated terminals, instead of running them into the city. Universal free transfers are given between the elevated and surface lines, and, to make the transfer as convenient as possible, surface cars are run upon inclines to the elevated level at the terminals, so that transfers are made at the same level. The effect of this change in the service has been to remove from Washington St. the surplus cars, and render it unnecessary for passengers to wait at street corners for the arrival of out-of-town cars.

Incidentally the construction of the elevated road has resulted in a very large financial revenue to the cities and towns in which it operates its elevated and surface lines. The elevated road pays nearly \$400,000 in taxes of various kinds upon its own capital, earnings and property in addition to that paid on the leased surface lines. Under the Massachusetts law this company, which is the lessee of the extensive West End Street Railway system, pays in taxes upon both systems, and for use of the subway, more than \$1,000,000 a year, or more than one-tenth of its entire income, which is distributed among the cities and towns in which it operates in proportion to the number of miles of track which it operates in each of them, except that the entire subway rental is paid to the city of Boston.

While upon the subject of taxation it may be well to state what these taxes are. A heavy corporation tax is assessed upon the market value of the stock of both the Elevated and the West End roads; a compensation tax in payment for its privileges is levied upon the volume of business which it transacts; the ordinary property tax is paid upon all property owned by both companies. It is also required to pay \$213,205.18 for the use of the subway, and, in addition, must divide with the public its earnings above 6 per cent, if it is ever so fortunate as to be able to pay annual dividends in excess of that amount.

Besides these taxes upon investment, income, property and profits, there are numerous equivalents of taxes such as the paving of a considerable portion of all of the streets in which its tracks are located; the removal of snow and ice, the expense of which some years run into hundreds of thousands of dollars, and other obligations, all of which constitute a heavy burden upon the revenues of the company, and make it practically impossible for the company to earn more than a small dividend.

IMPORTANT CONSOLIDATION AT RICHMOND, VA.

By purchase on April 24th of the property of the Richmond Traction Co., the Virginia Electrical Railway & Development Co., and the Westhampton Park Railway Co., the interests controlling the Richmond Passenger & Power Co., took control of all the electric railway, power and lighting properties in the city of Richmond and the suburban territory tributary thereto.

The Traction Co. and the Passenger & Power Co. have for some time been vigorous competitors for the street railway business of Richmond. They both had lines on the main business streets and so sharp had the competition for traffic become that both companies were running cars under less than five minutes headway during the entire day, resulting in an enormous and unprofitable car mileage for both roads. By the consolidation much of this useless mileage will be avoided. The Traction company owns 18 miles of track, and the Passenger & Power company, 68 miles. The new owners also control the Richmond & Petersburg Street Ry., 22 miles, and the Petersburg (Va.) Street Ry., 6 miles, making a total mileage controlled of 115 miles.

The Virginia Electrical Railway & Development Co. owns a 5,000-h. p. water-driven plant on the James River. This plant has an ultimate capacity of 15,000-h. p. and supplies direct and alternating current for traction, power and lighting. The new owners have also acquired rights to the water power of the old upper Appomattox canal, near Petersburg, and are now working on a 20,000-h. p. electrical development plant on the Appomattox River.

These interests will all be controlled by a new company called the Virginia Passenger & Power Co., with a nominal capital of \$3,000,000, which will be increased. The new owners are Baltimore and New York parties acting through Mr. Nelson Perrin and

Mr. Winslow Williams of Baltimore, Md. The president of the Virginia Passenger & Power Co. is Mr. Fritz Sutterding.

The properties taken over by the deal were formerly owned largely by what is known locally as the Williams syndicate, which included E. L. Bemiss, former president of the Richmond Traction Co., E. Randolph Williams, R. Lancaster Williams and others.

It is announced improvements and betterments of an extended character will be made, not only in the street railways, but also in the power and lighting properties. The plans for the Westhampton Park Railway Co. provide for a well regulated pleasure resort with a villa settlement and country club.

ONE WAY OF AVERTING A STRIKE.

A manager in conversation recently told a good story of how a superintendent of a road employing about 40 men broke up a threatened strike among his employes. It appears the company made a new rule in regard to an unimportant detail of operation but one which did not meet with the approval of the conductors and motormen. The superintendent knew there was some kicking going on but as there was no vital question involved did not believe the men would be foolish enough to strike. He thought the matter had been dropped until one night as he was riding on the last car out at night to his home which was about half way between the city and the car barn he learned that a meeting had been called for that night. The men had agreed to gather at the car barn after the last car had been pulled in and arrange a strike for the next morning. He quickly determined to remain on the car and attend the meeting although he had not been invited. Arriving at the barn he found about half the men gathered together and somewhat surprised to see him. He spared no time in telling the employes that they were trespassing on the company's property and requested them to disband and remove themselves from the premises. This they refused to do, whereupon the superintendent, who is something of an athlete, pulled off his coat and made a short but very vigorous speech to about the following effect: "Now, boys, you have got to get out of here. I can't whip you all together but you must either leave or come up here singly and be whipped or whip me. Who is the first one?" This was an appeal the men were not exactly prepared for but one which raised the superintendent a good many points in their estimation. They evidently had too much respect for themselves to join together and throw the superintendent out of the barn, which they easily could have done, and after a hurried consultation they walked up to him in a body, shook him by the hand one by one and quietly dispersed to their homes. This was over a year ago and not a word has been heard since in the way of objection to any of the company's rules.

ELECTROLYSIS CHARGE IN ST. PAUL.

The St. Paul board of water commissioners in a bill of complaint against the Twin City Rapid Transit Co., alleges that the mains and underground pipes are affected by electrolysis, caused by the return currents of the company using the waterpipes for a conductor. The water company asks to have the street railway company restrained from making such use of the water mains, and alleges damages to the amount of \$500,000.

In its answer to the complaint the Twin City company denies responsibility for any damages except such as may attach to it as a stockholder in the St. Paul City Railway Co., and, on behalf of the latter, asserts that the city of St. Paul and not the board of water commissioners, is the real plaintiff. In connection with this contention the company alleges that the laws and ordinances under which it was granted the use of the streets, under the restrictions and regulations made from time to time, amount to a contract between the city and the company. It is further alleged that if the courts decide that the street railway company shall provide other means of returning the currents, it will be changing the terms of the contract between the city and the company.

Work will soon be begun on an 11-mile electric line to the summit of Pike's Peak, to be known as the Seven Lakes-Pike's Peak Ry. Connections will be made with the Cripple Creek Short Line at a point near Clyde. H. C. Hall, of Colorado Springs, is one of the directors of the company.

HIGH RAILWAY SPEED IN GERMANY; ELECTRICITY OR STEAM?

A report to the State Department by Frank H. Mason, U. S. Consul General at Berlin.

It is now five months since the close of the experiments in high-speed electrical traction over the specially repaired and prepared railway line between Berlin and Zossen, and yet no official report of the attained results has been published. Individual experts, more or less directly interested in or connected with the trials, have contributed to various technical magazines here, in England, and in America long and highly interesting reports of the equipment and methods employed. They have described with elaborate detail the motors, the construction of the cars, and the system of transmission employed, but nowhere in any of these reports does the writer venture to state his conclusions as to what the experiments have proved that was not known before, and what immediate effect they are likely to have upon railway progress. From all that can be ascertained, even the "Studien Gesellschaft," or specially organized company under whose management and support the experiments were conducted, has not prepared an official report for the information of its own members, nor has it yet been decided when, where, and under what new conditions, if at all, the trials shall be resumed. It will be remembered that in former reports of this series (Advance Sheets Nos. 1103, 1154 and 1206), the experiments were described as being made by a society specially organized for that purpose, which included as members the General Electric Co. of Berlin, and Messrs. Siemens & Halske, each of which firms furnished a motor car of its own construction, and several associated banks, which contributed the necessary capital; that the trials were made after long and careful preliminary study and experiment, and with the expectation of accomplishing a speed of 125 to 150 miles an hour. The trials finally took place during the latter half of October last year, beginning at 40 miles and gradually increasing in speed until on the 3d and 4th of November, a speed of 150 kilometers (93.2 miles) an hour was attained. Then the experiments abruptly ceased, for the reason, as it was understood, that at the latter pace, the strain on the track and roadbed was so great that they had to be repaired at night, and it was found that the limit of practical utility and safety had been reached with the facilities which were then at command.

The nearest approach to an official verdict on these trials which has yet been made was a paper read last month before the "Verein für Eisenbahn Kunde" (an association of railway experts) by Geheimrath Baurath Moritz Lochner, an eminent engineer belonging to the Prussian State Railway Administration, and who in the experiments represented the Government, which had furnished the stretch of military railway line over which the tests were made. The address is withheld from publication, but, in substance, it confirms the conclusions of the other experts and may be summarized as follows:

The line, 28 kilometers (17.4 miles) in length, was laid with rails of the old Prussian standard, weighing 33.4 kilograms (70.14 lb.) per meter (39.37 in.), resting on metal ties. The track had been in use for a number of years, but prior to the experiments it had been put into perfect repair. At ordinary speeds, everything worked perfectly, and no trouble was experienced with rails or motor cars. The side swaying of the cars was scarcely noticeable, not sufficient to cause the slightest inconvenience to passengers. But as a speed of 130 kilometers (81 miles) was approached and exceeded, new and serious conditions were encountered. The rails and ties both proved too light for such a strain, the track began to give way, and the side swaying of the cars increased seriously. The highest speed attained was 160 kilometers (99.4 miles) per hour on two occasions, and as a result of the conditions then developed, the experiments were discontinued, the net result being that up to a speed of 81 miles an hour, they had been successful and satisfactory.

But as the pronounced purpose of the trials had been to make tests of speed up to 125 and 150 miles an hour, the actual result spread a chill of disappointment among electricians in this country. The trials had, indeed, shown that a polyphase alternating current, carried on triple overhead wires and taken off by trolleys, could be introduced as high potential into the rapidly moving car, and there reduced by portable converters to a safe and effective working pressure. The trolley and the motor—one of which was hung on

springs, the other set solid on the axle—worked to perfection. There was left no longer a doubt—if, indeed, any existed before—that, given a sufficient voltage, the current could be "got into the car" for any speed that might be desired. From the standpoint of the electricians, therefore, the experiments were technically successful.

The disappointment lay in the demonstrated fact that a large portion of the German railways could not, even if it were desired, be adapted to high-speed electrical traction without being practically rebuilt. While some of the leading lines have been relaid with rails of the new Prussian standard, 44 kilograms (97.4 lb.) to the meter, many of the principal and all the secondary railways are built with rails of the old and lighter standard, which failed so conspicuously at Zossen when the motor car surpassed the speeds which have been approximated in other countries by steam. They are laid to a large extent on metallic ties, which have not proved satisfactory under the severe test of high speed or heavy trains, and the rail joints likewise leave something to be desired from the standpoint of modern improved construction. The Prussian State railways are conservatively and economically managed; they yield a large and steady revenue, which the royal treasury needs from year to year, and it is clearly seen that any scheme of rapid, long-distance transit which would require the State lines to be torn up, their curves straightened, and their tracks relaid with heavier rails will have long to wait. In fixing a definite limit of safety and utility to the present track system, the Zossen experiments have helped to relegate the hourly high-speed electric express cars from Berlin to Hamburg, Liepzig, and Breslau—which had been so confidently predicted by amateurs here and in America—to a remote and somewhat indefinite future.

It is, perhaps, as a more or less direct corollary to all this that the German Society of Mechanical Engineers has again taken up the problem, and at a recent meeting voted a series of prizes, viz., 5,000, 3,000 and 2,000 marks (\$1,190, \$714 and \$476), for the first, second, and third best designs for a steam locomotive and train which will be designed to form a unit in a scheme of rapid long-distance passenger service. The prizes are of merely nominal value, but the honor and prospective profit of winning one of them will be worth any and everything that the competitive effort may cost. The proposed locomotive and train are to be adapted to the Prussian railways as they now exist. The engine must be capable of hauling a train weighing 180 tons over a straight, level track at a speed of 120 kilometers (74.5 miles) per hour, and must be able upon trial to maintain this pace for three hours without stopping. Troughs for automatically replenishing the tank of the locomotive while in motion are to be provided at intervals of 75 miles. The cars are to include in their plan and construction all modern improvements and to be so designed as to form trains of three or four carriages, each capable of carrying one hundred passengers and their baggage, with full provision for their food, drink, and every necessary comfort during a journey of from five to ten hours. The cars must be so built that they can be run safely over a good track at a speed of 150 kilometers (93.7 miles) per hour. The cars must be planned and built of such material as to minimize the danger to passengers in case of derailment, collision, or other accident. Especial importance is attached to safe, effective, and easily controllable lighting and heating facilities. The drawings and specifications—which are to show clearly every detail of construction, weight, cost and material used—are to be delivered to Mr. F. E. Glaser, secretary of the Association of German Mechanical Engineers, before noon of December 1, 1902, the plans of each competitor being marked with a cipher for identification after the awards have been made. The competition is restricted to German subjects and to locomotive and car builders of other nationalities who are permanently domiciled in this country.

Although it can not be ascertained that the State railway authorities are officially or directly connected with this enterprise, many of them are members of the Society of Mechanical Engineers, and it is well understood that the competition has been decided upon as a reach in a new direction toward improvement in railway service. Four large and important cities—Hamburg, Leipzig, Dresden and Breslau—besides several smaller towns like Hanover, Brunswick, Halle, Magdeburg, Chemnitz, Gortitz and Stettin, are within a run of four hours by ordinary express trains, of which there are three or four daily in both directions. If, instead of, say, four daily trains of ten or twelve cars each, running from 30 to 40 miles an hour, the service were divided by day into hourly trains of three cars, carrying

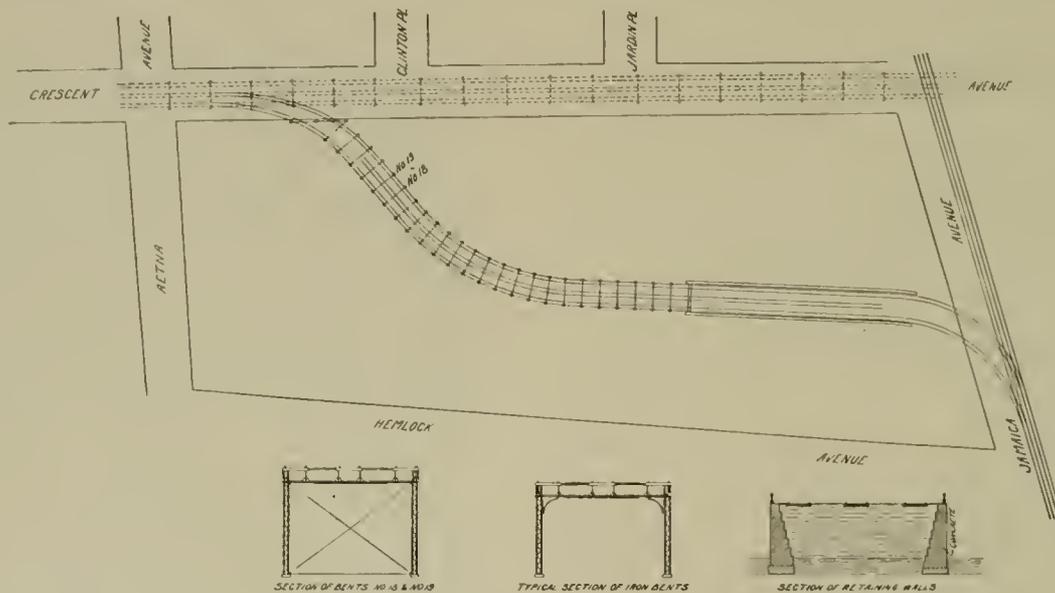
100 passengers, and running 50 to 60 miles an hour, it is clear that the public would be far better and more conveniently served. This much, at least, would be done with comparatively small expense and with but little change in the existing lines, which are generally well surfaced and in good condition. Northern Germany is, for the most part, a vast level plain only a few feet above the level of the North Sea. Over this area, railway grades are generally slight and tracks for the most part straight, level, and well adapted for much higher rates of speed than have yet been undertaken. It is generally assumed and understood that, by one method or another, the facilities for travel between Berlin and the other large cities are to be improved in respect to both speed and convenience. It now remains to be seen which direction—whether through the use of electricity or steam—these improvements will take.

NEW TRACK WORK IN BROOKLYN.

The Brooklyn Rapid Transit Co. is preparing to do considerable work this spring in the direction of rebuilding some of the older track, building needed connections, constructing certain new lines and generally inspecting and overhauling the entire track system in anticipation of the heavy summer business. Taking into con-

crete beam construction, with the view of testing the wear, life, and general adaptability of concrete track work for excessively heavy traffic. Mr. Packe states that the results thus far have not been altogether favorable to the concrete beam track. The line and surface remain perfect, but under the constant wear of the heavy rolling stock, which, incidentally, is constantly tending towards heavier types, the rail itself wears out in a far shorter time on the unyielding concrete foundation than it does on the less rigid tie construction. (For additional data in this regard see Mr. Packe's paper referred to.)

Pursuing the plan of thoroughly welding into one connected system the various properties controlled by the Transit company, inclines have been built at various points connecting the elevated roads with the surface tracks and elevated trains are now run to Coney Island and other outlying points. For this purpose many of the electrically equipped trains are provided with overhead trolley for operation on the surface tracks as well as with contact shoes for the third rail on the elevated. The last connection of this kind to be built is at Cypress Hills, where the Brooklyn Union Elevated line is joined with the surface tracks on Jamaica Ave. by means of an incline about 1,200 ft. long. The layout at Cypress Hills is illustrated on this page. The grade is gradual, not exceeding 2 per cent. About one-half of the incline is masonry work, consist-



PLAN AND SECTION OF INCLINE IN BROOKLYN.

sideration the enormous car mileage of the Brooklyn Rapid Transit Co. the track as a whole is in exceptionally good condition, far better than would be supposed after a superficial examination of the volume of traffic passing over some of the lines during the rush hours. But little will have to be done in the way of repair to the track laid subsequent to the time at which the Transit company took control except on the Brooklyn Bridge and at the bridge terminals and most of the work will be confined to the older lines and to extensions and additions.

The standard construction in Brooklyn where the pavement is granite blocks on concrete is a 9-in. girder rail on ties 6 x 8 in. x 7 ft. laid with sand foundation tamped into place. Weber joints are used with brace tie plates every third tie. After the rails are spiked down, surfaced and lined, portland cement concrete is rammed in between the ties and around the ends of ties, forming a solid bed of 6 in. above the subgrade between the tracks and rails and 2 ft. outside. On this is laid 1 in. of sand in which to bed the paving. Hemlock rail fillers are placed between the flange and head, and flange and tram of the rail, and the granite blocks are then put in place. The joints are filled with heated gravel and hot pitch to occupy all voids. (For details and illustrations of track standards in Brooklyn see paper by E. C. Packe, engineer maintenance of way, before New York State Street Railway Association, September, 1901, and reprinted in the "Review" for Sept. 15, 1901.)

In the summer of 1890 the company put in considerable track on

ing of concrete retaining walls, with dirt and cinder filling. The balance of the incline is carried on steel girders.

The company has always recognized the advantages of terminal loops at termini where the traffic is dense. All the lines running to Coney Island, Bowery Bay Beach, Brighton Beach and other resorts have these terminal loops, in addition to those on both elevated and surface lines at the Manhattan end of the Brooklyn bridge. The new work to be carried out this spring includes the building of four new surface loops outside of, and in addition to, the four loops now in use at the Manhattan Bridge terminal. These additional tracks will increase the number of cars that can be moved across the bridge at rush hours by at least 35 per cent, and it is believed will relieve much of the present congestion. The distance between each of the loops will be twice that of the space between the four loops that are now in use, and will permit the dispatching of about 350 cars per hour, instead of 280 cars, the present capacity.

The Louisville Railway Co. has sold \$250,000 second mortgage bonds out of a total issue of \$600,000. The average price of the entire issue was \$1.084 per bond and the entire issue brought \$271,170. The subscriptions amounted to several times the amount to be subscribed. The company cannot sell more than \$200,000 of the total \$600,000 of bonds per year, except that if less than that amount is sold one year the difference can be added to the \$200,000 sold the next year.

California and Combination Cars.—III.

BY W. E. PARTRIDGE.

The California type of street car, with its open ends and closed central body, as has been explained previously, was a development, or modification, of the cable car with an open compartment at one end for the gripman. As there was more space about the grip levers than was required by the gripman, this space was utilized for seats for passengers. The car thus constructed formed a combination car pure and simple. Such cars were used in San Francisco and Chicago and in some other cities where the cable was early introduced. It was not, however, until the California car had become pretty well established that the advantages of a car having a closed body at one end and an open compartment at the other were appreciated. Then there was a reversion to an earlier type, so that the car, which was first designed and used, appears in actual service later than the car which was designed or developed from it. Grip cars with open ends of considerable length were in use in Chicago for some years before combination cars attracted any attention. They were pretty generally considered as one of the freaks that went along with the cable.

The next combination car of which the author can find any record was by the same builder and was a wonder in every way. It was a double decked dummy with a closed compartment below and two open sections on the upper deck. The closed passenger compart-

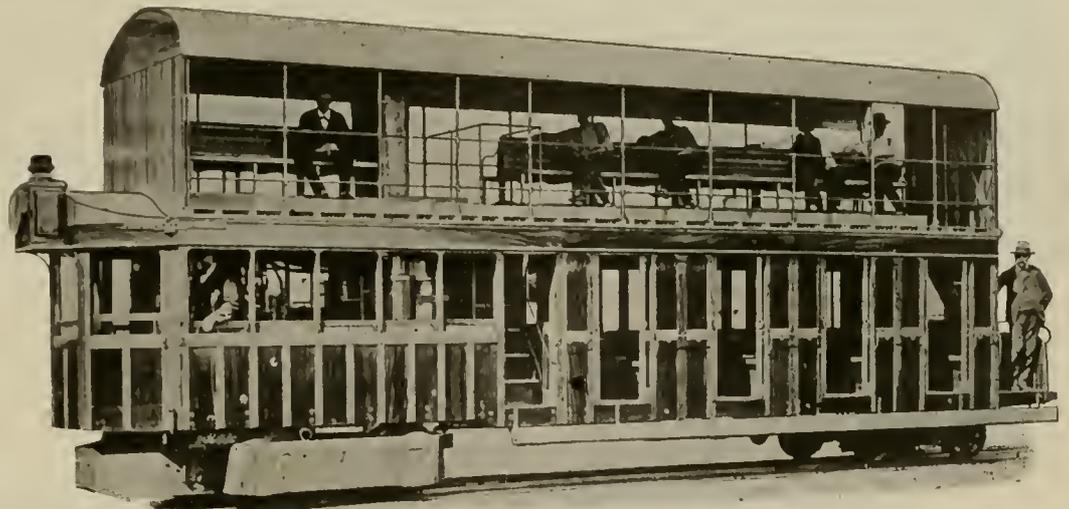


FIG. 2—EARLY COMBINATION CAR—A STEAM DUMMY.

ment had four side entrances. In front of this was the cab, which was also boiler and engine room as well. Between these compartments was placed a stairway by which the upper deck was reached. This deck had a roof and bulkheads at each end. It was divided into two portions by means of the stairway and the smoke stack of the boiler. The upper seats were all longitudinal, while those below were transverse. This car is shown in Fig. 2.

About this time, perhaps a little later, the Brill company built the two styles of grip cars shown in Figs. 3 and 4. These cars were about 37 ft. long over the dashers. One of them had the original style of open end first put in service in San Francisco and the other, Fig. 4, had transverse seats with a center aisle. In one of them a bulk-head for the protection of passengers was used at the open ends. Upon the other carriage curtains furnished the only protection. At that time the spring roller curtain was not generally found on street cars, in fact had scarcely been introduced at all into this form of service. Several modifications of this style of car were used in Chicago. As the cars were operated on loops and consequently always ran in one direction, the open platform was needed at one end only.

In spite of the prejudice of managers against cars of this class their popularity has grown. Even in the East, where open air riding is not comfortable in winter, these cars are found useful. In most of our cities in the northern states riding in an open car is not comfortable through the whole of the summer. The closed



In street car construction it is quite difficult to assign dates at which different forms of construction were first introduced. The records of many builders are not at all accessible. It is frequently the case that there are no photographs of early work to be had. For these reasons the author cannot speak definitely in regard to the first appearance of this type. To the best of his knowledge and belief the earliest combination cars which were not also grip cars were built by the J. G. Brill Co. The first of these shown in Fig. 1 was built about 1883 for a horse railroad, or rather a mule road, in one of the Spanish American countries. It had a platform in front of the standard horse car type, but the rear entrance was the usual omnibus broad step. The closed body was for the first class passenger, while the open portion was for the second class. The roof was of the "lard cage" or Rowley pattern. The ventilators, however, covered only a portion of the closed body. The curtains were of the old carriage style. From these primitive features one would be almost tempted to assign the cars to a date ten years earlier.



FIG. 3—EARLY COMBINATION CAR FOR CABLE ROAD, CHICAGO.

compartment therefore has its advantages. It especially appeals to railway men in those cities where the Board of Health orders that one car in every three or four shall be a closed car no matter what the season of the year may be. This is the case in some of our larger cities, notably New York and Brooklyn.



FIG. 4—COMBINATION CAR FOR CABLE ROAD, CHICAGO.

The writer has been unable to locate dates of construction beyond those already given and can arrange his material merely in the order in which it has been received.

In Fig. 5 is given a side view of a combination car built by the American Car Co., of St. Louis, for Sidney, New South Wales. It

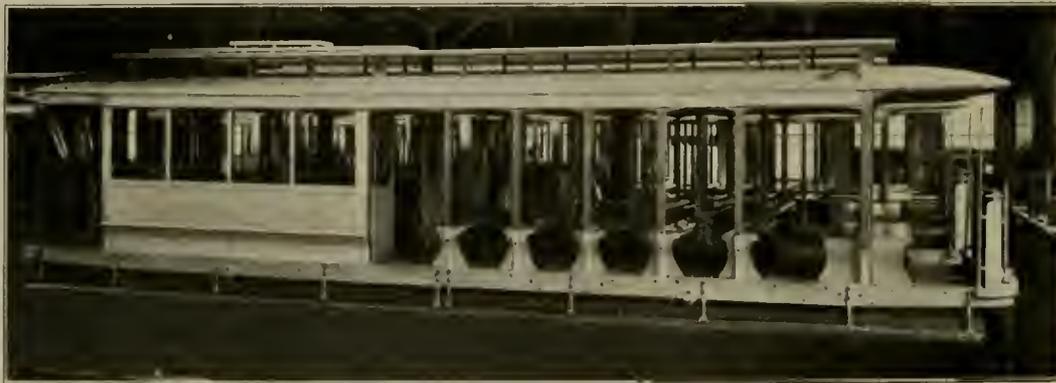


FIG. 5—LARGE COMBINATION CAR FOR NEW SOUTH WALES.

was one of a large order. The body measures 28 ft. 6 in. over the corner posts, while the closed portion is 11 ft. and the open portion a little over 17 ft. in length. The seating capacity is large, there being places for 51 persons, 35 in the open body and 16 in the closed portion. Two of the seats are placed back to back with the bulkhead between them. When the bulkhead windows are closed and the curtains are down only one seat is unprotected. The sills run through from end to end of the car and are plated with steel. The step or running board also extends the whole length of the car, without any break at the closed body. It is in two sections, however, as is usual in such long cars. The posts are carried in metal panels at the seat ends. This greatly increases the strength and stiffness of the post and the durability of the car. From the arrangement of the trolley board it is seen that the cars run in one direction only, with the open section ahead. This leaves the platform in the rear free from obstruction. As the practice is to haul trailers an opening is left in the rear dasher, so as to permit passage from car to car. The practice of running small trains on streets has been discouraged in many cities in the Atlantic states on the ground that it is unsafe. There are, however, many cases when the public would be greatly accommodated by such trains. The safety is a thing which depends upon proper management, rather than the number of cars which run together in a train.

The Wason company built a lot of combination cars for the Worcester & Suburban road, of Worcester, Mass., of the type shown in Fig. 6. It has side sills running straight through from dasher to dasher. The two sections are of about equal length. The platform at the forward end is very short, giving only sufficient room for the motorman and there is no seat outside the bulkhead. The roof is of the steam car pattern, and as the car runs in both directions there are two trolley boards and poles, one at each end. The step of the usual open car pattern is carried along the open part of the car and another step of the same kind placed at the vestibule which is completely enclosed. In many respects the design is a good one, but there are some points which could be changed advantageously as affecting a reduction of cost. Since the car runs in both directions a completely enclosed vestibule at one end is a rather unnecessary expense, the other end being entirely unprotected. A more economical method of building would have left both platforms entirely open. This would have been justifiable because a car of this kind is fit only for summer or autumn service. It could not be profitably operated the year round. A saving could have been effected also by using a common street car hood instead of the more expensive type.

In the construction of a combination car one important detail should always receive attention. As the open body is always carried high and the step or running board is also high, entrance for old persons, children and those below the average height is difficult.

The platform at the end of the closed body can be dropped and in this way the step may be brought within easy reach of the ground.

For safety and to make stops as short as possible this is an important matter. It is also a question whether two steps are not

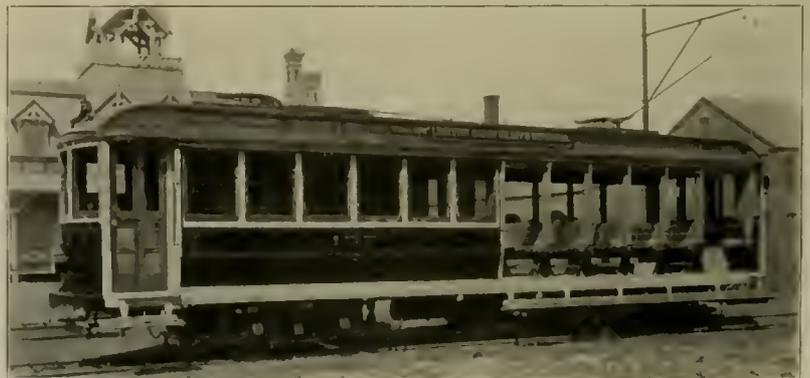


FIG. 6—COMBINATION CAR—WORCESTER & SUBURBAN STREET RY.

safer, better for the passenger and quicker for loading and unloading than a single step 18 or 19 in. above the head of the rail.

The Denver Tramway Co. has some combination cars in operation which are especially interesting to railway men. They are

novel in both construction and design. These combination cars are shown in Figures 7 to 15. They are made up of a closed body trailer car and an open grip car joined so as to form a single car. The utilization of the old cable cars was a commendable piece of

work tied together at the ends by both end and cross sills. They have bolsters over the trucks and are fastened by wood cross ties. At the corners they are stiffened by angle plates. The I-beams have wooden fillers on the outside so as to give them a smooth surface.



FIG. 7.

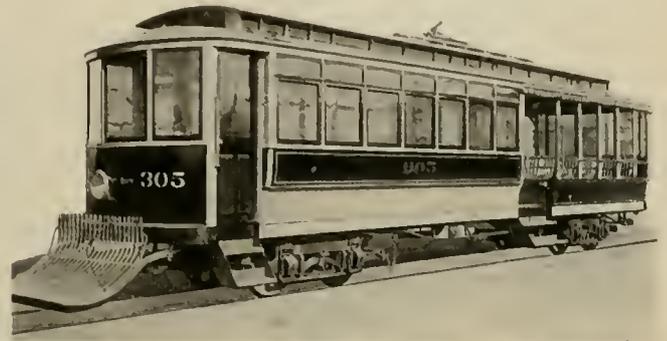


FIG. 10.

economy which gave the road 80 effective motor cars at a comparatively small outlay. There are now many large systems in the East having considerable numbers of good cars, which are now too small for the service, which might be utilized in this way. The

The frame work for mounting the two car bodies extends clear to the end of the platforms so that no platform timbers are needed. This construction, where the sills run through from one buffer timber to the other, makes a most effective car frame and

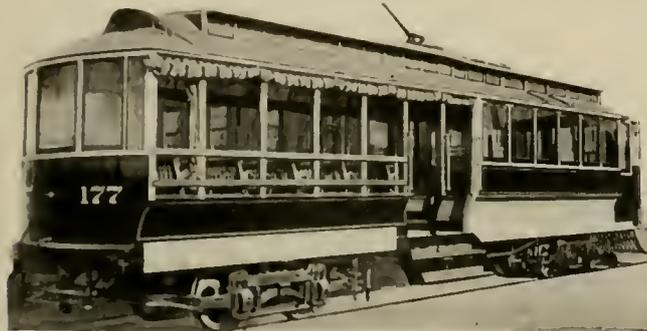


FIG. 8.

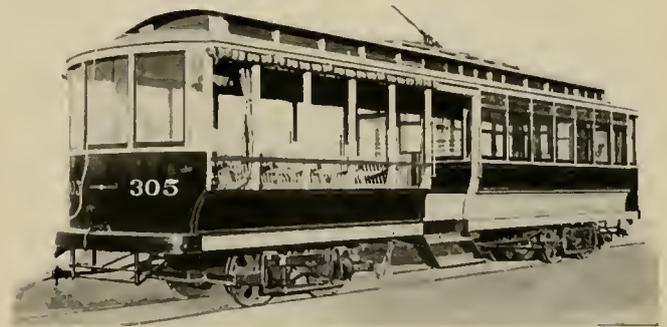


FIG. 11.

writer knows of hundreds of old horse cars now used on motor trucks which are too small for the service. By combining them with the short open cars operated on the same roads, and following the style shown in the figures, fine combination cars would be obtained. The framework of all these old small cars is admira-

ble gives a strength which is not obtainable in any other way. This will be seen by a glance at Fig. 14. The whole body frame is carried high enough to clear the truck wheels, but by using two steps the lower one is brought within 12 in. of the ground. This step has an 11-in. riser, and the one above it 10 in., so that an



FIG. 9.



FIG. 12.



FIG. 13.

ble. They are strong and light and will still wear for years. Probably these Denver cars will show as large a service if not greater than many larger cars which are built at the present day. In splicing, they were mounted upon a frame of 6 in. I-beams

entrance to the car is gained with the least possible effort. These steps are 5 ft. 6 in. long and the gangway between the open seats and the end of the closed body is 4 ft. 10 in. wide. In Fig. 15 the open section car with two entrances only is shown.

In most respects the construction is the same as that of Fig. 14, but by closing the center entrance on one side considerable additional seating capacity is obtained. In both designs the bulkhead is placed at the extreme end of the open section. The plans are similar with the exception of the entrances. The use of a closed

seats are transverse on one side of the open portion. There is then a 28-in. aisle and on the opposite side there is a longitudinal seat extending (in Fig. 15) from the bulkhead to the closed body. In Fig. 14 it is somewhat shorter. One unusual feature of this design is an iron support in the open portion of the car which is

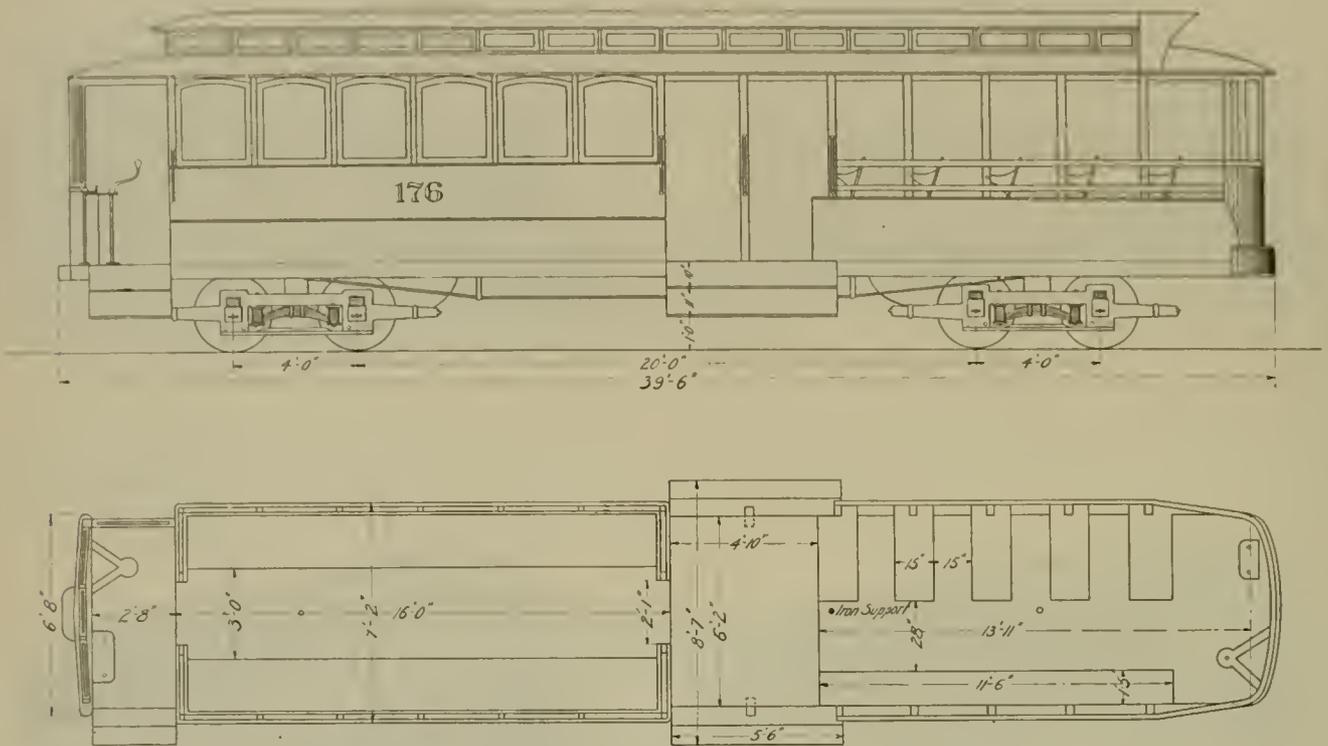


FIG. 14—PLAN AND ELEVATION OF DENVER CAR WITH THREE ENTRANCES.

side to the level of the seats is a feature which adds much strength to the body. The interior arrangement of these cars is a decided novelty. In some of the designs the closed body is furnished with longitudinal seats, as in Figs. 7, 9, 14 and 15. In the new cars,

placed near the seat end and extends from the roof to the floor. This is shown in the plans, also in Fig. 9. These designs, although very peculiar and entirely unlike anything which has been in use in the East are well worth study. They show a long car which has a large amount of standing room and which can be easily loaded and unloaded, yet they are so arranged that the conductor has the entrance platform within easy reach. While these cars measure about 40 ft. over the dashers they are in capacity somewhat more than the equivalent of two cars having 20-ft. bodies, and they occupy considerable less space than two cars measuring 20 ft. over the corner posts.

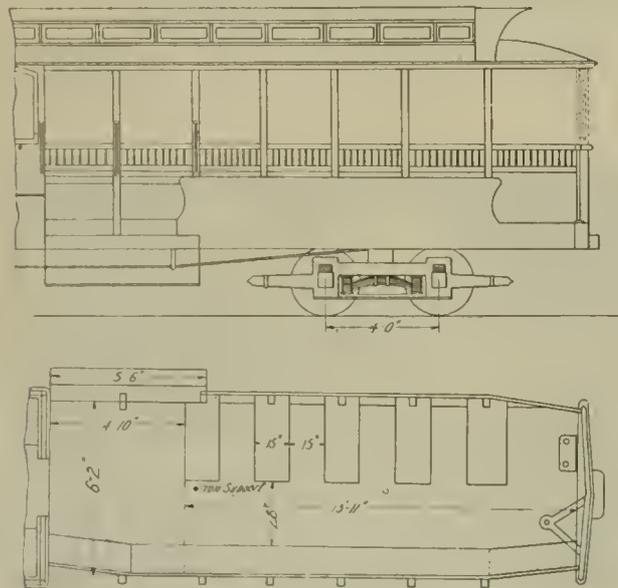


FIG. 15—DENVER CAR WITH TWO ENTRANCES.

The space which the length of the car body takes in a street is not considered of much importance in this country but in many parts of Europe not only is the width of the car restricted but rules and regulations make it necessary to confine the length of the car to that of a double truck with its team of horses. For this reason cars mounted upon pivotal trucks have been barred from many cities. Some years since the Brills built some combination cars for England where it was necessary to make them as short as possible while retaining a large seating capacity. As a matter of fact they had to be equivalent to double deck cars. This was done as is shown in Fig. 16. The platforms were made so short that there was not sufficient room for the motorman. He was therefore placed as it were in the doorway and the door and the partition made an angle inside the car.

The side sills were cut entirely in two and united by a heavy U-shaped iron which dropped below the steps. The entrance was at the center of the car and from both sides. To gain seating capacity a movable seat was placed in the entrance space. It had a reversible back. In Fig. 16 it is shown pushed toward the side from which the picture is taken, the entrance being on the opposite side. Owing to the narrowness of the car all the seats were made longitudinal.

In the last mentioned car there were no curtains to the open portion. In the Denver cars the old fashioned carriage curtains are employed. In the closed portion we understand that drop blinds of wood are used to exclude the sun. Generally in the

however (see Fig. 12), transverse seats finished with spring cane are used. In the open portions of all the cars the transverse seats have spindle backs, and in the later cars (see Fig. 13), the aisle is in the center with seats on each side. In Figs. 14 and 15 and also in Fig. 9, an entirely different arrangement has been adopted. The

East wood blinds are gradually being pushed out of service by the lighter and more convenient spring roller curtain. The latter by reason of the closeness with which it can be made to fit is a much better protection against storm than the carriage curtain as commonly used. The chief advantage, however, is the ease and speed with which it may be drawn down or raised.

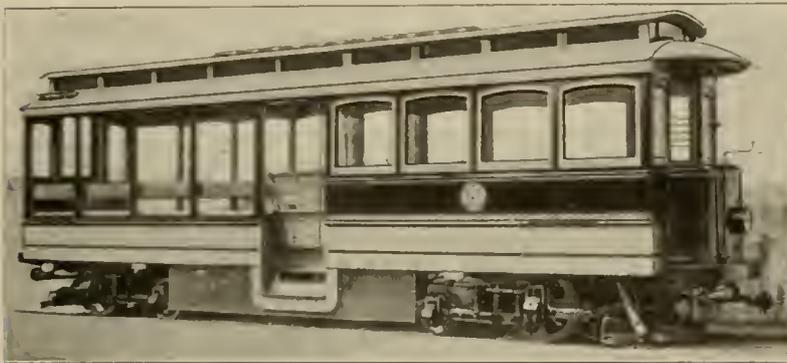


FIG. 16—COMBINATION CAR WITH SHORT PLATFORM.

Perhaps the oddest affair in the way of a combination car which has ever been put in service was one built by the Brill company for the Mount Lowe Ry. It was a motor car with a closed body and platforms without hoods. The body was short and the platforms long. It was mounted on a four-wheel truck. As the entrance was always at stations with elevated platforms steps were not necessary. Even stirrups were omitted since it was not desirable that there should be any entrances or exits except at the ends of the runs. All the seats were longitudinal, both on the platform and in the body. For the sake of gaining space the backs of all the seats were placed outward, and in addition to this there were seats at the entrances. Glancing at Fig. 17, the gates will be seen opened out against the platform side. The top of these gates when closed form the back of a seat. The seat itself fills the entrance opening when in place. Referring again to the engraving, it will be seen on the right hand side how the seat is cut and hinged so as to fall back over itself and leave a passage through which people may enter. The construction gave two large observation platforms with seats on both sides. It made entrance or exit from the car out of the question except at stations. The closed body was short but a very necessary feature. The omission of hoods is a thing not likely to be understood by those who have not made an ascent of a steep grade where there was a distant view. On such a grade the hood standing at an angle with the horizon cuts off a large portion of the view and is entirely a nuisance. On open cars for a mountain railway a roof in like manner spoils the view for a large number of the passengers.

In cars of this class a closed body is extremely necessary, because fogs, snow or rain storms of great severity are to be expected at almost any time and a secure protection from them is absolutely necessary. On account of the great fall of temperature which accompanies fog, rain or snow, curtains usual in open car construction become entirely inefficient. The open car roof, too, as we have seen, is objectionable, so that the short closed body with long and entirely open ends appear to fill the conditions better than any other form of car. The arrangement of the body between two open platforms might seem to put this car into the California class, though it hardly belongs there on account of the absence of the hoods. In fact it is so peculiar that it may well be said to form a class by itself.

It may well be doubted whether for mountain work an 8 wheel car would not be safer. Longer platforms would then be available, while the riding would be much more steady and comfortable for the passengers.

WATER POWER FOR SWISS RAILWAYS:

The fact that Switzerland is dependent on foreign countries for all the coal which is consumed there, as none whatever is produced in that country, has drawn attention to the great amount of unemployed water power and has given rise to many propositions tending to promote the country's independence in traffic and industry. A few months ago an interesting study was published by L. Thormann, a Zurich engineer, on the possibilities of substituting electricity for steam on the Swiss railways. While this idea is not new it has never before received such expert investigation. Mr. Thormann shows that it is quite possible to utilize sufficient water power to operate all the Swiss railways, but he also shows that it is a mistake to believe that the expense of the traffic would be decreased by this means to any considerable extent. United States Consul, H. H. Morgan, has forwarded some of the data presented by Mr. Thormann, showing the amount of water power easily available and giving some figures as to the cost of the electrical construction and equipment of the railroads of the country.

The five principal Swiss railroad lines require about 30,000 h. p. for their operation. To guarantee this 60,000 h. p. at high tension, alternating current stations would be required to which the necessary reserve would have to be added. The question whether the available water power of the country would be capable of supplying this amount is answered in the affirmative. Mr. Thormann, without taking into consideration the greatest water falls, gives a list of 21 plants which are either in the course of construction or design. The total output of these plants amounts to 86,000 h. p., and as this would be more than sufficient for the use of the railroads a surplus would be available for industrial purposes.

The cost of establishing this system would be very great; it is roughly estimated at \$31,073,000 divided as follows: Rolling stock, \$7,720,000; transmission cables, etc., \$13,510,000; and converter sub-stations, \$9,843,000. The author points out that although the direct saving would not be important the country will profit greatly by the change, as the commercial balance of Switzerland would become more favorable and the vast amount expended for coal would remain in the country. The general utilization of water power throughout the country would also mean favorable encouragement for other industries. The project is considered entirely practicable and has been brought into prominence by the fact that the electrical works at Oerlikon have made an application to the Federal government for a concession to establish a road of 12 1/2



FIG. 17—A COMBINATION CAR FOR MOUNTAIN SERVICE.

miles of standard gage electric railway for experimental purposes. There is no doubt but that this concession will be granted.

It is estimated that by the year's end all the important cities in Northern Illinois will be connected by electric lines, representing in new construction an expenditure of \$3,000,000.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.

The third annual convention of the American Railway Engineering and Maintenance of Way association was held in Chicago March 18th to 20th, and which a number of reports of the standing committees of the association were read. While many of the committee reports referred to subjects exclusively of interest to steam roads there were a number of papers which included suggestions of value to electric railways and we present herewith, abstracts of several of these reports which embody information relating to the maintenance of way of any railway irrespective of its motive power.

REPORT OF COMMITTEE ON BALLASTING.

A material suitable for performing the functions of ballast must be in smooth angular pieces hard enough to resist the load and tamping without material injury; must be free from decay and unaffected by water; it must permit of easy handling and provide good drainage. The materials which have been found to fulfill these conditions more or less perfectly are broken stone, gravel, coarse sand, burnt clay, partially disintegrated rock, slag, cinders and various products such as chatts, Joplin gravel, etc. The report then considers the qualities of the different materials best suited for ballast and describes the method of preparing the sub-grade and applying the ballast. The necessary depth of ballast below the tie is determined by several conditions. The condition usually ruling is that the load should be distributed by means of ballast so that the weight on the ties distributed to any part of the sub-grade would not be above its sustaining power.

Materials which will stand at approximately a one to one slope like crushed stone will distribute the load with reasonable uniformity at a depth not less than the distance between the bearing surfaces of the ties. With other material which will stand at a lesser angle a greater depth would be required. The report recommends that 8 in. under the ties be the minimum total depth for any class of ballast. The following recommendations as to ballast cross sections are presented:

Rock Ballast—Depth below tie 8 in. to 12 in.; top surface of ballast, top of tie. Slope of ballast, from top of tie at the ends to sub-grade at the rate of $1\frac{1}{4}$ or $1\frac{1}{2}$ to 1.

Gravel—With gravel containing an appreciable amount of clay and not too easily drained under all conditions—Depth of tie from 8 in. to 12 in.; top of ballast between rails, top of tie; top of ballast at end of tie, bottom of tie; slope to sub-grade two to one. The report considers that there is no cross section which can be used for all classes of gravel ballast to advantage. When it drains very poorly it will be necessary to leave the end of the tie open to avoid churning, as it becomes more and more pervious it may be brought up on the ends of these until, in light sand ballast having usually worn particles and draining very freely, it will be necessary to bring it above the top of the tie and even carry the top of the ballast some distance beyond the end of the tie before starting the slope. Among some ballasts of this nature better results are obtained by raising the top of the ballast between the rails above the top of the tie. For crushed and washed gravel the cross section for stone may frequently be used.

Chatts, disintegrated stone and coarse sand, which should thoroughly drain—Depth of ballast below tie 8 in. to 12 in.; top of ballast from 1 in. to 2 in. above top of tie; top of slope 6 in. beyond end of tie and even with the end thereof; slope $1\frac{3}{4}$ to 1 to sub-grade. It is believed with this class of ballast, particularly the lighter varieties that the tie should be buried in the ballast or it will blow out, and only under these conditions, where it becomes self tamping, can the line and surface be satisfactorily maintained. Tracks in this kind of ballast are frequently knocked out of line unless the tie is buried and the slope begins some distance beyond the end of the tie.

There are some deposits of partially disintegrated limestone, flint and granite which can be given a cross section closely approximating that of crushed stone. The conditions which determine the proper figure of the cross section depend more than anything else on the draining qualities of the material used, and also as to whether the pieces are angular or jagged or more or less light and smooth. Angular pieces will soon embed them-

selves into the surface of the tie and will hold it firmly so that it is only necessary to carry the natural slope of the side of this ballast a short distance beyond the end of the tie. The questions of quarrying, washing, loading and distributing ballast and the manner and time of putting it in the track were not touched upon in the report.

REPORT OF COMMITTEE ON TRACK.

In the report of the committee on track five subjects were considered which were—maintenance of line, maintenance of surface, maintenance of gage inspection of track and track tools. Under the first head the committee recommends that tangents should be adjusted by throwing the tangents between summits; between curves; or by throwing curves to meet tangents; or by partially throwing curves and partially throwing tangents as may produce the least work. Centers should be set with transit to insure accurate line. For the adjustment of curves the report recommends easement curves should be as follows: For roads not exceeding speed of 30 miles per hour, on all curves exceeding 2 degrees. For roads not exceeding a speed of 60 miles per hour, on all curves exceeding 1 degree. For roads where higher speed is attained on all curves exceeding 30 minutes. Easement curves should be used between curves of different degrees in the same way that they are used between curves and tangents.

For ordinary practice a chord length equivalent to 100 ft. for each degree of variation in curvature is recommended. Where the distance between curves will not allow this or for other reasons, a chord length of 25 ft. to 30 ft. may be used. For very high speed roads a chord length equivalent to 150 ft. or more per degree of variation is recommended. To secure and maintain perfect line it is recommended that permanent witnesses should be placed at points of tangent, points of spiral, points of change of curvature, summits and other points, so as to enable the alignment to be identically reproduced with the transit. Under maintenance of service the elevation of curves is considered with reference to the amount and beginning and end of elevation as modified by the location of curve and condition of traffic. The inner rail should be maintained at grade and the following formula is advised for determining the elevation of the outer rail:

$$E = G V^2 \div 32.16 R$$

in which E = elevation in feet, G = standard gage, V = velocity in feet per second and R = radius of curve in feet.

This formula is recommended for ordinary practice, but must be modified to suit special conditions. Since the elevation required is a function of, and depends upon the train speed, this speed is the first element to be determined. As a matter of safety the preference should be given the fast passenger traffic, the slower freight traffic, however, must also be considered and it often happens that on freight lines the correct elevation for passenger service would be so excessive for freight service that the train resistance would increase enough to greatly reduce the tonnage hauled.

Vertical curves are recommended to be used wherever changes occur in the rate of grade. The proper method of tamping the various kinds of ballast is also considered in regard to the maintenance of surface. In maintenance of gage the methods of spiking are important. The gage should be a wooden bar with circular metal arcs fastened rigidly to it for gaging surfaces. This should be used whenever a spike is driven. Outside spikes should be started straight with the base of spike in contact with base of rail. The spike should never have to be straightened while being driven. Outside spikes of both rails should be on the same side of the tie and the inside spike on the opposite side of the tie. The inside and outside spikes should be separated as far as the face of the tie will permit. The ordinary practice is to drive the spike $2\frac{1}{2}$ in. from the outer edge of the tie. The widening of gage as an allowance for curvature is a matter of importance which the committee desired to investigate further before submitting recommendations.

Except in cases of roads with very light traffic, all the main track should be inspected each day by the section gang or track walker. The track walker should be sent out over territory not covered by the section gang in a day's work and also in case of heavy storms, washouts, etc. The track walker should be provided with spike maul, spikes, wrench and train signals. He should in-

spect the track, roadway, fences, bridges and culverts, and in case of trouble should put out torpedoes or other danger signals and notify the officers from the nearest possible point. In regard to switches, frogs, crossings, derailing points, interlocking plants, etc., a section foreman or track walker should make a close daily inspection of them on the main line, and in case temporary repairs cannot be made the employe discovering the defect should be held responsible for the protection of trains until the defects can be remedied. The report concludes with a complete description of all the tools necessary for use in the maintenance and repair of track.

REPORT OF COMMITTEE ON IRON AND STEEL STRUCTURES.

This report chiefly covered the general practice of placing railroad bridge work under contract. The two features to be considered are as follows: First, the degree of completeness of plans and specifications that the railroads should furnish for the purpose of informing the bidder what is wanted, and second, the best manner for the railroad to select the proper builder to construct its work. As to the degree of completeness of plans and specifications furnished by railroads there are three general plans open. First, the plan of giving sufficient data to allow the bidder to figure the weight correctly, and if awarded the contract to at once place the mill orders for material. Second, giving general outline drawings showing composition of members but no details of joints and connections. Third, a full specification with survey plan only, leaving the bidder to submit a design of his own. A large majority of engineers and bridge companies favor the making of detailed plans, and it would seem a plain business axiom that the buyer of a bridge should know what he wants before asking for bids, and in order to enable bidders to make close prices he should furnish such drawings and descriptions as will leave no question as to what is required either in the structure, in materials or the method of doing the work. If plans are complete enough for listing the mill orders, which must be considered the minimum requirement covered by this method, they would show the bidder nearly what the character of the shop work will be and enable him to compute the weight with precision. If a large quantity of work is wanted when it seems probable that prices will advance it may be advisable to get it under contract at once before drawings can be made. In this case a description of the work wanted with approximate weights may be sent to bidders and price obtained per pound, the detail plans to be made later. Most of the railroads responding to inquiries on this subject favor letting bridge work by the pound. It relieves the estimator from much responsibility when figuring up the weight of the bridge for the purpose of making a bid and it allows changes to be made in the design without hardship to any one. It is the only proper basis for bids when a specification only is furnished. Asking bidders to submit plans with their tenders leads to practical difficulties of several kinds. If five bridge companies are invited to bid a lump sum on a piece of work and are required to submit strain sheets, etc., with their bids, the same work is done five times and four-fifths of this work is wasted. Every bridge company includes the cost of this work in its estimate of costs, charging a higher price for lump sum jobs with which strain sheets and designs have to be submitted with a bid than for jobs on which the pound price only is required. Only those concerns which would be acceptable as contractors should be asked to bid on bridge work. The report concludes with specifications for rolled steel and the method of testing specimens, etc.

REPORT OF COMMITTEE ON SIGNS, FENCES, CROSSINGS, ETC.

The report of this committee is limited to the consideration of the subject of highway crossings, especially surface crossings and crossing gates. The most common methods employed for the protection of grade crossings are gates operated by watchmen, alarm bells operated mechanically and watchmen or flagmen. Of these methods gates are the most effective, flagmen without gates next, and automatic alarm bells the least so. The best service is considered to be obtained from the use of pneumatically operated crossing gates. These give but little trouble from various climatic conditions, are simple, cheaply maintained, and several sets can be operated by one man from a tower if so located as to get the proper view. The cost of one set of gates is given at \$475, or with a

tower, \$575. The cost of operating per year figured on 10 hours per day is \$480 and the cost of repairs per year about \$60. Where electric railway lines cross the steam road tracks at grade derails can be placed in the electric line tracks and be operated pneumatically with the gates, adding materially to the safety of the crossing.

Of the method of protection by flagmen little can be said that is not well known. The degree of safety secured depends upon the reliability of the man employed. The cost of protecting the crossings in this manner is estimated at \$500, including flags, lanterns and other supplies for the flagman.

Of alarm bells, those operated by electricity and actuated by the track circuit are recommended. The gong should not be less than 12 in. in diameter and the track circuit distance such as to allow the bell to ring at least 45 seconds before the train reaches the crossing. For a train speed of 60 miles per hour this would require 4,000 ft. of track circuit, which is a greater distance than can be considered advisable with any of the bells now on the market. A light showing red each way on the crossing while the bell is ringing is a useful adjunct. The average cost of an electric alarm bell installed is \$275 and the cost of maintenance about \$25 a year.

The proper construction and care of crossings is also included in this report. This consideration will necessarily vary with conditions but it is divided into four general classes: first, where paving is required to conform to street specifications; second, crossings of streets where no paving is required; third, crossings of public roads or highways outside of towns and cities; fourth, crossings of private or farm roads. For class one the cross ties should be treated chemically, to prolong their life to the greatest possible limit, and laid on a bed of stone or slag ballast not less than 12 in. in depth, or in an 8 in. bed of Portland cement concrete. Porous tile drains not less than 6 in. in diameter should be placed at intervals leading to the nearest point from which efficient drainage can be secured. On long stretches of track laid in streets paved with stone blocks, the use of a special rail section not less than 9 in. in depth is advisable, thus avoiding the use of chairs. Street crossings where no paving is required may have planking laid on the entire surface of the crossing or plank may be laid only next the rail and the space between filled with suitable material. The width of highway crossings should not be less than 18 ft. Crossings of farm or private roads should be built by filling in with suitable material to the level of the rail head, leaving the proper flangeway inside the rails.

REPORT OF COMMITTEE ON MASONRY.

This report deals largely with the classification of the different kinds of masonry with a view to leading to uniformity of practice in so far as it is desirable. Standard specifications and other data in regard to their practice were received by the committee from about 70 railroads in the United States, Canada and Mexico. A review of the best of these specifications showed considerable agreement in numerous main points and it therefore seemed advisable to the committee to secure substantial agreement on some classifications that could be made to apply to general practice throughout the country. Before giving a suggestion for description of the several classes of stone masonry a general definition was submitted as follows:

"Masonry in its widest sense includes all constructions of stone or of kindred substitute materials in which the separate features are either carefully placed together with or without cementing material to join them, or, if the pieces are not separately placed with care, are encased in a matrix of firmly cementing material."

The three divisions into which masonry is divided are stone masonry, brick masonry and concrete masonry.

Stone Masonry—All stone used in masonry shall be sound, durable, not liable to be affected by the weather, from sources approved by the engineer, and shall be laid on their natural beds. Mortar shall consist of one part of approved portland cement to four parts of good sharp sand, or one part of approved natural cement to two parts good sharp sand, all to be carefully moistened and mixed and to be used within one hour after mixing. Mortar for pointing shall consist of one part portland cement to one or two parts of sand.

The following specifications give briefly the main points recommended in the committee's report for various classes of stone masonry:

First Class Masonry—First class masonry will be laid in port-

land cement mortar in regular courses, each stone being carefully cleaned and dampened if desirable before setting. The beds throughout and the edges for 12 in. back from the face shall be dressed to lay to half-inch joints. No course shall be less than 12 in. nor more than 30 in. in thickness. Headers must not be less than 4 ft. long except where the wall is not over 5 ft. thick, when they shall extend entirely through the wall. Headers shall extend at least 20 in. beyond the width of the adjacent stretchers. The backing shall consist of large, well shaped stone laid in full mortar beds and breaking joints so as to bond the work together.

Second Class Masonry—Second class masonry shall be laid in cement mortar. The face stones shall be rock faced, edges pitched to a straight line, shall have parallel beds and rectangular joints. The beds and joints for 8 in. back from the face shall be dressed to lay not over $\frac{3}{4}$ in. joints. The stones need not be laid in any regular course, but shall be laid level on their natural beds, shall be well bonded, having at least one header $3\frac{1}{2}$ ft. long to every three stretchers. The backing shall consist of well shaped stone not less than 6 in. thick and of which at least half shall measure 3 cu. ft. To be all in full mortar beds with joints well broken, well bonded together and with the face stone. All spaces to be thoroughly filled with smooth stone and cement mortar.

Third Class Masonry—Third class masonry shall be laid dry or in mortar according to the direction of the engineer. It shall consist of good quarry stone laid upon natural beds and roughly squared on joints, beds and faces, the stone breaking joints at least 6 in. The wall shall be bound together by headers occupying 1-5 of the area of the face of the wall front and rear and extending 3 ft. or less in thickness.

Concrete Masonry—Cement concrete may be described as formed of broken stone or brick, gravel and kindred materials, cement and sand. The combination of the best materials in the best preparations thoroughly prepared and erected will result in a structure which may be considered nearly, if not quite the equal of the best stone masonry in respect to its stability and durability. In proportion as any of the parts are of inferior quality or the workmanship and care deteriorate the resultant will be of inferior quality as to appearance, strength or durability.

The report then gives an outline specification for cement concrete, giving the quality of cement to be used, the preparation of the different materials, the directions for mixing, etc., which practically coincides with the standard specifications generally used. The report contains an appendix on Railroad Concrete Masonry, by W. A. Rogers, which covers the whole subject very thoroughly and includes reports on a number of tests.

REPORT OF COMMITTEE ON RAILS.

The report of this committee was made in regard to the subject of rail sections and processes of manufacture. In its report for the previous year reference was made to some difficulties which were encountered at the mills due to finishing rails at low temperatures and it was then suggested that it might be necessary to modify the heavier sections in common use, especially the A. S. C. E. sections, which have come into wide use. In the opinion of the committee some changes would have to be made sooner or later either in sections or in the mill practice of rolling. It is known that there is no use in trying to make a good rail by means of the chemical composition alone. Evidence clearly points to the fact that much better rails can be made from the steel now in use provided it receives the proper treatment in rolling.

The committee strongly advocates the use of uniform specifications and uniform methods of testing. Details of process of manufacture have generally been neglected except in the one aim of the mill to turn out the largest tonnage in the shortest time at a minimum cost. No fault can be found with this, as it has enabled the railroad companies to buy rails at a lower price, even if they do not wear as well as desired. But if the demand is to be made for better rails some attention must in future be paid to the details of manufacture. The quality of rolled steel depends upon its composition and the heat treatment it receives in connection with the work of rolling. And in order to get the best results, steel of good uniform chemical composition should be used and rolled at a uniform low temperature. The work at higher temperatures merely changes the form of the iron without changing its structure. The bad effects of the high finishing tem-

perature are fully recognized by the rail manufacturers, some of whom are now rolling their heavier rails at a much lower temperature than formerly. There is no use advocating any change of section or method of rolling unless some reliable assurance may be had that the rails are being rolled at the proper low temperature. It has been suggested that the amount of shrinkage in the rail after it has been cut at the hot saw is the best and easiest method of checking the finishing temperature.

The specifying of a drop test seems to be almost universally regarded as essential and yet, unless the portion of the ingot from which the test piece comes is known, the drop test may be quite misleading. The test piece should be taken from some designated location, preferably from what was the top of the ingot for then it is reasonably sure that all the rails represented by that test piece are at least equal to, and probably better than the test piece. It is also recommended that the following simple test be made by those interested in the wear of rails of different compositions and manufacture: Take a curve where rails are found to wear rapidly and lay the different kinds of rails alternately. The rails are then acting under precisely uniform conditions and it will take but a few months to determine what rail is giving the best results. If this experiment were made anew each year for a few years the road making such a test would have valuable information which would help to decide on the kind of rail which will give the best results in actual service.

A proposed standard for specifications for steel rails was submitted by the committee which related the process of manufacture, chemical properties, heat treatments, and other principles in regard to the manufacture of rails.

REPORT OF COMMITTEE ON TIES.

The report of this committee was devoted to two subjects, namely, timber supply and culture and timber preservation. The vastness of the supply of timber has not been so much in evidence of late as an apparent shortage which has resulted in changes in the selection of tie material and the sources from which it is drawn. Of a large number of roads reporting on the kind of ties used and their source of supply, 18 roads representing a mileage of 17,500, secured all their ties from along their own lines and have a supply in sight for the next ten years. On half of these roads pine ties were the standard.

On a number of other roads it is reported that the supply of ties along their own lines is equal to from 10 to 50 per cent of their requirements and the supply in sight will last for from 2 or 3 to 10 years. Regarding supplies of inferior kinds of wood 13 roads reported none available, while all the rest reported supplies sufficient for from 3 to 30 years. Some of the lines are now using treated pine ties and in consequence of the treatment they do not rate as inferior ties such as are usually so considered.

In regard to the preserving methods, experience is perhaps still too recent in this country to provide accurate data as to their value. A record of treated pine ties which has been filed by one railroad company shows their life to have been from $10\frac{1}{2}$ to somewhat over 11 years. Treated Colorado pine ties have a maximum record of about 15 years. On the roads where preserving methods for ties are employed the best process, so far as the life of the tie is concerned, is creosoting, but it is necessary to use a heavy oil which is rich in antiseptic substances such as carbolic acid, naphthalene, etc. The information supplied by the different railroad managements says that the best process on the market is creosoting. The average life of creosoted ties is about as follows: Creosoted pine on main lines 15 years, on sidings 5 years, total 20 years. Creosoted oak on main lines 18 years, on sidings 7 years, total 25 years. Creosoted beech on main lines 20 years, on sidings 10 years, total 30 years.

Under the auspices of the United States Department of Agriculture an experiment was inaugurated in 1901 to test the relative merits of the different methods of treating ties of various kinds of timber. A total of 5,850 ties consisting of oak of various kinds, hemlock, beech and tamarack have been treated in different lots by the zinc-tannin, the zinc chloride, the Allardice and the Hasselmann processes, also with Beaumont petroleum and zinc chloride, with carbolic acid and spiritine.

A very noxious place has been selected for testing these ties in Texas where unprepared pine ties generally decay in 12 to 14

months. The results are to be watched and reported upon year by year by the commissioners of the Bureau of Forestry.

Most of the roads applied to for data are yet unable to furnish statistics relative to the life of treated ties, but records are now being kept on a uniform basis and it is hoped before many years to have some reliable data on this point.

The report concludes with a number of tables of statistics of a few roads which have experimented in this direction.

SPECIAL READING FOR STREET RAILWAY MEN.

In the Saturday Evening Post for Mar. 15, 1902, was an interesting article on "Chances for Street Railway Men" from the pen of Gen. William A. Bancroft, president of the Boston Elevated Railway Co., in which he discussed the opportunities offered to young men who are willing to begin at the bottom in street railway service. In concluding General Bancroft makes the following statement as to the special reading and study that should be undertaken:

"To such a young man, rightfully ambitious for the future, some preliminary special reading and study will not come amiss. The almost universal use of electricity as the motive power of the modern street railway clearly calls for a more scientific training, on the part of all who would rise in the service, than was formerly required; and the man on the platform who knows something of natural science, other things being equal, is the one most likely to be in demand when the question of promotion to a higher position comes up. A good book on the general problems of electricity will be the natural beginning of a course of reading; though unfortunately not many such, adapted to the comprehension of young men with no previous technical education, have been published. Electricity Made Easy, by Edwin J. Houston and A. E. Kennelly, may be recommended, however, as being on the whole satisfactory. The same authors have written a series of 'leaflets'—as they are entitled, in spite of their containing some 300 pages each—on Electrical Engineering, which in the opinion of many electrical students are among the best books of the kind on the market. They come in three grades—elementary, intermediate and advanced—only the first of which, of course, can be recommended to the novice. The object throughout is to present the fundamental principles of electrical science; and the first volume is especially intended to give just such instruction as the motorman, or the electrical workman generally, with slight scientific knowledge of electricity, needs for a more intelligent performance of his daily routine work. Two other books that may be suggested have to do specifically with electric railway service—Electric Railway Motors: Their Construction, Operation and Maintenance, by N. W. Perry; and Electric Railway Motors, by George T. Hanchett. Both are sound, and not too difficult.

"There are two periodicals covering the street railway field, one or both of which might well be read by every one in the business, from conductor to president—the Street Railway Journal and the 'Street Railway Review.' No scientific or technical periodical, of course, should be regarded from the same point of view as a book, where the intention is to be definite and final in statement and conclusion; a magazine of this sort is to a considerable extent a record of current theory, opinion and experiment, leaving to the reader much of the burden of responsibility for sifting the wheat from the chaff of contemporary practice. With this caution—which applies to every publication of the kind aiming to present impartially the news of its special field—both journals may be unhesitatingly recommended, giving as they do, from issue to issue, a full account of the latest developments in every branch and department of the street railway business all over this country and abroad. Among electrical magazines the Electrical World and the American Electrician are excellent, but rather hard reading for beginners; however, if they are conveniently accessible to a young man they might often prove suggestive. During the last few years a number of 'correspondence schools,' so called, have been started in various parts of the country, some of the courses in which, I am informed, are admirably adapted to the needs of a young man who intends to enter or has already entered the street railway business. Though it is true that all companies undertake to give their men such in-

struction as may be necessary for the performance of their duties, it is equally true that one who, by additional study and reading, has gained a fuller knowledge of the theory and nature of electricity as well as of its practical application, stands in a more favorable position than one who has not."

THE COLOR LINE IN VIRGINIA.

On May 1, 1902, there went into effect a very radical law enacted by the General Assembly of Virginia authorizing the Washington, Alexandria & Mount Vernon Railway Co., and certain other street railway companies in the State to separate the white from the colored passengers and to set apart or designate a portion of each street car, or certain seats, which are to be occupied by white passengers and also a certain portion or seats for colored passengers.

It is provided that the companies shall make no difference or discrimination in the quality and convenience of the accommodations provided for the two races, but that the conductor, manager or other person in charge of any car shall have the right at any time, when in his judgment it may be necessary or proper for the comfort and convenience of the passengers so to do, to change the said designation so as to increase or decrease the amount of space or seats set apart for either race or he may require any passenger to change his or her seat when and as often as he may deem necessary.

It is further provided that all persons who shall fail to take and occupy the seats so assigned to them, or fail to obey the instructions and directions of the conductor or manager of the car as to the seat or space to be occupied by such passenger shall be deemed guilty of a misdemeanor and upon conviction shall be fined not less than \$5.00 nor more than \$25.00. And any person refusing to obey the conductor's instructions may be ejected from the car and in case the passenger has paid his fare he shall not be entitled to a return of any part of said fare. It is further specifically stipulated that the companies nor any of their employes shall in any case be liable for damage to any one for such ejection.

By the provisions of the act all conductors and motormen are made special policemen and have all the powers of conservators of the peace while upon the cars in the enforcement of the provisions of the act, and in the discharge of the duties of special policemen in the enforcement of order upon the cars and right of way of the company.

It is provided that the act shall not apply to employes engaged in running or operating the cars, nor to persons employed as nurses nor to officers in charge of prisoners.

WAGES INCREASED AT OAKLAND, CAL.

April 26th the following general order to motormen and conductors was issued by the Oakland Transit Co., W. F. Kelly, general manager:

"One year ago, on the first of May, we considered that the conditions warranted an increase of wages, and accordingly the present rate was announced. Since that date we have been pleased to note that you have been careful and diligent in the discharge of your duties undisturbed by the clamor of agitators or the strife of others. Another May 1st is now near, and in appreciation of the loyal, faithful men who have operated our cars skillfully and conscientiously we take pleasure in advising you that on and after May 1st, all motormen and conductors will be paid at the rate of 24 cents per hour. Trusting and believing that each and all of you will take a personal interest in the faithful discharge of his duties to the end that it may be a pleasant and prosperous year for us all, and with cordial good wishes for your personal success in your respective duties, we remain, etc."

Mr. Thomas Lowry has made a tour of inspection of the street railways in Duluth and West Superior with a view to deciding what improvements shall be made this year. It is announced that new and permanent tracks will be put down on the streets where new paving is laid, and a part of the system will be practically rebuilt. An extension to West Duluth is also contemplated.

DRAINAGE WATER WRECKS MASONRY BRIDGE.

The heavy waterfall of early March caused the partial destruction of a comparatively new brick and stone masonry bridge which carries Warburton Ave. and the tracks of the Yonkers Street R. R. over Rowley Brook just north of Yonkers, N. Y. Although it should not be necessary to wreck a bridge in order to determine whether or not it is properly built and maintained, disasters of this kind when they do occur usually have lessons to teach.

In the case of the Yonkers bridge it does not appear that charges of carelessness or incompetence can be brought against anyone.



YONKERS BRIDGE AFTER THE WASHOUT.

As far as can be determined the washout was caused not by the volume of water passing under the bridge but by the drainage water passing through the gutters in Warburton Avenue.

The bridge has about 50 ft. span and consists of a 36 in. brick arch on concrete foundations with stone retaining walls and facing—a type quite generally followed for country and town bridges in this part of the country. The structure was finished in May, 1899, and cost originally \$24,000. It was built by the county, but is understood to be under the charge of the town of Greenburgh, which is responsible for its proper maintenance. The sides of the gulch are extremely sandy and somewhat treacherous. The design provided for carrying the street drainage water in gutters to the center of the bridge where it passed through culverts to the brook below.

The first signs of the failure appeared at the base of an electric light pole that had been recently placed in the sandy soil about



VIEW OF WASHOUT FROM ROADWAY.

4 ft. south of the southeast abutment of the bridge. During the heavy rains the drainage water settled around the pole and soon developed a large hole at the base. This rapidly enlarged until the pole fell, starting at the same time the entire southeast corner of the bridge, and material amounting to about 10 per cent of the masonry structure slid down the banks into the stream. The remaining parts stood intact with the exception of a broad crack that developed longitudinally through the center of the brick arch.

The car tracks on the surface undoubtedly served as a tie for the span and aided in preventing the total collapse of the structure.

The commissioner of public works of Yonkers, who was also one of the engineers in the construction of the bridge, made the following statement concerning the matter: After investigation we find that for some time a great volume of water from Warburton Avenue has not been passing along the gutter to the culverts provided on the bridge, because of the fact that the gutter was obstructed by snow or ice or dirt. The water was directed out of the gutter across the sidewalks and down along the masonry at the southeast corner of the bridge to the brook below. Following the thaw of Thursday and Friday, February 27th and 28th, a hole about 3 ft. square developed in the gutter opposite the recently erected electric light pole at the outside edge of the sidewalk a few feet south of the bridge abutment. There is no doubt but that the great volume of surface water from rain and melted snow which swept down the hill side into the gutter burrowed an underground water course starting at the break in the gutter and undermined the corner of the bridge."

The Yonkers Railroad Co. had nothing whatever to do with the construction of the bridge or its maintenance.

INDIAN TERRITORY COAL FIELDS.

In the "Review" for March mention was made of the organization of the Indian Territory Traction Co., of South McAlester, I. T., to build a road passing along the route of a number of coal mines. This coal field is discussed by Mr. Joseph A. Taft in the 22nd Annual Report of the United States Geological Survey, now in the press. The Indian Territory coal field is directly connected with the Kansas coal field on the north and the Arkansas on the east. The northern and extreme western parts are undeveloped and little known. The area of this coal field approximates 20,000 square miles. There are several beds of coal in the Indian Territory field thick enough to be commercially workable, besides others which may be of equally workable thickness. The McAlester coals appear in three districts in the southern part of this field. This coal is mined most extensively at Carbon, Dow, Anderson, Krebs, and McAlester, and varies in these mines from 3 to 4 ft. in thickness. The above towns are all upon the route of the new line which is to be built by the Indian Territory Traction Co., and a considerable revenue will result in carrying miners to and from the mines. The coal is successfully coked and ranks as a high grade bituminous coal.

Commercial coal mining in Indian Territory began near McAlester with the erection of the Missouri, Kansas & Texas Railroad in 1872. In 1900 Indian Territory produced 1,922,298 tons of coal the shipment of which is made entirely by rail, and the development of the mines had depended directly upon railroad building. Four railroads reach the Indian Territory field, the Missouri, Kansas & Texas, the St. Louis & San Francisco, the Memphis & Choctaw and the Kansas City Southern.

FURTHER EXTENSION OF WESTINGHOUSE WORKS.

The Westinghouse Electric & Manufacturing Co. will begin immediately the construction of new buildings at East Pittsburg, which will greatly increase the size of the works. The new buildings will be known as the East Extension, and the plans for them were made two years ago, when it was seen that the natural development of this company's business would, about this time, make the additions necessary. The plans also require the building of a river wall along the banks of the Turtle Creek from a point near Turtle Creek Station to Brinton Station, below the works of the Westinghouse Machine Co. Arrangements have also been made with the Pennsylvania Railroad whereby a special railroad line will be built from East Pittsburg to the new Westinghouse foundries which are now being established at the town of Stewart, several miles to the east. This railroad will be built for the exclusive use of the Westinghouse companies. The construction of this large undertaking has been entrusted to James Stewart & Co., of Pittsburg, St. Louis and New Orleans, whose remarkable achievements in erecting, in record time, the new Westinghouse Electric Works at Manchester, England, have for several months been the theme of general attention in the English and American press.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

DUTY TO KEEP PLATFORMS AND STEPS OF CARS IN SAFE CONDITION IN ALL WEATHER.

Herbert v. St. Paul City Railway Co. (Minn.), 88 N. W. Rep. 996. Jan. 31, 1902

A street car company, the supreme court of Minnesota holds, is required to exercise the highest degree of care to keep its platforms and steps in safe condition for use in the season when operated, so far as it practically can do so, in consideration of the climate, temperature, and condition of the air with respect to snow, moisture, and frost. And it affirms in this case a judgment for \$1,000 damages for injuries sustained by a passenger who, when alighting from a street car, slipped and fell from the same by reason of ice and snow alleged to have been negligently permitted by the carrier to be and remain upon its steps and platforms.

DUTY WHEN CAR APPROACHES WHERE ONE ON OPPOSITE TRACK IS STOPPED—UNREASONABLE SPEED EVIDENCE OF NEGLIGENCE—FAILURE TO LOOK FOR APPROACHING CARS.

Bass' Administrator v. Norfolk Railway & Light Co. (Va.), 40 S. E. Rep. 100. Dec. 5, 1901.

A passenger on alighting from a car went around it onto the other track, where he was struck by a car coming from the opposite direction. The supreme court of appeals of Virginia holds that it was the duty of the company not only to give notice or warning of the approach of its car, but as it neared the crossing, where its first-mentioned car had stopped to let off and take on passengers, to run at such a rate of speed as to have the car under control, and be able to stop it readily. Unless unusual speed is expressly permitted by law, the speed of a car, it says, ought to be no greater than is reasonable and consistent with the customary use of the street by the public with safety. Any speed in excess of that rate is at least evidence of negligence.

Failure to look for approaching street cars by a person about to cross a street railway track, especially at a street crossing, ought not, the court thinks, upon principle, to be held to be negligence, as a matter of law. It says that the authorities upon this question are conflicting, but that its conclusion is sustained by some of the ablest text writers, and by many, if not by a majority, of the decided cases.

RISKS ASSUMED BY EXPERIENCED CONDUCTOR LEARNING DUTIES ON ANOTHER ROAD.

Ladd v. Brockton Street Railway Co. (Mass.), 62 N. E. Rep. 730. Feb. 27, 1902.

A man who had acted as conductor on other roads and considered himself an experienced man, was struck by a trolley post at a place where the track ran along the side of the road for about 1,000 feet on a line that he was engaged in learning the duties of conductor upon in anticipation of being employed on. He began learning those duties two days before the accident, but had not worked on that part of the road before that morning, though on that morning he had made two or more trips by the place where the accident happened before it occurred. He testified that he knew that it was common in country towns to have tracks run on one side of the road, and that he knew that in such cases there were posts for the trolley wires. He also testified that he did not observe whether the car was on the side of the road or in the center, and paid no attention to that fact, or to the post or poles or track. And there was nothing to show that as he stepped down onto the running board he looked to see if there were any obstructions, or exercised any precautions. It also appeared that the running board on the opposite side of the car would have been entirely safe, and that there was nothing requiring him to use the running board on one side of the car rather than the other. Under these circumstances the supreme judicial court of

Massachusetts holds that, at the close of his evidence, a verdict was properly directed for the company.

The court says that it thinks it plain that the risk was an obvious one, which the man must be held to have assumed, and that he was not in the exercise of due care. The situation of the posts and tracks was manifest, or, so far as appeared, was not unusual. There was nothing in the nature of a trap. The man was familiar with the duties of a conductor. The company owed him no duty of warning or instruction in regard to dangers that were obvious, and it owed him no duty to change the arrangement of the track and the posts. Upon entering the employment of the company, he must be held to have contracted with reference to those as they were. Moreover, in view of the fact that he had been sent out upon that portion of the company's road where he was when injured to learn the conditions attending its operation there, it seems to the court that to step down onto the running board as he did without looking to see whether there was any obstruction in the way or whether it was safe to do so was negligence on his part.

INABILITY TO STOP A CAR ON STEEP GRADE BETWEEN CROSS STREETS—RIGHTS AND DUTIES OF PEDESTRIANS.

Burian v. Seattle Electric Co. (Wash.), 67 Pac. Rep. 214. Dec. 14, 1901.

A cable car ascending a hill where the grade was about 20 per cent, with the cross streets level, was apparently stopped as quickly as possible after it reached the level of a crossing upon which there was a pedestrian, but before it had safely landed upon the level its front end struck him. It was urged in defense that the car could not, with safety to its passengers, be released from the cable until it had cleared the incline of the hill, and stood upon the level of the crossing, since if a gripman should release a car from the cable at any point on the incline it might not be possible by means of brakes to prevent the car from retreating down the hill, while the speed of the car could not be checked, since it must follow the speed of the running cable at that point. Therefore, it was insisted that no negligence could be attached to the company for not checking the speed, or for not stopping the car. But the supreme court of Washington says that it is not prepared to state as a matter of law that the company's rights were such as might authorize it to maintain a system of operating cars that would prevent it from safely stopping the cars at any point within the distance of an entire block, or at a point where they were in the act of entering upon the level of a street crossing.

The obligations of a street railway company and of other travelers along the street, the court says, are mutual, and each must exercise care to prevent collisions and accidents. This mutual obligation is as binding between the operator of the cars and pedestrians at a street crossing as it is between the operator and drivers of vehicles at other points along the streets. The car track is as much a part of the street as any other portion of the traveled way, and pedestrians have a right to cross the track, and particularly at street crossings they must of necessity cross it. If the apparatus used in the operation of cable cars renders the street crossing more hazardous to other travelers than under ordinary conditions, then the street car company should take every reasonable precaution to protect the public from that additional danger. Other travelers having knowledge of these extra hazardous conditions are also under obligation to exercise reasonable care and caution to avoid the danger.

Wherefore, the court holds that it was not within its province to say as a matter of law that no negligence was shown in this case on the part of the company in the fact that the speed of the car could not be checked, or that it could not be stopped before it reached the point where it did stop. This was a question to be submitted to the jury, that it might determine whether, under all the surroundings, the conditions which created the facts as stated constituted negligence.

USE OF COUNTRY HIGHWAYS.

Farmer v. Myles (La.), 30 So. Rep. 858. Nov. 18, 1901.

Police juries have no legal authority to grant a right to construct, own, and operate a line of railway over and through the public roads in the parishes, the supreme court of Louisiana holds, under section 2750 of the Revised Statutes, which authorizes them to pass all such ordinances as they may deem necessary relative to roads, etc. It says that the grant of power for this purpose must be specific, and not implied. Country roads cannot be occupied by street railway tracks without legislative sanction. The authority must be granted by the legislature directly or through the authorized action of the municipality. It is generally conceded that country roads cannot be used for such purpose, even by legislative consent, without compensation to the adjoining landowners. Any legislative permission to use public roads for such purposes would be subject to the rights of the adjoining landowners in the premises. The right could not be exercised under the permission, unless the owners should have given their voluntary consent, or their forced legal consent had been obtained under expropriation proceedings. A landowner has the right to resist the unauthorized diversion of a country road over his property to any other than its usual and legitimate use.

CONSENTS ASKED FOR MUST BE FOR POWER AUTHORIZED BY COMMISSIONERS FOR REFUSALS TO BE COUNTED SUCH.

In re Kingsbridge Railway Co. (N. Y. Sup.), 73 N. Y. Supp. 440. Dec. 6, 1901.

The first appellate division of the supreme court of New York holds that where the state board of railroad commissioners has authorized the operation of a proposed road by electricity, it cannot be said that the abutting property owners have refused to consent thereto where the request made to them which was refused was a consent to "construct and operate a street surface railroad to be operated by electricity or any motive power other than locomotive steam power that may be approved by the state board of railroad commissioners," and hence that an application for the appointment of commissioners to determine whether the road should be constructed notwithstanding a refusal of the abutters to consent thereto must be denied. In other words, the court holds that the refusal of the property owners to consent to another and entirely different road than that authorized to be constructed—a road to be operated by a motive power of an entirely different character—is no evidence of a refusal of the property owners to consent to the construction and operation of a railroad authorized and which the railroad company proposed to construct.

LIABILITY FOR INJURY OF PASSENGER UNDER OPERATING ARRANGEMENT BETWEEN TWO COMPANIES.

Richard v. Detroit, Rochester, Romeo & Lake Orion Railway (Mich.), 89 N. W. Rep. 52. Feb. 11, 1902.

This was an action for personal injuries alleged to have been sustained by a passenger through the negligent starting of a car when she was alighting therefrom. The company sued had an arrangement with a connecting electric line for cars to be run through by both companies jointly between their joint terminals. The contract was that each company should remain in full control of the operation and management of the cars while on the tracks, and the ownership of the tracks should determine the responsibility of the respective parties to the public. Each party should have the right to replace the employes of the other at the junction point, so that its own employes might operate the cars while on its own tracks. Each company should pay to the other, for the use of double-truck passenger cars two cents per car mile. The fares should belong to the company owning the tracks, for a ride over which they were collected.

The accident in question occurred near the switch where the car of the company sued, on which the passenger had ridden over the other company's line, left the latter's track. The company sued claimed that the passenger was hurt before the switch was reached,

while the car was on the other company's tracks, and while the conductor and motorman were under the control of that company's superintendent; that while these employes were primarily paid by the company sued, it was reimbursed by the other company, and, if there was any liability at all, it was the other company which was liable, and not the company sued. The record disclosed that, upon the fare paid by her, the passenger would have been entitled to ride at least a block further than where she got off, and over a portion of the road of the company sued. It also showed that the conductor had thrown the switch belonging to the company sued before the car was started.

In affirming a judgment against the company sued, the supreme court of Michigan states that whatever might be said of this contract, between the parties thereto, it was very clear that it was to the mutual advantage of both the companies to have the cars of the company sued pass over the track of the other company, and to have passengers ride in the cars of the company sued. The fare which this passenger paid entitled her to ride over the tracks of both companies, and, according to the contract, each company was receiving a good and valid consideration for her ride. One received a five-cent fare; the other received a rental for its cars, the privilege of through car service, and all the benefits which such service brought, by giving the company sued a terminal where it did. Then, under the most favorable construction which could be given to the contract, the company sued and the other company were jointly operating the car on the night in question, and were jointly and severally liable for any tort or wrongful act which may have been committed by their servants. And, the court adds, it is a well-settled principle of law that, where more than one party is guilty of a negligent act, the party injured may proceed against them jointly or severally.

IMPLIED DUTY AS TO REMOVAL OF SNOW FROM STREET.

Gerrard v. La Crosse City Railway Co. (Wis.), 89 N. W. Rep. 125. Feb. 18, 1902.

The complaint in this case set forth in detail the requirements of the city ordinance granting to the company its street franchises that it should not allow snow or ice to accumulate upon its tracks in such quantities as to obstruct travel, nor deposit snow upon the street in such manner as to obstruct travel or render the same unsafe, and charged their violation. Moreover, by the last clause of the third subdivision of the complaint it was charged, in substance, that the company negligently caused the snow and ice on its track to be excavated and removed in such manner as to leave a deep ditch, rendering the street unsafe and dangerous for public travel. The supreme court of Wisconsin says that it can construe this as meaning nothing more or less than a breach of the common-law duty not to render the street unsafe for travel, which is manifestly wholly independent of the provisions of the ordinance. It was argued, however, that there was no such common-law duty; that the company's obligations to the public were measured by the requirements of the ordinance. But with this contention the court says that it cannot agree.

Even in the absence of any requirements in the ordinance upon the subject, the court says it must be held that when the company received its franchise to operate a street railway upon the streets for its private gain, as well as the public convenience, it at the same time assumed a duty to the public not to unnecessarily render ordinary travel on the street dangerous. It must exercise its rights with due deference to the rights of the general public. It had no license to build and operate its tracks with total disregard of the rights and safety of the man with the horse and wagon, or the woman with the horse and cutter.

On this subject, the court quotes from Elliott on Roads and Streets (2d Ed., sec. 764), "A street railway company which accepts a grant or a license impliedly agrees that it will use due care not to unnecessarily impede travel or to make the use of the street hazardous. The burden which it assumes in conjunction with the benefit which it obtains is a continuing one, and it must bear it, though to do what due care and diligence requires may sometimes entail considerable expense. * * * Where the track is cleared for its own convenience, it must do what is reasonably necessary to make the part of the street not occupied by its tracks reasonably safe, for it cannot for its own accommodation obstruct it so as to endanger trav-

clers." The court says that it accepts these propositions as correctly stating the law.

It was said that to require the company to remove any part of the snow from the street outside of its tracks was an undue burden, involving, perhaps, great labor and expense; but, as pointed out above, the court says, the company by accepting its franchise, assumed a duty to the public and any disposition which it is obliged to make of falling snow in order to run its cars must be such a disposition as preserves the rights of the public to have a reasonably safe street for ordinary travel. If the public right can be preserved by simply brushing the snow to one side, well and good; but if the snow is so deep that the right can only be preserved by removing the snow from its tracks and from such additional space outside thereof as is necessary to prevent the formation of a dangerous declivity, then the company must make such removal. Any disposition which it makes of the snow must be made with due deference to the rights of travel upon the highway.

CONSTRUCTION AND OPERATION OF ROAD WITH
CURVES—SWAYING OF CARS MUST BE EX-
PECTED—CONTRIBUTORY NEGLIGENCE OF
PASSENGER ON RUNNING BOARD OR
FRONT PLATFORM.

Bruce v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 74 N. Y. Supp. 324. Jan. 17, 1902.

The second appellate division of the supreme court of New York says that it apprehends that it is not the law of that state that a street surface railway must be built upon a straight line, after the manner said to have been directed by the Czar of Russia in the construction of a transcontinental railroad or that in the practical operation of the cars they shall be so handled as never to sway or vibrate. It says that it shall assume that such corporations may construct their lines upon approved engineering plans, with such grades and curves as shall be necessary in the practical accomplishment of the purpose for which they are created; and that in the operation of the cars they may, subject to the liability for the negligent injuring of passengers or persons lawfully upon the highway with their property, run them in such a manner as to meet the requirements of transportation. In other words, it is not required that in the operation of street railway cars there shall be no swaying of the cars, no jars or jolts. These are reasonably to be expected in the practical discharge of the duties which are assumed by the corporation in accepting its franchise, and it is the duty of passengers to take notice of the obvious fact that a car weighing from 4 to 10 tons, running at a practical rate of speed, will be subject to the laws of applied mechanics, and will be swayed with greater or less violence in passing around curves, and will be jolted to some extent in passing over other tracks at street intersections.

This, the court continues, does not give the street railway company a license to operate its cars without regard to the safety of passengers. It owes them the duty of carrying them in safety over its lines, provided, always, that the passenger has been guilty of no neglect contributing to the accident. For instance, if a passenger is occupying a seat in a car, and voluntarily leaves that seat, and steps down upon the running board of an open car, and, without taking hold of anything, relies upon his being able to keep his balance, and the car, in passing around a curve, should throw him off, the company would not be liable, even if it were negligent in the operation of the car, and the burden of proving lack of contributory negligence is upon the plaintiff at all times. It is true, of course, if the injury happened to the passenger while occupying a seat provided by the company, the presumption of lack of contributory negligence would at once arise; but it is none the less proved by the plaintiff by establishing the facts which made it impossible for the passenger to contribute to the accident, as in the case of a collision or the derauling of a car.

In this case, all that was established by the evidence was that the passenger (a policeman) thrown from a car at a curve had left the interior of the car, where it was not to be doubted he was perfectly safe, and took a place upon the front platform. Conceding that it was not negligence per se, or in and of itself, to occupy a place upon the front platform of a car, it is equally certain, the court says, that it was not evidence of lack of contributory negli-

gence. No legitimate inference may be drawn from the fact that a man leaves the interior of the car where he is not crowded, and where the company has afforded accommodations for its passengers, and goes out on the front platform, that he is free from contributory negligence at a time when he reaches the platform. Here it was undisputed that the passenger gave no sign to the motorman that he was present upon the platform until just at the moment of entering upon the curve; and, if it be held that it was negligent upon the part of the company not to operate its cars in such a manner as not to injure one who had quietly taken a place upon the platform without the knowledge of the company's servants, the court holds that it could not be said that it was evidence of a lack of contributory negligence on his part, and without such evidence there could be no recovery of damages.

VALIDITY OF LICENSE TAX.

Newport News & Old Point Railway & Electric Co. v. City of Newport News (Va.), 40 S. E. Rep. 645. Jan. 23, 1902.

The question in this case was as to the authority of the city to levy a license tax as follows: "On each and every street railway company twenty-five dollars each for the first ten cars, and ten dollars on each car in addition thereto used in the city, and an additional tax of fifty cents on each and every pole owned by said company in this city." The charter of the city provided that, "For the execution of its powers and duties the council may raise taxes annually by assessments in said city on all subjects taxable by the state, such sums of money as it shall deem necessary to defray the expenses of the same, and in such manner as it shall deem expedient, in accordance with the laws of this state and of the United States." This language, the supreme court of appeals of Virginia holds, conferred upon the city council general powers of taxation, including all persons and subjects of taxation, except only as it might be limited by the laws of the state or of the United States. And, upon the whole case, the court is of the opinion that the ordinance in question was not in conflict with the constitution and laws of either the state or the United States, but was a legitimate exercise of municipal power.

It was contended that this ordinance was invalid, because in violation of the provision of the state constitution securing equal and uniform taxation, and was also obnoxious to the provision which authorizes the general assembly to levy a tax upon certain licenses named, and all other business which cannot be reached by the ad valorem system. The argument was that, inasmuch as no license tax was imposed by the state upon the company bringing this action, its property being reached by the ad valorem system for purposes of state taxation, no license could be imposed by the city until the state abandoned its method of taxation, and declared that the property could not be reached by the ad valorem system. But the court points out that the property used in conducting the company's street railway business was taxed by the city upon the ad valorem basis, as it was by the state, the ordinance in question imposing, in addition, a license tax upon the privilege enjoyed of conducting the street car business. That the privilege of running street cars through the crowded thoroughfares of a city is, in the discretion of the council, a legitimate subject upon which to impose a license tax, either for the purposes of raising revenue under its general powers of taxation, or in the exercise of its general police power, the court says, cannot be seriously questioned.

The license tax required was not unequal taxation, the court holds, because the ordinance imposing it applied alike to all street railway companies. Nor is it a double taxation to require a street railway company to pay a license tax for the privilege of conducting its business, and at the same time to impose a tax upon the property used in carrying on that business.

Neither does the court consider the position tenable, that because street railways were not mentioned in the section of the city charter which authorizes a license tax upon certain pursuits therein stated, they were therefore excluded from such taxation, it being clear that the legislature did not undertake to enumerate all the subjects and classes upon which a license tax might be imposed. Likewise, it pronounces unsound the contention that the right to assess a license tax upon the company, in order to be exercised, should have been reserved to the city in the ordinance granting the company the right

to construct its tracks and operate its cars on the streets. It says that the right to levy taxes does not arise out of contract. Exemption from taxation is never to be presumed. It has been repeatedly held that a municipal ordinance granting to a street railway company a franchise to construct its tracks and operate cars upon the streets of the city, and which is silent upon the question of taxation, cannot be construed as conferring immunity from the payment of a license tax in the absence of an express stipulation to that effect. The company took its charter subject to the same right of taxation in the city that applies to all other privileges and to all other property. If it wished or intended to have an exemption of any kind from taxation, it should have obtained a provision to that effect in its charter.

Because the company's street railway extended beyond the corporate limits of the city, through the county, to certain adjacent towns, it was suggested that a railway company is an entirety, and cannot be spoken of as actually located in any county, city, or town which it traverses. Granting this to be true, still, the court says, it may be taxed by the city, the streets of which are traversed by it, upon the business done in such city, although its lines extend beyond the city limits.

RISKS ASSUMED BY EMPLOYEE GOING IN SEVERE
WEATHER INTO OPEN COUNTRY TO REMOVE
SNOW FROM TRACKS—WHEN COMPANY
LIABLE FOR INJURIES THEREFROM.—
TRANSPORTATION OF EMPLOYEE.

King v. Interstate Consolidated Street Railway Co., 51 Atl. Rep., 301. *Carl v. Same*, 51 Atl. Rep., 305. (R. I.) Feb. 12, 1902.

In the first-named case it was alleged in the first count of the declaration that the party suing was employed by the company to help remove snow from its tracks in very cold weather, the work to be done over a wide tract of open country, remote from dwelling houses and other habitations; that the company knew that the work was very trying and dangerous to those engaged therein, and that it was its duty to furnish the party suing sufficient food and shelter during the continuance of the work, and to provide for his safety while so employed, and to carry him to his home when returning from the work; that he was ignorant of the danger attending the work, and that while engaged for 24 hours therein, and while in the exercise of due care, and in ignorance of the peril to which he was exposed, both of his feet were frozen, of which fact he informed the company's agents and servants, and requested them to carry him to his home, but that the company, its agents and servants, well knowing the premises, carelessly and negligently failed to provide food and shelter for him; and that the freezing of his feet was due to the failure of the company, its agents and servants, to supply him with food and shelter while so engaged; and that they had to be amputated. The second count differed from the first in that it alleged that, without fault on his part, both of his feet were frozen, of which fact he informed the company, its agents and servants, and requested them to carry him to his home, which they carelessly and negligently refused to do, and being unable to procure passage to his home, he was obliged to make his way there on his hands and knees, and was engaged in making said journey from 7 o'clock in the evening until 8 o'clock the next morning. And he averred that in consequence thereof, and without fault on his part, his feet were so badly frozen that they afterwards had to be amputated, and that it was the duty of the company, under the circumstances set forth, to provide him with food and shelter and transportation as stated.

The supreme court of Rhode Island holds both counts demurrable. The first, in failing to allege that the company either expressly or impliedly assumed the duty of furnishing the party suing with food or protection from the cold. That one of the risks incident to long-continued outdoor employment in the winter time in this climate is that one's feet or hands may be injured by freezing, the court says, is so clearly within the rule of assumed risks on the part of the servant as to require no argument. The furnishing of food and clothing, the proper care of oneself in the doing of his work, the recognition of the existence of well-known physical laws,—these duties, in the absence of some custom, rule, or understanding to the contrary, are clearly devolved upon the servant; and for any failure to observe them he alone must suffer the consequence. In order therefore, to cast such a duty upon the company as that which was here relied upon, it must appear from the facts and circumstances

set forth in the declaration that the party suing was led to neglect or omit to provide for himself by reason of the fact that the company had assumed the duty of providing for him. Likewise, with reference to the second count, the court says that it was not alleged that the company conveyed the party suing to his place of work, or that it promised, either expressly or impliedly, to carry him back to his home; and it was not, and could not successfully be, contended that it is any part of the duty of an employer to carry his employees to or from their place of work, in the absence, at any rate, of some custom, understanding, or agreement to that effect.

The second named case, like the first, was one of trespass on the case for negligence, as it is called. But there was a material difference between the two cases in at least two respects, viz.: The declaration in the second case set out that the party suing was taken and conveyed by the company to the place where he suffered his injuries before being set to work, and that after he began to suffer from the cold, and was unable to work any longer, and requested to be permitted to leave off work, and being refused, he was ordered to enter and permitted to remain in one of the company's cars, and that the company wholly neglected to take care of and provide for him for a long time, while practically in a helpless condition. In view of these allegations, the court holds that the demurrer in this case should be overruled. It says that, if the company directed the party suing in this case, after becoming disabled to work, to go into one of its cars, and permitted him to remain there, as alleged, it cannot say, under the circumstances, that it would not be competent for the jury to find that the company assumed upon itself the duty of taking reasonable care of him while there, and of seasonably conveying him to his home, or to some place where he would be taken care of.

CARE REQUIRED IN SELECTION OF PLACE FOR PAS-
SENGER TO ALIGHT.

Foley v. Brunswick Traction Co. (N. J.), 50 Atl. Rep. 340. Nov. 15, 1901.

A passenger, in alighting from a street car at a point of transfer, or temporary terminus selected by the company, stepped upon a stone in the highway, and sustained injuries for which she brought suit. The jury was instructed that she could recover damages if the place selected by the company for her to leave its car was not a safe one for that purpose. The court of errors and appeals of New Jersey holds that this instruction was erroneous, because it did not submit to the jury the question of the company's negligence, which was the gravamen or vital point of the action.

The gravamen of the action, the court says, was the failure of the company to use reasonable care for the woman's safety as a passenger; hence the correct instruction would have been that the company was liable for her injuries if it failed to take reasonable precautions to see that the place provided by it for her discharge was a safe one for that purpose. If this language be transposed so as to read that it was the duty of the company to see that the place where it discharged her was a safe one if reasonable precautions would make it so, the court says the doctrine will receive an apparent emphasis, although upon analysis each statement will be found to be the legal equivalent of the other. Whatever the form of words employed, the idea expressed should be that the guilt of the company is to be measured by the degree of care it has put forth for the passenger's safety, and not by the degree of success attendant upon its efforts.

There was, doubtless, a degree of circumspection, the court goes on to say, that would have discovered the stone in the highway, whatever its size or location might have been, and a degree of caution that would have prompted either its removal or the selection of some other place as a temporary terminus; but whether such circumspection and such caution were required of the company depended upon the reasonableness of its exercise, and that question was not left to the jury. It might be that the jury, notwithstanding the undisputed fact that the woman fell while alighting upon the highway, would have found that the stone that caused her to fall was so small in size, and so concealed from view, or was so connected with the roadway, that the company, in the exercise of reasonable care, would not have noted its presence, or have foreseen the danger of failing to remove it. It was the company's right to have that question submitted to the jury.

MECHANICAL DEPARTMENT

THE REPAIR AND IMPROVEMENT OF A TYPE K CONTROLLER.

BY L. A. S.

Most of the older street railway companies have in service some of the type K controllers which have vulcabeston insulated controlling cylinders. The segments of these cylinders as they wear down become too low for the contact tips and new tips or new cylinders have to be purchased. It is cheaper to buy new cylinders, since the shaft wears fast where the controller handle goes on, as does the star wheel.

In buying new cylinders one can get a K-10, and by altering the

steel tubing, and this is a good thing to do when putting in new cylinders.

The diagram shows the connection board and wires of the K, K-10, and K-10 Special controllers.

To change a K into a K-10 Special proceed as follows:

Change 19-R-3 jumper to 19-R-5.

Cut 19 wire two segments.

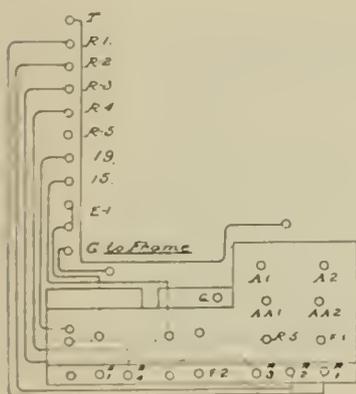
Cut 15 wire two segments.

Cut E-1 wire one segment.

New wires for R-3 and R-4.

Take out L-1 and L-2 wires.

The reverse wires are similar for all three controllers, as shown in diagram for K.



K-10.

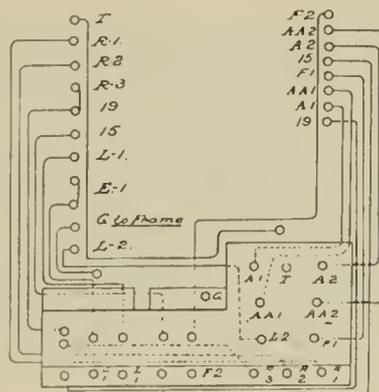
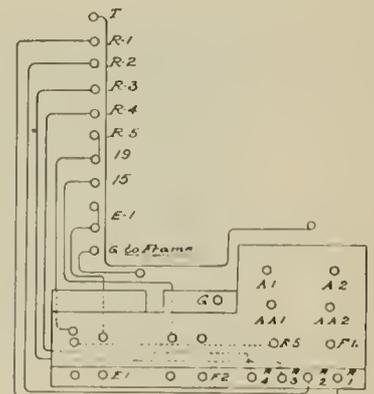


DIAGRAM OF CONNECTIONS OF K CONTROLLER.



K-10 SPECIAL.

wiring between the connection and the finger board made a more modern controller and also one better adapted to handling a crowded car and saving motors from the rough usage they sometimes get with a K controller and only one resistance box.

In making over a K into a K-10 it can be done in two ways. One is to buy a K to cylinder, a K to controller top and a K-10 water cap and pointer. By turning down the water guard around the reverse cylinder on the controller top the same cylinder may be used, and by a little cutting, the same reverse handle also. Then changing the wires gives what may be called a K-10 "Special" to keep it distinct from a regular K 10. The terminals on the cable leads can remain and be used as before with the regular K landing post.

The fibre insulated K reverse cylinders cause some trouble by the screws becoming loose and segments short circuiting and in some cases have to be replaced. In this case, in changing from a K to a K 10, it would be best to purchase a K 10 reverse cylinder and water cap and by changing the connection board terminals (besides doing the same as in case of a K-10 Special) make a regular K 10 controller.

It is a good plan to complete the change by rewinding the magnet spool and making the trolley landing post fixed to the magnet. This removes it from the connection board where it causes trouble from short circuiting.

If this change is made a 3-panel resistance box is needed and the old shaft frame may be used by changing the filling.

Of course in making this change five resistance wires in stead of three are required and the L1 and L2 wires in the cable may be used for R4 and R5, thus saving the running of any new wires.

In old frame the top bearing of the controlling cylinder becomes worn and may be repaired by boring out for a bushing of

SPLICING ARMATURE SHAFTS.

Street railway men having motors of the old Sprague type may be interested in knowing of a method of repairing broken armature shafts for these motors. Electrically these Sprague motors have always given good results but the long projecting shaft at the pinion end gives a leverage that has resulted in an unduly large number of broken shafts. The break usually occurs close up to the commutator collar and makes necessary an entire rewinding of the armature at a cost of something like \$25 or \$30.

As a means of repairing the shafts when they do break the Bing-hamton Railroad Co. uses a piece of steel shafting forced into the broken end of the old shaft.

The procedure is as follows: The commutator is first removed from the damaged armature. The broken end of the shaft is cut off close to the collar and with a 1/4-in. twist drill a hole is bored into that end of the shaft to a depth of 4 in. A piece of steel shafting about 12 in. long and perhaps 3 in. in diameter is put into the lathe and turned down for a distance of 4 in. from one end to a diameter just large enough to make a very close fit in the hole in the armature shaft. With a hand screw press rigged up on the shop bench the piece of shafting is pressed into the hole as far as it will go. The whole shaft, armature and all, is then put into a lathe and the added piece turned down and cut off to the proper diameter and length. It is not claimed the spliced shaft is any stronger than a new one would be, but this method of repair avoids disturbing the armature coils. If the shaft breaks a second time the hole is merely drilled out again and a new piece of shafting inserted as before. The new shaft may be part of an old wheel axle or a steel shaft or bar rescued from the scrap heap.

When the idea was first suggested some doubt was felt as to

whether the added piece would work loose or not and it was thought it might be necessary to key the piece into place. This would have increased the cost materially and after experimenting it was found a key was not essential. The company has a number of armatures in service repaired in this way.

GREASE AND OIL RECORDS IN MAINTENANCE OF ROLLING STOCK.

Although grease and oil do not constitute an exceptionally large account in the maintenance of cars and trucks, they are important items and unless their distribution is carefully supervised the waste and loss through careless handling may easily reach unwarrantable proportions.

As a check against thoughtlessness and extravagance in this particular, the accompanying report blank as adopted by a former su-

Form D-46.—7-2-1900—500.

The United Railways & Electric Co. of Baltimore.

GREASE AND OIL REPORT.

..... 190

BRAND

MOTOR GREASE (.....)

Lbs. on hand first day of month, - - -

Lbs. received during month, - - -

Lbs. on hand last day of month, - - -

Amount used, - - - - -

BRAND.

GEAR GREASE (.....)

Lbs. on hand first day of month, - - -

Lbs. received during month, - - -

Lbs. on hand last day of month, - - -

Amount used, - - - - -

BRAND.

CAR BOX OIL (.....)

Gallons on hand first day of month, - - -

Gallons received during month, - - -

Gallons on hand last day of month, - - -

Amount used, - - - - -

Foreman Barn.

perintendent of the United Railways & Electric Co., of Baltimore, is suggested. The blank is filled out monthly by the foreman of each barn and not only gives the superintendent and manager a check on the foreman but also enables him to keep tab on the supplyman, as the quality of the brand of oil or grease will be quickly reflected in the quantity needed to maintain a certain number of cars.

In the latest catalog of the Mayer & Englund Co., of Philadelphia, we find the following as to the proper spacing of rails when laying track:

"A careful investigation of the best practice suggests the following rule:

Temperature, Degrees Fahrenheit.	Space between Rails.
80 to 100	None.
60 to 80	1-16 in.
40 to 60	1/8 in.
20 to 40	3-16 in.
Zero to 20	1/4 in.

The Northern Ohio Traction Co. has opened offices in Toledo, and the office at Cleveland has been closed.

TRUCK FOR HANDLING ARMATURES.

A convenient truck for picking up and transporting armatures about the shops is in service at the shops of the Capital Traction Co., Washington, D. C.

The arrangement is a wooden frame 8 ft. long mounted on two wheels, 20 in. in diameter, having tires 1 1/2 in. wide. From the

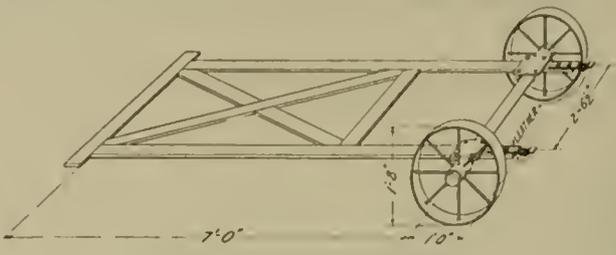
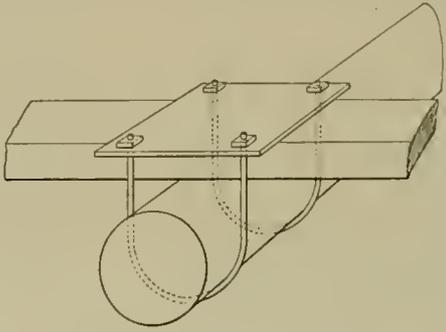


DIAGRAM OF ARMATURE TRUCK.

sketch it is seen the frame comprises two long side pieces joined by cross bracing and having at the ends two metal pieces designed to form rests for the armature shaft. These end pieces are forgings bolted to the frame and having linings of leather attached to the inside of the cup-like portions for the purpose of preventing injury to the armature or its shaft.

The frame is attached to the axle by four U bolts passing under the axle and through a bearing plate resting on the top of the



DETAIL OF AXLE CONNECTION.

frame side pieces. The axle is placed about 1 ft. from the free ends, thus giving sufficient leverage effect to the handle to enable the operator to lift an armature with but slight effort. It will be evident that with the truck an armature resting upon the floor may be picked up and moved about without further handling.

The Danville (Ill.) Street Railway & Light Co. observed its annual "Charity day" May 1st, donating the proceeds from the operation of its lines on that day to the local hospitals and Children's Home.

The Georgia Railway & Electric Co., operating the consolidated street railways in Atlanta, will effect a general change of routes when the physical combination of the properties shall be complete. Under the new regime there will be 15 city and 5 suburban divisions.

The Wichita (Kan.) Railroad & Light Co. is reported to have abandoned for the present its project of opening a popular resort at College Hill this summer, owing to the difficulty of securing a sufficient number of new cars to handle the expected increase in traffic.

An unsuccessful attempt to wreck a car on the Louisville, Anchorage & Pewee Valley Electric R. R. was made on the evening of April 10th. The car in rounding a curve struck a heavy timber which had been placed across the track and fastened to the rails. The force of the collision, however, was sufficient to hurl the obstruction out of the way and the car passed in safety.

NEW CARS FOR THE HAMILTON, GLENDALE & CINCINNATI TRACTION CO.

The accompanying illustration shows a large car of the type built by the John Stephenson Co. for the Hamilton, Glendale & Cincinnati Traction Co. The car was designed for suburban or interurban service primarily and is equipped to work on fast lines, but it can also be operated within the city limits without difficulty. The body of this car is 31 ft. 10 in. in length and it has vestibules 4 ft. 8 in. long, making the length over the dashes 41 ft. 2 in. Its greatest width is 8 ft. 4 in. and the height from the under side of sills to the top of the trolley board is 9 ft. The buffers have a 12-in. extension and are solid on the platform timbers. They are composed of 6-in. steel $\frac{1}{2}$ in. thick.

The car is provided with all the modern conveniences, including baggage, passenger and smoking compartments, toilet room and Baker hot water heaters. The baggage and smoking compartments are usually combined in this type by fitting the room with folding seats. This makes it easy to handle freight or baggage while giving smokers ample accommodations. In the passenger compartments there are 15 seats of the walk-over pattern. Over the windows there is a continuous parcel rack extending the whole length of the car. The windows have three bar guards which are hinged so they can be lifted out of the way when the windows are cleaned. The

lighting and power. In many instances the trolley feeders themselves could be employed to convey energy for lamps and stationary motors. This last is true even where these feeders are fully loaded with the current for car motors, because the maximum demands of these motors are made during only a small part of each 24 hours, and at times when the requirements of lamps and stationary motors are below their highest points.

Aside from legal restrictions on the general supply of electrical energy by street car systems, which restrictions of course vary with the laws of different states, questions connected with insurance rules and certain technical considerations must be met, before traction plants can engage in the commercial distribution of light and power. The almost exclusive use of the single trolley system, with rails and other return conductors in direct contact with the earth, renders it unsafe, as a matter of life and fire risk, to put the wiring of buildings generally into electrical connection with the dynamos at the power houses of street railways. Insurance rules, in recognition of these conditions, prohibit the introduction of circuits from street railway lines into insured buildings, except those used for street car purposes.

The vast majority of electric traction systems in the United States operate with direct current dynamos at 500 to 600 volts, connected one terminal to the trolley wire feeders and the other terminal to the rails. Two wire circuits directly from these dynamos



INTERURBAN CAR FOR CINCINNATI COMPANY—JOHN STEPHENSON CO.

seats in the smoking compartment are longitudinal and built of spring cane. In both compartments the interior finish is of inlaid mahogany. The designs used in the panels over the doors are quite elaborate and all the moldings are also inlaid.

ELECTRIC LIGHTING BY STREET RAILWAY SYSTEMS.

BY ALTON D. ADAMS.

No less than five bills are now before the Legislature of Massachusetts, granting powers to certain street railways to do electric lighting in the cities and towns through which they pass. There is also a bill before the same body, giving the privilege in general terms to all street railways of the state to do electric lighting in towns where electric lighting systems do not exist.

The movement in Massachusetts is simply an instance of the larger one throughout the United States, looking to the supply of electric light from street railway stations.

From the standpoint of the general public, electric lighting by street railway systems is certainly desirable, as these systems pass through many towns and into many suburbs where there is no public electrical supply. A load of lamps and stationary motors would obviously be of great advantage to many street railways, because it would afford a source of large income at a comparatively small increase of fixed charges. Periods of maximum demand for energy in street car service and to electric lamps and stationary motors do not coincide. A surplus capacity is thus available at the generating stations of street car systems that may readily be devoted to street lighting, or to commercial electric service.

In almost every case the pole lines that carry feeders for the trolley wire, could also be used to support conductors for general

would be as dangerous in buildings as wires brought from trolley wire feeders and the rails, when the dynamos were connected to the traction system. In either case the insulation of wires in the buildings supplied would be subject to an electrical strain corresponding to the entire voltage of the system, not only as to each other but also as to any grounded metallic structures, such as gas and water pipes. Any person making bodily contact with such pipes and that side of the electrical circuit connected to the trolley wire, either directly or at the dynamo, would be subject to the pressure of 500 to 600 volts. Any plan for the general supply of light and power from existing street railway systems must evidently avoid these dangers.

The generating stations of electric traction systems have enjoyed from their inception the great advantage of multiple working for all their dynamos, in marked contrast with stations for electric lighting. This advantage will hardly be given up by the introduction of dynamos different from those used for traction purposes, in order to do electric lighting. Taking the present generating equipment of street railway systems, general demands for electric light and power may be safely supplied in either of at least two ways. If the terminals of each 500 volt direct current dynamo are brought to a double pole switch, trolley feeders and track may be connected to one side of this switch and an entirely independent set of circuits for general light and power service to the other. With this arrangement a single throw of the switch for any dynamo connects it to either the traction or the lighting system. In this way any of the station dynamos may be operated singly or in multiple on either the lighting or the traction load. As each dynamo is entirely disconnected from the trolley and track when supplying commercial circuits, dangers incident to the ground connection of the rails is entirely avoided. With this arrangement, direct current at about 500 volts pressure is available for general distribution from the generating plant. This current is at once suitable for stationary

motors and can readily be used in enclosed arc lamps, connected four or five in series. Some plan must be provided for the supply of incandescent lamps, and for this a three-wire system will usually be found most suitable. Incandescent lamps for pressures of 225 to 250 volts are now regularly on the market, and a three-wire system for these lamps can be readily supplied from a 500-volt generator. To regulate this supply a motor generator should be so connected to the two 500-volt mains and to a third or neutral wire, that the pressures between this neutral wire and each of the mains will be kept equal to each other by the automatic action of the motor-generator, whatever the loads of lamps or motors between the neutral wire and each of the mains. The capacity of a motor-generator for this purpose need only be 5 to 10 per cent of the capacity of the connected dynamo. Other means instead of a motor-generator may be employed, if desired, to maintain the balance of the three-wire system from the 500-volt dynamo. On this three-wire system 225-volt incandescent lamps can be distributed in multiple, and enclosed arc lamps can be connected two-in series between either main and the neutral. Three-wire Edison systems with about 250 volts pressure between the outside mains are able to distribute energy economically to a distance of three-fourths mile from the generating station. With 500 volts between the two outside mains the radius of distribution for a given load, fixed per cent. of loss in conductors, and constant weight of conductors, is multiplied by four, compared with the radius of the 250-volt system. It follows that the 500-volt three-wire system can economically distribute energy for lighting and power purposes to a distance of at least three miles from generating stations.

The plan just suggested, while making use of standard 500-volt generators, such as are in general use in street railway plants, does not bring existing circuits and feeders into lighting service. This latter is often very desirable, as where the circuits of a traction system pass through one or more towns at distances of several miles from the generating station, so that a separate set of conductors for lighting purposes would require a large increase of investment. The limits of 0.75 mile for 250-volt, and of three miles for 500-volt three-wire systems, in distribution for electric lighting, are imposed in large measure by requirements for regulation of pressure at the lamps. For distribution to motors only the economic radius is much greater than these figures, because the demands for regulation at motors are much less exacting than those at lamps. This is illustrated in many traction systems where lines extend from a 500 or 600 volt station to distances of five and ten miles.

To make use of existing 500-volt dynamo and of feeder circuits in traction systems for electric lighting, at any points to which these circuits extend, small sub-stations at these points are necessary. Such a sub-station should contain one or more motor-generators and a storage battery. The motor-generator should draw energy from the traction circuits and deliver it to the storage battery and to the local lines, for electric lighting and service to stationary motors. Energy should be taken from the trolley feeders only at times when the demands of car motors are comparatively small, or when cars are not in operation.

In this way a large amount of energy can be distributed from sub-stations without increase of either the dynamo equipment at the generating station or of the traction circuits. The local lines from sub-stations will usually be required to cover only a moderate area, as these stations require very little space and may be located in the centers of lighting districts. The fact that one side of the traction circuits is grounded creates no serious risk in connection with the service from sub-stations, because the lighting circuits from the motor-generator and batteries have no electrical connection with the traction lines. The voltage at which the supply from a sub-station shall be carried out may be freely selected without regard to the pressure of the railway circuits, but a two-wire system at 225 to 250 volts will probably be most suitable in the majority of cases. Such a system will supply lamps and motors over such areas as will usually be necessary at a very moderate outlay for conductors and with the utmost simplicity of circuits. In the newer class of street railway work that is now being done from stations that supply alternating currents, the problems of lighting service are easily solved. From such stations alternating lines at high pressure may be run for lighting purposes to any sections where such service is wanted, and energy there distributed from local transformers in the usual way. Either at the generating station or the sub-stations of such an alternating system transformers and rotary converters may

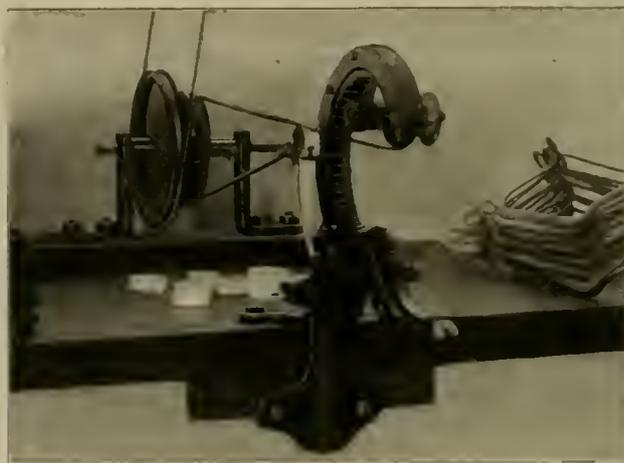
be operated exclusively for general lighting and power service, in addition to the transformers and rotaries devoted to traction work. With this arrangement, as before, there would be no electrical connection between the lighting circuits and those joined to the trolley wire and track. Evidently no especial technical difficulty will be encountered by street railways that enter the lighting field.

TAPING ARMATURE COILS.

A simple device for taping armature coils has been used at New Bedford, Mass., for some time. It is the invention of J. A. Webber, armature winder for the Union Street Railway Co., who has patented the device.

The machine consists of a circular casting with base attached to fasten to the bench. Around the inside of the casting is a recess in which is set a brass ring having gear teeth cut on the inner surface, and held in position by projections at either side. This ring is driven by a pinion and grooved pulley belted to a counter shaft.

A section of the casting and ring at the front is hinged at its



COIL TAPING MACHINE.

lower end and swings out and down to admit the coil that is to be taped. When the coil is in place within the ring and casting, the section is closed and fastened by a thumb screw so that the continuity of the ring and casting is not broken.

The tape is not fed continuously from a reel but is cut into suitable lengths, each piece being sufficient to tape one coil. Each piece is wound on a separate bobbin by an attachment at the right hand side driven by a belt from the counter shaft, which also drives the gear ring.

In taping a coil a hobbin is placed in the stud projecting from the gear ring, the stud having a slight offset to give the tape the proper pitch as it winds on the coil. The tape passes through a clamp attached to the stud, permitting any desired tension to be put upon the tape as it leaves the bobbin. During the winding, it will be understood, the coil is held in the hands of the operator, who moves it to the right as the gear ring carries the tape hobbin around. A winder after short experience will learn how to handle the coil to secure uniform and smooth taping. Mr. Webber states he has taped 500 coils a day with this machine.

TROLLEY FREIGHT SERVICE IN OHIO.

The Toledo & Western Railway Co. has put in commission a number of box cars and flat cars of the type used for freight service on steam roads, and this, in addition to its packet freight service, will make the 60-mile interurban electric line a formidable competitor of the steam roads as a freight carrier. An electric locomotive capable of hauling eight or ten loaded cars will be used, and to obviate the difficulty of running such trains through the streets of Toledo, yards have been established at West Toledo, where goods can be transferred from the regular packet cars that run through the urban districts.

Southwestern Gas, Electric Light and Street Railway Association.

Fourth Annual Meeting Held at Dallas, Tex., April 18-22, 1902—Street Railway Subjects Discussed Were: Fuel Oil—Injury and Damage Cases—Street Railway Management in Texas—Selection of Street Railway and Motor Equipments.

The fourth annual meeting of the Southwestern Gas, Electric Light & Street Railway Association was held in San Antonio, Tex., April 18-21, 1902. There was a large attendance of members as well as supply men and visitors and both the business and social parts of the program were successfully carried out. The association was called to order on the morning of April 18th, by the president, H. F. MacGregor of Houston, Tex., who introduced Mayor Hicks, of San Antonio. Mayor Hicks welcomed the delegates and visitors to the city in a most cordial manner and his address was responded to by Mr. Thomas D. Miller of Dallas, and Alderman Fred Terrell of San Antonio. Then followed the annual address of President MacGregor who stated in part that the Southwestern Association was the "progress club" of the gas, electric and street railway business of the state. Its functions are to better equip the active members for a more perfect performance of the duties of quasi-public service and to teach them how to accomplish the most at the smallest cost. The year that has elapsed has been one continued round of prosperity, in which the gas, electric and street railway plants have participated. The special features of the year affecting the interests represented by the association was the discovery of oil in various sections of the state. This has reduced the fuel expense in the entire southwest territory from 1-3 to 2-3 in proportion to the distance from the base of supply.

President MacGregor then reviewed the various subjects on which papers were to be presented and admonished the delegates to the convention that the object of the meeting was primarily to attend to business and requested that the social side of the program be postponed until after the business sessions had been closed. Friday evening the delegates and ladies to the number of 60 were taken for a ride about the city in a private excursion car of the San Antonio Traction Co., and after visiting the principal points of interest in and about the city the party was taken to the Menger Hotel where the annual banquet of the association was served in the evening.

Among the papers read bearing upon street railway subjects were "Fuel Oil," "Injury and Damage Cases," "Street Railway Management in Texas," and "Selection of Street Railway and Motor Equipments."

FUEL OIL.

A paper on this subject was read by Mr. W. W. Reed, Houston, Tex., who stated that the subject was such a broad one that he felt obliged to limit his paper to the consideration of the commercial side of the question of utilizing oil as fuel for steam purposes. "The discovery of oil at Beaumont in apparently inexhaustible quantities will doubtless mark the opening of a new era of employment for Texas and the Southwest. With such a cheap fuel at our very doors the immense advantages to manufacturing enterprises must be clearly seen. Fuel oil has already displaced in a large measure the use of coal in many sections of Texas. The immense saving to be accomplished through the use of oil will in a short time, pay for the investment of the oil burning equipment, and while oil will never entirely replace coal, its use in the Southwestern sections of the country will be very extended. Oil makes an ideal fuel, and aside from its low cost there are many other advantages to be gained by its use. It is more easily handled than coal or wood and its use cuts down in a large measure the amount of labor necessary to be employed.

Probably one of the best equipped fuel oil burning plants in Texas is that of the Houston Lighting & Power Co., a brief description of which was given by the author. Oil is delivered on the spur track in front of the plant in tanks from about 6,000 to 9,000 gallons capacity. It is unloaded by gravity into the station storage tanks. There are three of the latter, which are of steel and have a capacity of 12,000 gallons each. They are situated in an underground water proof brick vault over which is a galvanized iron roof. The storage tanks are provided with heating coils to heat the oil in cold weather so that it will not become too viscous to flow freely and be handled

by the pumps. From the storage tanks the oil is pumped into a small receiver where it is heated to a high temperature by the exhaust steam from the pumps. It is then forced to the burners under pressure, the pump being automatic in its action and maintaining a constant pressure of oil regardless of how much oil is being used. The amount of oil consumed is registered by a meter in the oil feed line. Before getting to the nozzle of the burner the oil comes into contact with live steam from the boilers which exhausts and atomizes it. In some burners the atomization of the oil is accomplished in the burner itself while in others it takes place practically in the fire box. The former method appears to be the most effective.

RELATIVE HEAT VALUES OF OIL AND COAL.

Prof. Phillips gives in his report on "Texas Petroleum" the following values. For petroleum from 17,000 to 20,000 per cent B. T. U., and the value of 18,500 B. t. u. may be assumed as the average. For Alabama coal he gives 13,000 B. t. u., McAlester coal 13,500 B. t. u., New Mexico coal 12,000 B. t. u. and lignite 9,900 B. t. u. On this basis one barrel of crude petroleum weighing 320 lb. is equivalent to 438 lb. of Alabama or McAlester coal, 492 lb. of New Mexico coal and 598 lb. of lignite. From these values the number of barrels of oil to equal one ton of coal would be: One ton Alabama or McAlester coal equals 4.56 barrels of oil, one ton of New Mexico coal equals 4.06 barrels of oil and one ton of lignite equals 3.34 barrels of oil. In actual practice the value of oil as compared with coal depends on a number of factors, such as the grade of coal, the efficiency of the burners or atomizers, the furnace construction, etc. Results based on actual practice range from 2½ to 4 barrels of oil to a ton of soft coal.

REDUCTIONS IN COST OF HANDLING FUEL.

With fuel oil the cost of handling fuel is greatly reduced. The oil is usually unloaded by gravity thus doing away with the cost of unloading coal. It is fed automatically to the furnace so that the stokers and coal passers may be done away with. All the labor required is that of one man in the boiler room to look after the water level and the general operation of the system. There is no special skill required to operate an oil burning system, but a great deal depends upon the careful adjustment of the burners so as to insure a proper amount of steam and air supply for the amount of oil consumed. A blue transparent flame which completely fills the fire box gives the best results. The use of fuel oil increases the steaming capacity of the boilers in the neighborhood of 35 per cent. At the plant of the Houston Lighting & Power Co., with a given load on the generators, one boiler using oil now does easily what formerly required two boilers using coal.

CLEANLINESS AND SAFETY.

In using fuel oil the boiler room and premises can be kept tidy and clean, as there is no coal pile, no dust, ashes or clinkers.

Insurance companies will not allow a gravity system of feeding the burners so that there is no oil above the level of the burners. Recent fires, so near to the oil tanks that this oil was heated to a very high temperature, have shown that there is little or no danger to be feared on that score, as the oil did not explode or even ignite and burn.

Other advantages in the use of fuel oil are that the fires may be regulated from a low to an intense heat in a very short time. The fire box with the proper use of oil will last much longer than with the use of coal and there are no repairs and maintenance of fire tools. The fire doors not having to be opened, cold air is not admitted into the combustion chamber to cool down the gas and cause unequal expansion and contraction of the tubes and boiler sheets.

TESTS OF OIL FUEL.

The author gave the results of two evaporation tests made with Beaumont oil. One of these was made by the Houston Electric Co., on two Babcock & Wilcox boilers and an evaporation of 13.48 lb. of water per pound of oil was obtained from and at 212 deg.

F. The oil weighed 7.43 lb. per gallon. The other test was made at the plant of the Houston Water Works Co., where an evaporation of 14.71 lb. of water per pound of oil was obtained from and at 212 deg. F. No evaporation tests have been made by the plant with which the author is connected and he considers that such a test is not a fair one so far as actual results are concerned unless the steam used to operate the atomizers is deducted from the amount of water evaporated. This is particularly true where two burners are to be compared, as to the amount of steam required to operate different burners varies considerably.

In the plant of the Houston Lighting & Power Co., it was found by comparative tests on coal and fuel oil that one ton of Montreal run-of-mine coal was equal to 3.6 barrels of oil. A number of tests were also made at this plant to determine the relative efficiencies of the various forms of burners. The efficiencies were taken in gallons of oil consumed per kilowatt-hour output at the switchboard. This method is not entirely accurate since it takes into consideration the efficiencies of steam and electrical machinery but the conditions governing the tests were, however, as nearly as possible the same in all the tests, and the tests all covered the same length of time. Of the four burners tested, No. 1 used .713 gallons of oil per kw. h.; burner No. 2 .667 gallons per kw. h.; burner No. 3 .606 gallons per kw. h., and burner No. 4 .575 gallons per kw. h. It will be seen from this that burner No. 2 effected a saving of 6.4 per cent over No. 1, No. 3 a saving of 15 per cent over No. 1, and No. 4 a saving of 19.3 per cent over No. 1, which shows that much depends upon the construction of the burner. The high efficiency of the latter burner is believed by the author to be due to a device used whereby the oil and steam are very intimately mixed, and also to the fact that highly superheated steam is employed to atomize the oil, thus bringing the mixture up to a very high temperature. The nozzle of this burner is also proportioned so that the flame completely fills the firebox. A great deal depends upon the construction of the firebox. Of course, what is suitable for one might not suit another kind and in any case it is necessary to determine by experience the best arrangement of fire box and burner.

When grate bars arranged for burning coal are left in place and covered over with a layer of fire brick the furnace can be adapted for the use of coal again in a few minutes time in case the supply of oil runs out or anything happens to the system. With this construction the air is also heated when passing through the hot bricks and the temperature of the gas in the firebox is not cooled off. The amount of air for complete combustion can be regulated by opening or closing the ash pit doors.

SULPHUR IN OIL.

When Beaumont oil first began to be used for steam purposes, much was said about the destructive effects of sulphur in the oil. It was claimed that the large quantity of sulphur in the oil would soon ruin the tubes and sheets of the boilers, but time has proved that there is nothing to fear on this score. The percentage of sulphur in Beaumont oil is placed by different analyses at from 1.33 to 2.04 per cent. After the use of oil in the Houston plant for over 10 months no injurious effect on the boilers could be detected.

A communication from Mr. C. F. Bitgood, chief inspector of the Hartford Steam Boiler Inspection & Insurance Co., was also read concerning the experience of this company with fuel oil on steam boilers. The communication was in part as follows:

The use in this territory of crude oil as fuel began in April, 1901, and our observations cover the periods since then. At the outset, our inspectors received special instructions concerning the new fuel, and were cautioned to use special vigilance to the end that its effects on the boilers under our charge might be ascertained as quickly as possible. Thus far the closest scrutiny has failed to reveal any deleterious effects where proper care is exercised in installing and operating the oil burning apparatus. In some instances, tubes have been bent and shell plates overheated by reason of undue concentration of the oil flame on certain exposed portions of the boilers, but these troubles have uniformly disappeared when the faulty conditions were rectified. Some apprehension was felt at first that the amount of sulphur contained in the crude oil might be sufficient to cause more rapid deterioration by pitting and corrosion than had been experienced with coal. The fear has so far proved groundless. No extraordinary pitting of tubes and shells has been noted since introduction of oil as fuel. This may be accounted for

by the fact that the amount of sulphur liberated per thousand heat units is less with oil than with coal.

The wear and tear upon the boiler structure is probably less with oil than with coal. Much of the wear and tear with coal is due to strains produced by the sudden and frequent inrushes of air against the hot plates and heads while furnace doors are opened for firing, resulting often in leakage at seams and tube ends and small fractures of the boiler plates. These are almost entirely avoided by using oil for fuel. The doors are never opened and the temperature remains practically even. In some cases where constant trouble had been experienced with coal from the above mentioned causes there was a marked improvement when oil was introduced.

This company's experience with oil would indicate it as an ideal fuel if used with proper precaution. There should always be such number and arrangement of burners as will secure thorough diffusion of the heat liberated over the entire fire surfaces of the boilers. Once an installation is properly made, its operation is quite simple.

Probably the association will appreciate a word of warning on one or two points in particular. One of these is haste in raising steam from cold or cool boilers. Oil is rich in heat units and a large amount can be burned in the furnace in a short space of time. This makes it easy to get up steam too quickly.

Another danger lies in forcing the boilers too much. Oil lends itself readily to forcing the boilers away and beyond their rated capacity and there are frequent temptations to do this. Much caution will have to be exercised in these respects, if undue wear and tear is to be avoided, to say nothing of the liability to dangerous explosions.

INJURY AND DAMAGE CASES.

This subject was assigned to Mr. Frank E. Scoville, superintendent of the Austin Rapid Transit Railway Co., who opened his paper by reciting in part the experience for the past nine years of the road with which he is connected. During the first year that this company operated as an electric road it did not keep a separate accident account. The second year, 1893, it had such an experience that for the following year it insured with a liability insurance company, paying for that year \$1,200. There were two serious accidents during that year both of which might have been settled had the company been free to do so, but the liability company refused the compromise presented and suits were brought in both cases in which judgments were rendered much larger than the amounts specified in the compromise agreement. Meantime the liability company failed and the judgments had to be paid by the street railway company. From January, 1893, to March, 1896, the company paid out \$10,746 on account of accident and \$1,200 for interest, making a total of \$11,948 or an average of \$3,875 a year. Owing to this experience the company now settles its own claims. In the first six years these have amounted to \$5,708, or \$951 a year, showing much in favor of the present method. The main object of the company is to gain the confidence of the public, which has rights that should be respected. There are many ways of making a friend of the public. Accommodations that cost little or nothing make friends. Should anyone have a complaint to make listen to him, do not let him go away with the idea that you think your men can do no wrong. If the person makes an unreasonable or unjust complaint and abuses the employes, a motorman or conductor can hardly be blamed for talking back, still it is a poor policy to allow it under any circumstances. Give the men to understand that all controversies will be settled at the office. In many cases people get angry and say things that if not taken up by the employes would never be heard of again. When a complaint does come to you, do as you have promised, investigate it and see where the fault lies. Should the employe be in the wrong, explain the situation to him and give him to understand what is required in such case. Should the passenger be wrong, listen to him patiently, but it does little good to try and convince him that he is in error. The best way is to keep all your friends and give no cause for complaint against your men. With the public as your friend and the friend of the employes it will feel much more kindly towards you when an accident does occur.

One point to be kept before the employes all the time is to avoid accidents. When one does occur however, the men on that car are relieved at once and required to make a full detailed report giving names of witnesses, what they said, their addresses and all informa-

tion it is possible to obtain. Blanks for this purpose are furnished and also blanks for witnesses on which to make their statements. Witnesses will readily give a motorman or conductor a statement to help them where gross negligence does not show. These statements are used to determine the company's liability in the case or submitted to its attorney for opinion. The company believes in keeping out of the courts if possible, but does not believe in submitting to a hold-up. These attorneys are paid by the year and when a case cannot be settled out of court it is the company's policy to go into court to win. In many instances street railway companies are blamed for very thoughtless and careless actions of passengers. Passengers frequently attempt to jump off a car while in motion without giving the motorman time to bring it to a stop and if they happen to be injured their first thought is to sue the company, no matter whose fault it may have been. There are also a great many lawyers throughout the country who are only too anxious to take this class of work on contingent fees. A law has been passed in Texas regarding the solicitation of cases of this character on contingent fees. This law should be kept in mind. A few prosecutions for this offense will result in the loss of a lawyer's license to practice and will have a tendency to stamp out at once a part of this evil.

It is not to be understood that all cases against street railways are wrong, as this is not so. There are many instances where the employes do not have the interests of their employers at heart; they are impudent and careless in their work when they think they will not be found out. Then there is in new men a period of over confidence after they learn to handle a car during which accidents can be looked for. Besides the accidents caused by over-confident men there is another class of accidents that from force of circumstances are unavoidable. There is much agitation in the East concerning plans to prevent accidents and one which the author especially commended is that of the International Traction Co., of Buffalo, which was described in the "Review" for February, 1902, page 78. The author believes that the question of accidents is one of the most important with which street railway managers have to deal and at the same time one that does not receive the attention it should in many cases.

STREET RAILWAY MANAGEMENT IN TEXAS.

A paper on this subject was read by Mr. T. H. Stuart, of Waco, Tex., who said in part: In the Southwestern territory similar conditions prevail as to the management of street railway properties, and these conditions bear such a kindred relation to each other that we can very satisfactorily pool our experience and knowledge. We have about the same class of labor to handle, the same character of maintenance, of track, trolley and train and practically the same public. The street railway is a necessity to a growing town and the town is a necessity to the street railway. In other words, the street railway was born of the wants of the city, and the growth and development of the one is closely associated with the growth and development of the other. For this reason, the street railway manager cannot be too zealous or active in all public enterprises calculated to stimulate the growth of the city or the comfort and welfare of the citizens, and on the other hand the citizens should take as much pride and interest in the street railway as in any other enterprise within its boundaries. The obligations of the street railway and those of the people should be reciprocal. It has been stated that the best way to gain success is to attend strictly to business and to choose as a motto, "equal rights to all, special privilege to none." Assume an even tenor, upright dealing, courteous and proper methods of handling people and the consequence will be friendly relations between the street railway and the public with the ultimate result of good patronage and satisfactory receipts. The public is generally appreciative and the street car manager must learn what they appreciate and act accordingly.

It is astonishing how people can be trained when the task is undertaken and pursued properly. In most cities within the bounds of our association the distance are not so great, but that if the road displeases the public the public will walk and the road will suffer. The most important feature in street railway management is to keep the public posted as to what minute it can expect a car. This should be done in practice, not in theory. Posting a printed schedule as to when the cars are to be expected at a certain place

and having them there at that time are two entirely different propositions, and the man who follows the latter course is the one most likely to succeed. As a rule people are restless and when they have waited for the schedule time of the car to arrive and no car appears, they generally decide they had best walk. There are other ways, which I might call artificial methods, of inducing people to ride, one of the most successful ones being to induce riding by affording places of amusement. It has been conclusively proved that a pleasure resort operated in conjunction with a street railway will prove a benefit both to the patron and the railway. The character of amusement offered may vary considerably, but whether it is in the nature of a park, lake, theater or what not, it should be conducted in a clean, respectable and attractive manner. The predominating rule in furnishing these attractions seems to be that they should be free to the patrons of the street railway line. Where a theater is the attraction, which requires the use of a performing company and where seats are required, a charge for seats is usually made which in most cases covers the expense of the theatrical company, thus making a net gain to the railway company of all fares collected for transportation to and from the park. This in my opinion has proved a very satisfactory plan. Another important factor in inducing people to ride is a liberal transfer system which will land them at their points of destination for a fare of five cents. A good transfer system will undoubtedly greatly increase travel and if properly guarded from fraud will pay the manager who adopts it.

The success and reputation of a road depends to a large extent upon the treatment the passengers receive at the hands of the motorman or conductors. These employes should possess the traits of uniform civility, honesty, good judgment and tact, the latter most especially. While a manager should, of course, lay down rules for the government of his men with certain instructions to be followed, considerable latitude should be left the men in the handling of exceptional cases with which they are bound to be confronted. Many costly errors have been made by the poor judgment of conductors accompanied with stringent and ironclad rules with which they are often burdened. Accidents continually arise in which no general instructions can be given and when these occur it is expected that the employes will use good judgment. In selecting men for street railway service it is not always best to rely altogether upon the application blank. The usual questions are all good and necessary, but it is well for the manager to study the applicant to see if he has the proper mettle to take all kinds of abuse and petty annoyances which will continually fall in his way; whether he possesses good judgment and would sacrifice his personal feelings and resentment for the benefit of the company. Even if these decisions have been made by the manager and the applicant placed in the employ of the company, it still devolves upon the manager to study the man's predominating traits of character.

It is a question worthy of discussion whether motormen or conductors should be expected to have a sufficient technical knowledge of electricity to make repairs on their cars in case of breakdowns during a run. It is my opinion that a man cannot have too much knowledge, but it is my firm belief that if he possesses enough knowledge of electricity to entrust him with the making of repairs he is best fitted for the line, shed or power house. A motorman after long service may become proficient in all branches of the service, but his prime duty is to learn to start and stop a car, especially the latter. If he does this successfully and keeps clear of all vehicles and pedestrians and keeps his time, he has his hands pretty well filled.

The subject of accidents has already been well handled, but I will simply touch upon one point which is expected of the motorman or conductor in the case of accident. Too often the motorman or conductor, either by poor judgment or faulty instructions, goes about taking statements in a manner which makes a very bungling job of the whole affair or leaves it in a very awkward condition to be handled by the claim agent. It is a very common thing, especially in a new motorman, to excuse himself to any injured party by stating that if the brakes had been in working condition he could have avoided the accident. Such a man's head should come off at once. He should have simply stated the truth and we all know the truth under such circumstances is that none but the latest and most improved appliances are in use. Other motormen perhaps show too much concern over a trivial accident, and this often causes a damage suit where if the concern had not been shown the matter would have passed over unnoticed.

SELECTION OF STREET RAILWAY MOTOR EQUIPMENTS.

By F. A. JONES, M. E., HOUSTON, TEX.

From the nature of my subject you will undoubtedly expect of me a paper somewhat technical, for it is my business to deal with the technical side of electrical interests. I shall endeavor to point out some of the problems that arise in handling any electric street railway service and then show the difference in cost of power, and hence, economy of operation, for different methods and equipments. I am going to make a statement that I know will be a matter of surprise to you, perhaps be doubted by some, but it is based on a study of the condition of a large number of roads, and I believe would be well within the bounds of what actually is the case if a thorough canvass and investigation were made. Fifty per cent of the electric roads of the United States are consuming at least 40 per cent more power than is necessary to operate their cars and make their schedules; another 25 per cent are consuming 20 per cent more power than is necessary; 15 per cent are using 10 per cent of needless energy, and the remaining 10 per cent of the systems have been thoroughly analyzed and are operating on the best possible economy. This statement would be endorsed by engineers in the East, older in the electrical fields than I am, so that there is a vast field opened up for effecting a saving in cost of operation of the majority of railway systems, if only this one item of saving in energy, by reason of adaptability of equipment, is considered. Besides the saving in energy consumption, by reason of the nature of equipments, there are other problems of expense constantly before the street railway superintendent that I shall not attempt to treat, among these might be mentioned cost of labor and maintenance, and under these items would come the arrangements for handling at the car barn, the economy of the power plant, the difference in fuels, closeness of inspection, the energy lost in the line, the rail bonding, etc.

My subject deals only with the railway motor equipment, and what should enter in when making its selection. In the first place the rating of the railway motor is a matter of temperature; the horse power is purely nominal and really indicates the commutating capacity of the machines. It means that if the motor is placed upon the stand and run at a current and voltage necessary to give its rated horse power for one hour the temperature rise will be about 65 degrees C. A motor on any railway service, if the cycle of events is steadily repeated, has a certain fixed rise in temperature, with small variation from this temperature. For example, if we have a ten ton car making a round trip of five miles in 30 minutes, with an average of five stops per mile, and including five minutes in lay overs and each stop an average of ten seconds in duration, and the average passenger load is included in this ten tons, then, for a certain motor, with a certain gear and pinion, there would be a certain rise in temperature which can be correctly calculated by knowing the characteristics of the motor. As you well know the smaller the pinion the lower the speed of the equipment, and the larger the pinion the higher the speed; for the distance between centers of gear and pinions cannot be changed for any one motor design; so that with any motor low or high speed gearing may be furnished, and as a matter of fact, eight or ten different sizes of gears are manufactured for each standard motor by the large companies. The speed of a motor may also be increased by decreasing the number of turns per coil of the armature. Thus we have one turn, two turn, three turn, four turn, five turn and six turn machines, and a few with even a greater number of turns. Very large motors have only one turn per coil when used for elevated railway service. Each manufacturing company gets out a line of railway motors ranging from 20 horse power to 250 horse power rating and each size of motor may have different sized pinions and gears and a different number of turns per coil in the armature; so that in making a selection of the proper motor equipment to handle any service we have three or four hundred different equipments to select from. Some engineers, and some of the best engineers, have specified a high maximum speed for every condition that would stand it. This necessitates high speed gearing, which means a lower tractive effort; that is, a greater current is required for obtaining the same tractive effort with high speed gear than with a low speed gear. Where the stops are few, for example, once every two miles, as in interurban or suburban service this may not be so

important, but in heavy city service where the stops are six and seven per mile, for low energy consumption, the equipment must be low speed, and at the same time nothing is lost in time, for the low speed equipment will accelerate more rapidly than the high speed equipment.

There is a method of representing pictorially the service conditions of any railway line, and this is called a service characteristic. It is based upon the fact that a motorman will repeat the same cycle of events very closely on going over the same ground and in the same time. If we represent as abscissae or in a horizontal direction, time, and as ordinates, or in vertical direction, speed, and plot the cycle of a car from start to stop, first accelerating and then running on the motor curve, free, running at a uniform rate, coasting, and then breaking, we can draw this service characteristic and the area of the figure will be the distance covered.

Thus by going over a service, averaging the distance between stops, and the time per stop, taking the number of passengers at 10 o'clock in the morning, about the lightest service, and 6 o'clock in the evening, about the heaviest service, and thus getting the average load; if necessary dividing the line up into sections, especially where part of the running is in the city and part suburban, we might get very closely to the conditions of operation.

Now it is very important that the temperature rise of the motor shall not be excessive. It is estimated that if the rise in temperature is 100 degrees C. the motors will begin to burn out after one year's service, and will give probably a great deal of trouble the first year. If the temperature rise is 90 degrees the probabilities are that no trouble will be experienced the first year, the second year there will be some trouble, and the third year new coils will probably be required for all the motors. With 65 degrees rise the motor should last seven years, so that it is very important that the rise in temperature should not exceed this amount, and it is important to determine the expected rise before the motor is bought. This may be done very closely if each motor is tested over a wide range of services and the temperature is accurately taken. It is not probable that any service condition in practice would be identical with the conditions of one of these tests, but this is provided for in the following manner. If the degree rise is divided by the number of watts lost in the field, and also by the number of watts lost in the armature, we get a series of values giving degree rise per watt lost for both field and armature for different ratios of distribution of losses. The ratio of distribution means the watts lost in the armature, divided by the watts lost in the field, and for every service there is a certain distribution of losses to be expected. The armature loss of the motor is made up of the core loss (which includes the eddy currents in the iron and copper) and the $C^2 R$ loss, C representing the current through the armature and R the resistance of the armature. The field loss is entirely a $C^2 R$ loss, the current of the field being the same as that of the armature, as railway motors are series motors, but R representing in this case the resistance of the fields.

Now, if by our analysis of the service condition we can determine the ratio of distribution of the losses to be expected from the tests of the motor itself, we can determine the temperature rise, and this rise can be determined within three or four degrees. The motor that has high core loss cannot be used for high speed work and long distances between the stops, for the core loss increases with the speed; but it is not so essential to have low core loss for a large number of stops per mile.

The best motor for interurban work is one with high resistances, and low core loss; for city work low resistances and as high core loss as is necessary. It is not possible to reduce the core loss below a certain point, for in intermittent work low armature reaction and high flux are necessary, and with high flux comes naturally high core loss.

I have tried to point out how the question of temperature primarily affects the selection of the equipment. Almost as important is the question of energy consumed, which is generally calculated in terms of watt hours per ton mile. The watt hours per ton mile for a 14-tooth pinion would be less than for a 17-tooth pinion, using the same motor and making the same schedule, with all other conditions the same, but the maximum speed would be less, and it might be that not quite as fast a schedule could be made by it. If it is possible to make the desired schedule however with a 14-tooth pinion, it would be much preferable to use it in spite of the fact of it not giving as high maximum speed as would be reached on a level.

One of the elevated railway companies in the North could undoubtedly save 10 per cent of the money expended for power by reducing the number of teeth of their pinions by two, and still make the same schedule that they are now making.

I will close with an explanation of what is proposed by the two largest electrical manufacturing companies in regard to approximating service conditions in making tests on railway motors.

The Westinghouse company proposes to run at such a voltage and current as will give the losses met with in practice with the motor mounted upon a stand. This is undoubtedly the most convenient method of testing, but I do not believe it approaches near enough to service conditions. The method of the General Electric Co. of actually running the motors at a voltage at which they will be used in practice on an experimental railway and obtaining in this manner the motor characteristics, seems to me to approach nearer the absolute conditions in practice. I know from experience that there is a difference in the way the motors act when stationary and when on a car, as to ventilation, heating and general operation.

PROGRESS CLUB OF TEXAS.

A short paper in regard to the Progress Club of Texas was read before the convention by Mr. E. H. Jenkins, president of the San Antonio Traction Co. Last fall when a New York delegation composed of the representatives of the principal business organizations of New York visited Texas, many important features looking to the development of Texas were considered not only by the New York delegation but by the representatives of the business interests in the various cities of Texas. It was evident during this meeting that there was a great lack of knowledge in regard to the resources as well as the laws of the State of Texas. This lack of knowledge was not confined to the representatives of foreign states but was shown to exist to a large extent among the citizens of Texas. Realizing how serious was this lack of knowledge on the part of all concerned, Mr. Edwin Chamberlain, who was of the reception committee in charge of the New York delegation, commenced the organization of what has since been named the Progress Club of the City of San Antonio, and it is aimed to have similar organizations in a large number of the prominent cities of Texas. The objects of the organizations are to direct political activity along business rather than political lines with the intent of fostering the commercial interests of the state and developing its natural resources. While this organization has no direct interest in the special business represented at the Southwestern Association, yet everything that pertains to the betterment of the State of Texas reflects in a greater or less degree upon the business of the gas, electric light and street railway companies and it is believed that these various companies will be interested to help forward any movement having such an object in view.

OFFICERS.

The officers elected for the ensuing year were as follows:

President, E. H. Jenkins, San Antonio, Tex.; first vice-president, C. F. Yeager, Laredo, Tex.; second vice-president, E. Dysterud, Monterey, Mex.; third vice-president, A. E. Judge, Tyler, Tex.; treasurer, Thomas D. Miller, Dallas, Tex.; secretary, H. A. Evans, San Antonio, Tex. Directors: The president, the vice-presidents, the treasurer and H. F. MacGregor, Dallas; T. H. Stuart, Waco; S. A. Spencer, Jennings, La.; H. T. Edgar, El Paso; W. A. Guthrie, San Angelo, Tex.; J. R. Ward, Beaumont.

It was decided to hold the 1903 meeting at Dallas, Tex., the date to be fixed later.

The San Antonio meeting of the Southwestern Association was a success in point of attendance, there being 32 representatives of members and 39 visitors present.

The Michigan Traction Co., of Kalamazoo, began tracklaying on its interurban line between Battle Creek and Marshall, May 1st, and expects to complete the work in six weeks, though the road will not be put in operation before September. The line between Albion and Jackson is nearing completion, and a 1,000 ft. bridge across the Michigan Central and Lake Shore railroads and the Kalamazoo River at Albion is in course of erection.

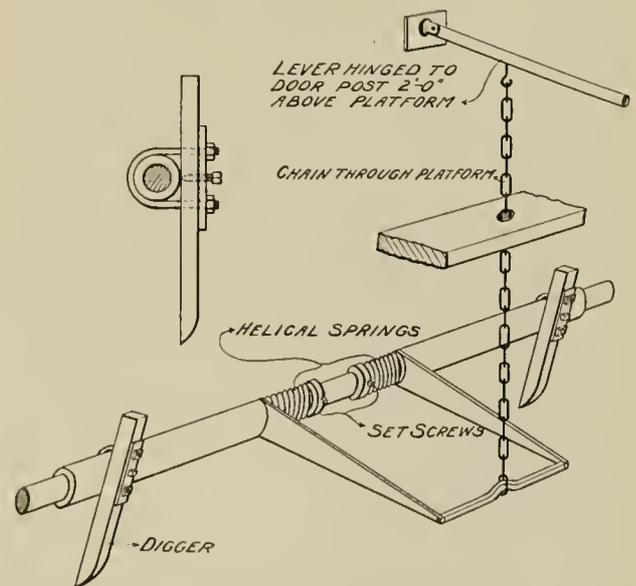
DIGGER FOR CLEANING GROOVED RAIL.

The chief objection to the grooved rail has always been the tendency which it presents for dirt, ice, stones and other material to collect in the groove, thereby increasing the loss of power through increased friction and poor contact. For keeping the groove of the rail clean in city streets where its tracks are laid with grooved rail, the Washington (D. C.), Alexandria & Mt. Vernon Ry. uses a digger devised by Mr. J. Colvin, the superintendent.

The form of the device as used with maximum traction trucks is illustrated in the sketch on this page. Modifications of this form are necessary with different types of trucks to suit the amount of space available.

The essential parts of the contrivance are the two digger pieces which are carried, one on either side, just above each rail and immediately in front of the forward wheels. The diggers are iron bars 1x1½ in. and 2 ft. long, having at their lower ends a piece of steel welded to the bar and made plow shape. When the device is in use these steel ends travel in the rail groove and throw all dirt from the groove toward the center of the track.

The digger pieces are carried on a frame comprising two pieces of 2½-in. iron pipe through which is passed an iron bar 1½ in. in



FOR CLEANING GROOVED RAILS.

diameter. The bar extends the full width of the truck and is rigidly fastened at both ends in properly shaped castings which are bolted to the truck frame. The shape of the castings will depend upon the style of truck. The digger pieces are attached to the iron pipes by U bolts as shown in the detail sketch, a set screw serving to permit proper adjustment.

At their outer ends the two pieces of pipe bear against the special castings mentioned and at their inner ends come in contact with helical springs which in turn bear against two collars held in place on the iron bar by set screws. This spring bearing gives flexibility and is essential to prevent the digger pieces from being broken by reason of inequalities in the track or other causes.

To the inner ends of the two pieces of pipe are rigidly fastened two arms which are joined by a cross piece and to which is attached a chain that passes up through the car platform and engages an iron lever hinged at one end to the door post. It will be evident that the motorman by raising this lever causes the pieces of pipe to rotate about the iron bar, thus bringing the digger arms down into contact with the rail. When running over T rail or where the digger will not be required the digger pieces are held back from the rail by chains to the truck frame and these chains must be disengaged by the motorman or conductor before the device can be brought into action.

A new electric line has been opened between Harrisburg, Pa., and Mechanicsburg. The first trip was made April 17th.

MASSACHUSETTS LEGISLATURE.

This year the Massachusetts Legislature has inaugurated a somewhat new policy in street railway matters. Heretofore the policy has been to keep the street railway business confined to strict lines, the paralleling of lines of existing railroads has been allowed in but very few cases, the carrying of freight has not been permitted and the lighting of streets is a privilege that has been withheld. In fact, all outside tendencies that would establish a precedent for future conflict with other vested interests, have been considered an illegitimate field for the street railway.

As mentioned elsewhere in this issue the granting of lighting franchises to street railway companies is under consideration, both street railway and lighting committees having bills under consideration.

The privilege of carrying United States mails and small parcels has been extended in a number of instances to include baggage and farm products on lines that practically parallel existing steam roads, though, of course, these old lines did not pass the farmer's door as do the electrics. In one or two cases, full freight carrying privileges have been allowed, though these have been where the electric roads were at right angles to the railroad, and are supposed to act as feeders for the latter, and the grants were not opposed by the railroad's attorneys. In these cases physical connections of the rails of the two companies are to be made and foreign freight cars are to be hauled up into country districts.

Another innovation is requiring street railways to pay a portion of the cost of abolishing railroad grade crossings where the street railways have locations. Up to the present time the railroads have paid 65 per cent of this cost, the state 25 per cent and the city and towns the remaining 10 per cent. The state has already expended \$5,000,000 in its share, and this year another loan of the same amount is about to be authorized. As a means of making the money go further, it is proposed to have the railroad's proportion remain the same, the street railway to pay 15 per cent and the state, city and town divide the remaining 20 per cent.

A question has arisen late in the session, which the street railway association proposes to fight to the bitter end. This is the matter of paying street paving assessments. In Pittsfield there has arisen a great demand for the paving of the main streets. The local street railway invokes the excise law passed in 1898, which it claims is a special tax by which the companies pay for the use of streets and the repairs thereof, and so should be exempt from further assessments for street improvements.

Another new proposition is to permit consolidation of a street and a steam railroad. In the towns of Grafton and Upton is a small railroad of something under ten miles in length that has now been paralleled by an electric line. Capitalists have obtained control of both and also of some connecting electric lines and want to consolidate and divide up the freight and passenger business.

In connection with this a bill was introduced to allow railroad companies to purchase stock in street railway companies that is about to be reported by the committee. It provides that after the railroad company has acquired two-fifths of the stock of a street railway company the railroad commissioners may fix a price at which owners of the balance of the stock may sell.

The Stoughton & Randolph Street Railway Co., which is in the hands of a receiver, is a petitioner for rather odd legislation. It seeks to clear up some of the legal entanglements hanging over the property by asking the Legislature to authorize it to give a clear title to the purchasers, the property being about to be sold by order of the court.

The Legislature is also considering a bill based on a recommendation of the governor that locations granted by boards of aldermen and selectmen be approved by the railroad commissioners. The bill will probably pass.

A bill defining the expenditures for which street railway companies may get authority to issue bonds or stock has been passed, on the advice of the railroad commissioners, who, heretofore, have been left to their own judgment to decide what was a legal expenditure to be met in this way.

The law authorizing street railway companies to carry road-making materials for cities and towns has been extended so that one company may transfer such loaded cars to another line in cases where one company's line does not extend from the city or town through to the quarry.

The street railway committee is about to report a bill to incorporate a company to build a line from the New York State line to Springfield through an extremely sparsely settled locality, and in doing so will grant unusual privileges in the way of carrying freight, etc. It is the longest line under consideration this year, but a great many people have grave doubts if the road will be built even with the extraordinary privileges allowed. ROB.

THE SPRAGUE COMPANY'S NEW BOSTON OFFICE.

The Sprague Electric Co. has found it necessary to move its Boston office into new and larger quarters to enable it to handle the increasing business in the New England district. The company has taken a suite of offices in the Weld Building, 176 Federal St., which is one of the most desirable office buildings in Boston. The location is extremely good and is convenient to the South Terminal Station which is almost opposite. The Weld Building is a new and modern office building with well lighted offices and the fastest running elevators in the city. Mr. H. C. Farnsworth continues as manager of the Boston office. He has recently added to his staff Mr. George D. Simmons, who was formerly superintendent of the Hawks Electric Co.

DAVENPORT & SUBURBAN RY.

April 12th, the Davenport & Suburban Ry., was granted a franchise for the construction and operation of street car lines in the city of Davenport, for a period of 25 years. The franchise provides that the company shall pay to the city the sum of \$2,000 per year as a bonus, commencing August, 1905, shall commence work within 90 days of the acceptance of the franchise, and shall allow the Davenport & Western Ry. the use of the Fourth St. tracks for one train an hour on the annual payment of 2 per cent of the cost of construction of the track so used. The Davenport & Suburban accepted the franchise as soon as it was granted by the council and deposited the \$10,000 forfeit provided for in the ordinance.

BULLOCK ANNOUNCEMENT.

The Bullock Electric Manufacturing Co., of Cincinnati, makes the following announcement in regard to matters concerning which it states false reports have been circulated, much to the annoyance of the company:

The Bullock company is not and does not contemplate negotiating the sale of its plant; the company is a close corporation and none of its stock is owned by its competitors; the controlling interest is owned by the officers of the company; the company is now building machines up to 3,200 kw. and has under construction a new shop which will give facilities for making units up to 10,000 kw. capacity; the only patent suit now pending is in relation to Tesla induction motor patents; the company has not been sued on its direct or alternating current generators, rotary converters or transformers, and it thus far won all the patent cases in which it has been involved.

INTERURBAN TERMINAL AT CINCINNATI.

The Interurban Terminal Co., of Cincinnati, which is capitalized at \$100,000, was incorporated May 2d for the purpose of providing terminal facilities for the entrance of interurban railways into Cincinnati. The incorporators of the company are G. R. Serugham, George H. Worthington, J. M. Kennedy, Lee H. Brooks, W. E. Hutton, C. H. Davis and Guy W. Mallon. A deal was recently closed for the purchase of a large tract of ground on Sycamore street for this company. The depot which is to be erected on this site will be six stories in height and will contain trackage on the ground floor to accommodate a number of cars. The depot will not be exclusively for the lines of the suburban syndicate, but if any other interurbans entering Cincinnati desire to have a terminal at the depot they will be accommodated.

The Georgetown & Lexington (Ky.) Traction Co. put three new cars in commission on its interurban line May 1st.

ALL YEAR ROUND CARS.

Open cars for the summer season are demanded by the public on small as well as large roads, and where there are interurban connecting lines, amusement parks, or where the roads run far into the suburbs, it is almost impossible to operate successfully without them. On the warm days of spring and autumn the receipts are usually substantially increased by their use.

On the other hand, open cars eat up their profits during months of idleness in the car barns. The expense of a double equipment



BRILL SEMI-CONVERTIBLE CAR FOR BEAVER VALLEY.

of cars, trucks, and motors, and the consequent enlargement of car barns, is heavy. A double equipment of merely the car bodies reduces the initial expenditure, but is seriously objectionable on account of the time and labor required in changing. The popularity of the open car, from the standpoint of the manager, is further diminished by complaints from the public if it is not taken off the street on the first chilly day, or put in service on every unseasonably warm day.

The public makes no allowance even if it considers that to meet its wishes would require a double equipment instantly available at



BRILL CONVERTIBLE CAR—CLOSED.

all times. In fact, the demand for an open car is hardly less imperative than the demand for a car which will meet all conditions of weather between seasons and out of seasons.

Almost every year since the first open car was built, there have been attempts to produce a car suitable for use all the year round, many of which were failures. Some were clumsy in appearance, difficult to operate, and many of them had no side entrance. The demand has increased notwithstanding the many failures.

There are two classes of convertible cars, those which contain their movable parts when not in use, and those from which the movable parts are detached. The limitations and defects urged against the latter class are the time required to make changes, the fact that changes are necessarily made at the place of storage, the breakage and injuries incident to changing, the space occupied in storage, and time of changing dependent upon guesses as to future weather conditions.

The design of self contained convertible cars was undertaken by Mr John A Brill, of the J G Brill Co., with the following requirements in view; the car when closed must be weather proof; the windows to be of regulation size; no unsightly parts associated with the storage arrangement to be left in evidence; in all, a box car of the usual type, including all the present-day features. The car when open must be easily accessible at the sides; the movable parts entirely concealed within the roof in such a manner as not to alter materially the roof's appearance; and, to include all the advantages of the best style of summer car. The convertible mechanism must be simple in character and easily operated.

The Brill convertible car has long passed the experimental stage, and the company states a large number having been in service for several years in different parts of this country. South America and Europe, they have been thoroughly tried under varying conditions, and in every case have fully answered expectations. At the Paris Exposition of 1900 this car was awarded the Grand Prix entirely upon the merits of its convertible system.

The Brill convertible car does not differ in appearance, externally, from the standard types of open or closed cars, except in a few insignificant details. Nor does it differ in strength of construction, no feature having been gained at the expense of strength and durability. The conversion from one type to the other, is accomplished in a few minutes, without stopping of car.

The distinctive features of the Brill convertible car consist of a set of posts carrying a complete set of sash, panels, and roller curtains; and a recess in the roof so constructed as to contain within very narrow limits these sash, panels, and roller curtains, completely hidden and securely held.

The panels are made of two sheets of metal, between which, at intervals, are horizontal slats. Being elastic, these panels conform to the curved outline of the posts. The sash are made in two parts, hinged together, the division being well above the line of

Sash and panels apparently slide in the same groove (one is within the other), and separate on entering the roof recess without the intervention of switches or mechanism of any kind. The Brill round-corner seat-end panels permit the roller curtains to be drawn to the floor.

The same classification made in the foregoing with reference to the method of disposing of the movable parts applies to the windows of the semi-convertible cars. The car is either self-contained or with detachable windows. The limitations and defects of the detachable system are of course the same as mentioned before. Another class should be added, namely, that in which the sash drop into pockets in the wall. The disadvantages of this method are said to be that it detracts from the interior width of the car, and adds to the height of the window rail, and the pocket affords a receptacle for newspapers and rubbish, which soon clog it up.

The chief difference between the convertible and the semi-convertible car lies in the fact that the former has side entrance like the ordinary open car, to permit of rapid loading and unloading. While this advantage is important on many roads, the semi-convertible car is considered by other managers to be the most satis-



INTERIOR OF BEAVER VALLEY CAR.

factory style of car for interurban service, as being safer where the speed is high, and in cases of accident.

The large windows and low window rail, together with the arrangement for storing the sash in the roof, are the chief features of the semi-convertible car. It does not otherwise differ in appearance from the usual type of closed car, having the monitor deck, drooped platforms, cross seats and centre aisle. Another point in the Brill semi convertible car on which stress is laid is the additional inside width obtained, actually 7¼ in. The comfort of

the passengers is thereby increased by wider aisles and longer seats, this extra width is secured without in any wise sacrificing structural strength. The system of roof pockets, windows, and roller curtains is practically the same as in the convertible car, the difference being that the roof pockets are narrower, and the windows larger and the sections not hinged together.

An admirer of this car has said that the astonishing facility with which the windows are raised and lowered produces a sensation



CONVERTIBLE CAR—OPEN.

akin to that experienced in assisting in a sleight-of-hand performance. It is accomplished before ones eyes, but just how is not apparent. Investigation reveals the fact that the sections of the window are separate and that the lower and larger, in being raised, slides up behind the smaller, and engaging it automatically without pausing carries it into the roof.

A NEW ELECTRIC RAILWAY TRUCK.

Within the past few months the Powell & Turner Truck Co., of 107 Washington St., Troy, N. Y., has brought out a new form of truck for electric cars, which has been termed the "New Century" truck.

In presenting the new type the company makes the following claims: The truck has an exceptionally long car carrying spring bearing; it has a right and left side spring with one end to the car sill, while the other end engages with a cross spring which supports the car at its ends, allowing but the platform and timbers to project beyond the spring bearing; it is non-oscillating while in motion; it will carry its load all on one end and not tip down, but will carry the car body straight; it has an equalizing bar which carries the weight from the end of the truck frame to the journal, it has a relief spring at one end of the equalizing bar, which takes all the jolts and jar off the wheels while passing over the joints, frogs and switches; it is constructed entirely of steel; its frame is made in a truss shape and warranted not to bend; all the prin-



POWELL & TURNER "NEW CENTURY" TRUCK USED IN ALBANY.

cipal parts are riveted together; it has a new three-lever wheel brake believed to be exceptionally powerful and reliable; its parts are simple, durable and strong.

The "New Century" truck has been running for the past eight months on the Albany division of the United Traction Co., of Albany, N. Y. Messrs. Charles Powell and James Turner, patentees of the truck are experienced railway men. Mr. Turner is foreman of the electrical department of the New Albany cars of the United Traction Co. Mr. Powell was for years connected with the Gilbert Car Manufacturing Co., of Troy, N. Y.

The Kansas City-Leavenworth Railway Co. will erect a new depot at its present terminus in Fort Leavenworth.

LIVERPOOL CORPORATION TRAMWAYS.

The first annual report of the general manager of the Liverpool Corporation Tramways has just been published, covering the year ending Dec. 31, 1901, this being the first complete year of electric traction in the city. The transfer of the lines was made from the Liverpool United Tramways & Omnibus Co. on the 31st of August, 1897, when the lease of the lines in the city, which were owned by the corporation, had over 17 years to run. The purchase price was fixed by agreement at £507,375. At that time the total length of single track was about 75 miles and the number of cars in service, 297. The changing and reconstruction of the lines was taken up immediately after this purchase and one route was equipped with the overhead trolley system as an experiment and was opened Nov. 16, 1898. The experience with this road was such as to do away with the objections which had been formerly raised against the overhead system, and it was eventually decided to reconstruct the whole of the existing system, putting in electric traction, and also to build about 46 miles of additional track for which Parliamentary powers were granted. The work of reconstruction was commenced in January, 1897, and by October, 1900, nearly 100 miles of line had been reconstructed. The last horse car in the city was taken off the road on Dec. 15, 1900. The track has been laid with 60-ft. girder rails, weighing 95 lb. per yard, having a tread of 2½ in. in width and a groove of 1 in. by 1 in.

Various joints have been used, including the Cooper patent rail joint, the Falk cast-welded joint and the ordinary fish plate joint. Where the latter has been used the bonding has been by means of two No. 0000 "Crown" flexible bonds.

The paving has all been laid upon a Portland cement foundation 6 in. in thickness, and is principally of granite sets. The exceptions to this are about four miles where Australian hard wood blocks have been used and a length of one mile laid with prismatic oak blocks. The construction of the roadbed was carried out by the corporation under the supervision of the city engineer. Some of the special work, which is very complicated, was supplied by the Lorain Steel Co.; one junction supplied by this company comprised 16 points. The overhead electric equipment was carried out by Messrs. R. W. Blackwell & Co., Ltd., London. On narrow streets span wire construction is used, and where arrangements could be made the spans were supported by rosettes attached to the buildings on either side of the street. Wherever the streets were sufficiently wide to permit it center poles were used.

The power for the road is supplied at 500 volts pressure from the power station of the corporation, which also supplies current for lighting and other power purposes. Two new stations are in the course of construction and when completed will each have a capacity of 15,000 h. p. The units adopted in these stations consist

of a Willans engine of 1,200 h. p. direct connected to a Siemens dynamo, giving an output of 1,450 amperes at 550 volts.

The gross profits for the year amounted to £147,057 and the net credit balance to £52,822, out of which is to be drawn a sum for both depreciation and renewals.

The company which has begun the construction of the proposed Nashville (Tenn.) & Gallatin and Nashville & Columbia Electric Rys. contemplates a third line which will connect Nashville and Huntsville by way of Murfreesboro, Shelbyville and Fayetteville. Charles W. Ruth, Frank Haskall and John H. McMillan, of Pittsburg, are reported to be the principal promoters. Construction work is in charge of J. H. Connors, Wilcox Building, Nashville.

LONDON'S TUBES, TRAMS AND TRAINS.

An interesting paper on this subject was read by Mr. J. Clifton Robinson, before the Society of Arts, London, on March 19th. Within the past 12 months two pressing problems regarding rapid transit in London have come prominently before the public mind. One of these is how the "tangle of locomotion" in the Metropolis is to be straightened out and relieved, and the other is the question of the greatly extended use of electricity in locomotion. Mr. Robinson's address included a review of the past progress of electric traction, a statement of its present position, more especially as regards London, and a glance forward to its future development.

Nearly 20 years ago the author, at the request of the Royal Scottish Society of Arts, read a paper on tramway traction. At that time the cable had just come into vogue in America and was far in advance of any other form of mechanical power for surface lines. He then, however, expressed the view that we should do well to preserve an open mind for future developments, and since then his whole time has been devoted to the practical application of electric power at home and abroad. He was engaged to years ago to prepare the plans and carry forward to completion the construction and equipment at Bristol of the first electric tramway in Great Britain built under the existing stringent regulations of the Board of Trade.

In reviewing the past history of electric traction in England the insufficient and meagre advance made in that country in the direction of tramway extensions are considered largely due to the tramways act of 1870. The burdens and hindrances laid by that act upon the promoters of tramway enterprises have been so great that the record of tramways in the United Kingdom showed in 1890 only about 160 roads in existence, covering less than 1,000 miles of route. A few of these sections were operated by cable, locomotives were used on a few others, while all the rest of the lines in the kingdom used horse propulsion. In view of the obstacles put in the way of tramway building a determination seems to have been arrived at that cars should not be allowed to operate in London's most crowded and therefore most necessitous thoroughfares. Yet, in spite of this blunder the returns show that with about one-eighth of the mileage of the kingdom, suburban London supplied about one-third of the number of passengers. Notwithstanding this encouragement to provide more of such a manifestly popular means of urban travel, we see to-day in London on one side an obvious necessity for the speedy improvement of the means of locomotion to, in and through the metropolitan area, and on the other side a most bitter opposition on the part of nearly every man in power and an endeavor of local authorities to hamper and obstruct attempts to grapple boldly with the vast and pressing problem.

Previous to the issue of the Board of Trade regulations two successful efforts to work a tramway by the overhead trolley system had been made in England. The first electric tramway which followed the issue of the Board of Trade regulations in 1894 and which was established in conformity therewith was the one in Bristol previously mentioned. This line proved an instant success and has been operated without stoppage or accident in the six intervening years. This first example of an electric tramway in a city formed a standard for future guidance. It proved conclusively that a district could be opened up under electric traction which, with only horse power available, must, owing to its gradients, have remained without a tramway. So unequivocal was the conversion of the citizens of Bristol from doubt or opposition to enthusiastic approval that the Bristol Tramway Co. at once proceeded to convert all its existing lines and to extend its mileage in various directions under electric traction. A fine power house lately completed and capable of developing 7,000 h. p. is no more than sufficient to meet the demands entailed by the continuous growth of the company's traffic.

An important event in the development of electric traction was the passing of the Light Railways Act in 1895. When the act came into operation the use of electricity for traction had not advanced very far, but the effect of the act is seen in the difference in the application made under it for the first 18 months. The proposed projects submitted to the commission at the beginning of this time numbered for steam locomotion, 53, of 626 miles, and for electric traction, 32, of 324 miles. For the last year the applications for steam roads numbered 9, of 59½ miles, and for electricity, 54, of 595 miles.

The laws in regard to the tubes, trams and trains are rather

anomalous, as for each of these different styles of roads different laws and practices exist. If a tramway is to be constructed, the General Tramways Act of 1870 with its purchase clause and other difficulties blocks the way. Light railways come under a different law but with difficulties peculiarly their own. The railway stands on a still different footing and it possesses the distinct privilege of going before Parliament on its merits, an advantage hitherto denied tramway undertakings. It was especially recommended by a joint committee of Parliament which sat last year that the London problem should be largely met by means of underground lines within the more congested parts of the city and its immediate suburbs, joined up for the purpose of interchange of traffic with electric surface tramways, etc., in the suburban districts. It is here a curious anomaly is encountered. To follow these rules under existing arrangements the surface lines must be promoted as tramways while the tunnels, although designed to form integral portions of the through service, must be promoted as railways. In one case the two-thirds consent of the various local authorities concerned must be obtained by previous negotiations or the project will fail, while a railway whether it be a tube or shallow tunnel comes at once into court on its merits, and cannot be wrecked by interested opponents or obstructive municipalities. The author joins with everyone who has recently spoken or written on the subject, that one of the greatest obstacles to electric progress in Great Britain has been the discouragement presented on the one hand to scientific and manufacturing skill and on the other hand to financial enterprise, by the shackles and hindrances which legislation has imposed.

There has been evidence of some gradual change of public feeling as electric lines have been opened up to traffic and the real benefits of the service have become manifest. But the irreconcilable opponent of tramways in any shape still exists and the hardness of heart of local authorities in striving to impose impossible conditions is as yet little abated. Small wonder it is that Great Britain lags behind the world in electrical development and that even when the lighting and tramway project has succeeded in being authorized it is necessary to come to the United States for much of the plant and machinery special to such undertakings.

One point of government interference referred to by the speaker which threatens to give great trouble to electrical undertakings of all kinds is the determination of the postmaster-general to introduce clauses alleged to be required for the protection of the telegraph and telephone wires which would place in the hands of the post office the power of controlling every electrical undertaking in the country. These clauses are certainly harmful to tramway enterprises. Attention is also drawn to another sign of danger to electric traction as regards underground lines or shallow railways under the streets, parks, etc. A paper recently read at a meeting of the Auctioneers' Institute of the United Kingdom dealt with the "problem of the tubes." The paper dealt principally with the land owners' position in this matter, and it is pointed out that only such a depth of ground is vested in the road authority as is needful to enable sewers, etc., to be constructed and the road to be kept in repair, while all the soil below belongs to the adjoining land owners. Owing to the great value of the surface it is often customary to sink double basements under the sidewalks and in other cases to run connecting tunnels under the streets between two buildings of the same owner on either side of the street. As the tube railways are run at various levels their construction might render it impossible hereafter to carry out double basements or subways, and this point constitutes a danger signal to which promoters of underground lines would do well to take heed.

Having thus glanced at the earlier history of electric traction in London and indicated some of the difficulties which have hampered progress in the past and which still threaten in the future, the author proceeded to describe the outlook in the immediate future. Of electric tramways in London the leading place is occupied by the operations of the London United. It is generally known that the London County Council obtained control of the tramways in South London six years ago and that the actual progress there is limited so far as electricity is concerned, to a decision to begin to convert a portion of the existing horse car lines to underground conduit. The Middlesex County Council has, owing to the pressure of public opinion, abandoned its obstructive tactics so that it will in the future work in harmony with the enterprise in which the development of greater London is so largely concerned.

As regards "tube" electric railways, the position in London shows:

LINES IN OPERATION.

- The City & South London Railway, opened in 1800.
- Waterloo & City Railway, opened in 1868.
- Central London Railway, opened in 1900.

LINES UNDER CONSTRUCTION.

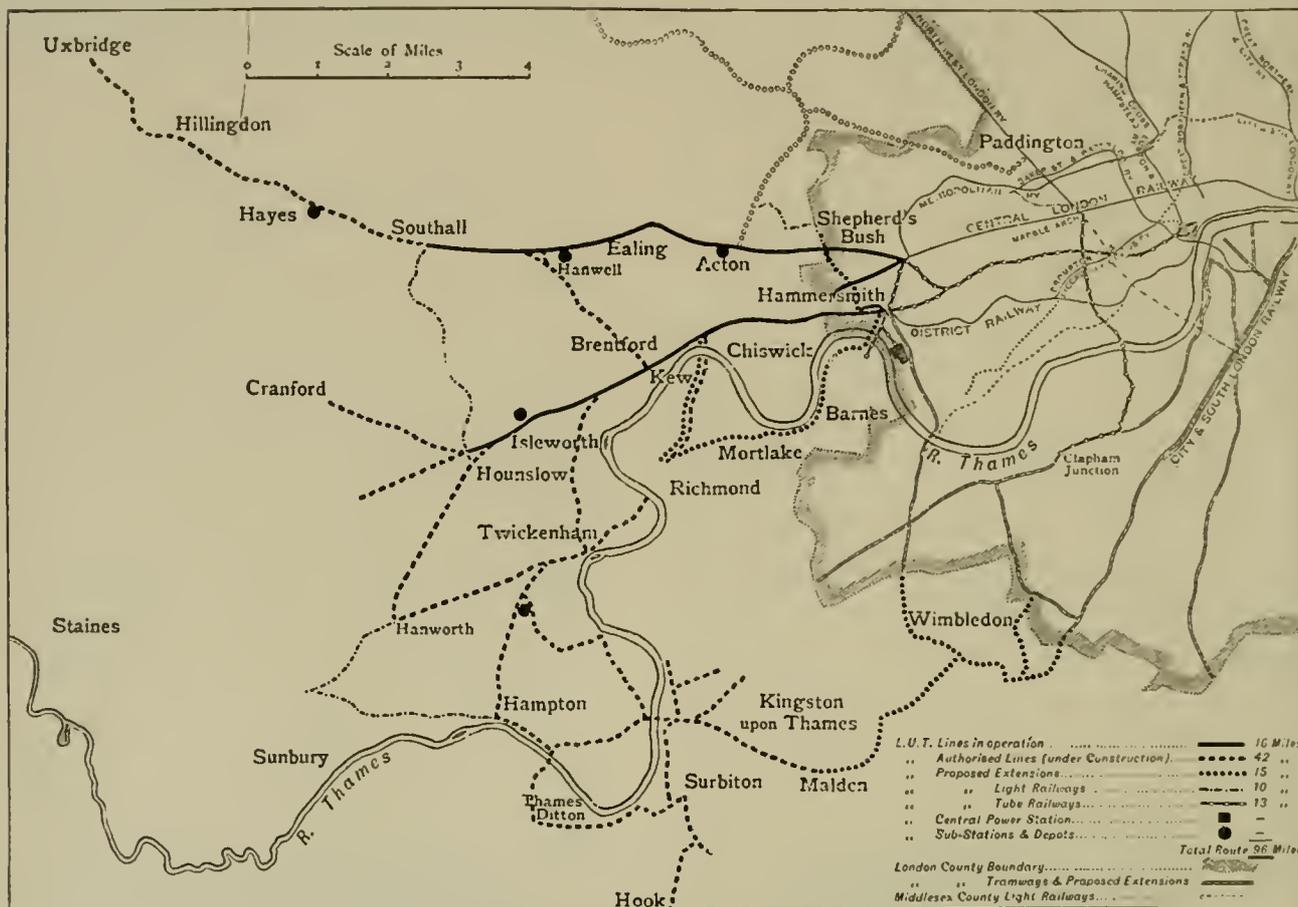
- Waterloo & Baker Street Railway.
- Great Northern & City Railway.

The last named differs from most of the other "tube" lines, in so far that it is constructed with tunnels of 16-ft. diameter, so as to allow ordinary railway stock to run over its rails.

LINES AUTHORIZED.

1. Brompton & Piccadilly Circus Railway.
2. Charing Cross, Euston & Hampstead Railway.

The lines in operation have served the double purpose of affording a great public convenience over a large suburban territory and of opening the eyes of London to the great possibilities in economy, efficiency, speed and comfort of a properly organized electric service. The lines under construction amounting to 42 miles of route are shown by the map to cover a large extent of the western and southwestern suburban district. The proposed extensions of the surface lines for which authority is now sought comprise 23½ miles of electric tramways and light railways. Here is an example of the tangle of tramway legislation. These lines are admittedly required and the assent of the local authorities to build them has been obtained, but the County Council in the position of a rival promoter has the power, as the other authority, to step in, and by refusing assent, prevent the promoters from presenting the case on its merits to Parliament. In several cases the promoters



MAP OF LONDON'S TUBES AND TRAMS.

3. City & Brixton Railway.
4. Great Northern & Strand Railway.
5. North West London Railway.

The above enumeration gives the following figures:

	Route miles.
In operation	15¾
Authorized and under construction.....	36½
	52¼

The accompanying map shows all the existing and proposed tramways as well as other railways, etc., in the district of the London United system. The following is a short tabular statement:

	Miles.
Electric tramways in operation.....	16
Electric tramways now under construction.....	42
Electric tramway extensions proposed	15
Electric tramways as light railways proposed.....	8½
Electric tube railways proposed.....	13
Total	94½

have concluded agreements where, in consideration of large outlays for street improvements they have secured franchises of 50 and 25 years respectively, with power of purchase, in some cases, as a going concern.

COMBINED SURFACE AND TUNNEL SYSTEM.

There is in British tramway practice a difficulty which does not present itself to the American or the Continental engineer, namely: the universality of outside seats on British tramway cars. Despite the austerity of the climate on occasions, there is a strong public desire for outside travel such as seems not to prevail anywhere else in the world. Hence there has always been the hard and fast line of demarcation between a railway carriage and a tram car, while in nomenclature the two have been one in America. But, except under special circumstances, it would be impracticable to adapt a shallow tunnel to accommodate top seat cars. The London United Ry. will make use of the Greathhead shield method of constructing these tunnels and at the same time reduce to a minimum the inconvenience at the stations by means of special arrangements in the form of moving platforms, ventilating, etc.,

so as to attract the public by lessening the objections more or less inseparable from an underground line. Interchange of traffic and minimum fares will be made special features, carrying out even more fully than the joint committee suggested facilities for travel from the center of London to its vast western and south-western suburbs. Communications will be opened with all other tube railways whose course may be touched or crossed so that the very widest facility will be provided for expeditiously traversing the whole of the suburban and metropolitan areas with a maximum of ease and a minimum cost on the part of the passenger.

It is believed that from the principles of construction, installation and operation the same success in conducting the traffic will be attained as has been achieved on the electric surface tramways now under the same administration and management. The routes to be followed by the London United Electric Rys. are seen from the diagram. They consist of two principal lines, making in all about 13 miles. The first of these is the east and west railway extending from Charing Cross to Hammersmith where an extended loop will embrace both Shepherd's-bush and the Hammersmith-broadway with a tunnel under the river to the Richmond Mortlake Tramway terminus at Barnes. Second, the north and south line running from the Marble Arch via Sloan St. and Battersea Park to Clapham Junction. The importance of this project will be seen as providing full interchange of traffic east, west, north and south, and the cost of the works, lines and stations apart from power house and equipments is estimated at about 3¼ millions sterling, the total estimate including acquisition of properties, stations, etc., being £5,413,250. The capital represented by tubes, trams and trains in and about London alone will represent when completed an expenditure of not less than £50,000,000.

TUBE RAILWAYS IN LONDON.

The Northwest London line, running from the Marble Arch traversing the Edgware Road has a length of 4¼ miles. The Charing Cross, Euston & Hampstead Ry., the contract for the main part of which has been let, has been ordered by the Parliamentary joint committee to stand over till the present session. This line will effect a connection at Charing Cross with the London United as will the northwest London line at Marble Arch, thus affording to the public valuable transfer facilities.

The Baker Street & Waterloo Ry. is in the central position between these two and the original route of three miles is nearing completion. An extension to Paddington will undoubtedly be built in due course.

The Great Northern & Strand Ry. is 6¼ miles as at present laid out and though it offers no through connections with other tubes under the present plans this will doubtless soon be rectified. Arrangements can be made for an interchange between the London United and the Metropolitan District at Charing Cross. This would secure through connections with the northern suburbs and with the populous districts served by the system of the United Electric tramways.

The Great Northern & City Ry., now being completed, has tubes which are 16 ft. in diameter. The difference in diameter prevents any direct interchange of traffic with other underground lines, but it will have a joint station with the City & South London Ry., and in this way will bring north and south into direct communication.

While northwards is found great progress with the new style of underground railway, the southwest and west regions as yet present a blank. The City & South London as shown comes to Clapham Common and was the first electric railway in London. The Waterloo lines also touch an important point in South London, but these are the only lines yet constructed south of Oxford St. and west of Waterloo Bridge.

From Paddington to Kennington Oval, via Victoria is also the proposed West & South London Junction Ry. Covering more or less the same route as is intended to be served by the east and west line of the London United Electric Rys., previously described, there are three other proposals promoted by the Charing Cross, Hammersmith & District Ry., the Piccadilly & City Ry., and the Central London Ry. The two latter extend into the city.

CORPORATION VERSUS COMPANY.

The author from the earliest period has been a zealous advocate of railway enterprises being in the hands of incorporated com-

panies rather than in the hands of local authorities. Even in the largest provincial cities difficulties have already arisen in the extension of tramways beyond the civic boundaries. In London the argument in favor of a company undertaking such works is especially powerful and is the more emphasized in the face of a strong desire shown in many places that the tramways there should be in the hands and under the management of the London County Council. The Council does not govern the whole of the Metropolitan area and even within its own bounds it possesses only a joint authority with a multitude of municipalities. How could the initial 16 miles of the London United have been brought into existence and operated had it been left to any combination of local authorities to project, construct and operate them? The company has been at a great disadvantage from the multitude of authorities with which it has had to deal, but it had a unity of purpose and even negotiations with three County Councils and 30 District and Urban Councils did not daunt it. This multitude of councils might have projected and constructed each its own bit of line and they might even have operated these fragments as one system, but each section would have had its staff of Parliamentary agents, engineers and contractors and each one would have demanded its share of the profits, if any could arise from such a jumble of ownership and management. The accounts would be voluminous and their accuracy would be practically impossible, while the hosts of officials would be disastrous to the funds.

In what form shall the power be applied on surface tramways? To this question the author unhesitatingly answers on behalf of the overhead trolley. It has as yet no rival in economy of construction, in simplicity of operation, in safety and in economy as regards passengers. In expressing this opinion the author quoted from his article in the "Review" for January, 1901, on Electric Tramways, as follows:

"Is there any other adaptation of electricity that will probably outrival the overhead trolley for general use under all conditions within the next ten years? I confess I have seen nothing as yet that would suggest this. Every point of view must be looked at before one system can be pitted against another. Is it cheaper, more efficient in operation, as convenient in daily use, as trustworthy in all weathers, and as reliable under all conditions; can it cope with all and every development of the public demand, is it free from danger to passengers and the public? Thus examined I see nothing in any of the existing conduit or surface-contact systems to commend them either to the practical tramway man, or to the engineer. The aesthetic objection? Is that a sufficient reason? Edinburgh, or at least its Lord Provost thought so, for refusing the electric overhead wire, so economical in construction and communication to outlying districts. I think not, and shall probably continue to think so ten years hence."

There is, of course, a probability of startling discoveries in accumulators and some other discoveries in electricity which might upset all existing ideas and send generators, poles and trolleys to the scrap heap. These things are of course possible, but they are not at present "within the range of practical politics." And even if such a day should come the overhead trolley lines could be changed with less capital sacrifice than any other known system. The surface contact system is not favored by the author, largely on account of the rattle and noise of the skates. In Paris the lines on this system originally laid down are being superseded by the overhead trolley, although at Wolverhampton the corporation has entered on a bold scheme of allowing 11½ miles to be equipped in this way. In view of the many changes and improvements which are constantly occurring in this field the author is a little careful as to prophesying, but he expressly limits his opinion to the next ten years and believes that even at that time nothing better will probably be found for London than the plans established by last year's Parliamentary Committee in regard to the problem of intercommunication in the city.

An electric line from Batavia, N. Y., to Lake Ontario, via Medina, is projected and actual construction work will be begun before the end of the year.

The Newport (R. I.) & Bristol Ferry Railroad Co., which was incorporated in March to build an interurban in Rhode Island, has effected a temporary organization with James Anthony, of Middletown, as chairman.

MASSACHUSETTS REPORT.

The thirty-third annual report of the Board of Railroad Commissioners of the state of Massachusetts has just been issued, covering the fiscal year ending Sept. 30, 1901. Reports were received from 110 railroad companies. Eighteen new companies were organized during the fiscal year under the general law, and five companies were organized under special laws, while 20 companies have been consolidated with other companies. This reduced the total number of companies to 99; of these, 66 are operating their own roads; the railways of 17 were operated by other companies under lease or contract; 14 have organized and are constructing their railways, and 2 have organized, but have not commenced the construction of their lines.

The total miles of main track operated is 2,215,459, an increase of 242,905 over the previous year. It is also to be noted that the use of horses as motive power has entirely ceased in Massachusetts, the last two roads which had used them have substituted electricity. All of the track owned is surface railway, with the exception of 6.644 miles of elevated railway line and 6.468 miles of elevated second track. All the elevated track is confined to Boston.

The Massachusetts companies now own 1,004,744 miles of street railway lines, 272,233 miles of second main track and 132,090 miles of side track, making the total length of track 2,309,066 miles. The difference between the miles operated and those owned by the

Gross and Net Earnings from Operation per Mile of Main Track Owned, 1892-1901.

YEARS.	AVERAGE PER MILE OF TRACK.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.
1892,	\$12,980	\$9,312	\$3,668
1893,	12,392	8,582	3,810
1894,	11,972	8,321	3,651
1895,	12,127	8,359	3,768
1896,	11,627	8,274	3,353
1897,	11,187	7,713	3,474
1898,	10,998	7,589	3,409
1899,	10,459	7,132	3,327
1900,	10,452	6,878	3,574
1901,	9,998	6,690	3,308

Gross and Net Earnings from Operation per Car Mile Run and per Passenger Carried, 1892-1901.

YEARS.	AVERAGE PER CAR MILE.			AVERAGE PER PASSENGER.		
	Gross Earnings.	Expenses of Operation.	Net Earnings.	Gross Earnings.	Expenses of Operation.	Net Earnings.
1892,	33.01	23.69	9.32	5.05	3.62	1.43
1893,	31.39	21.74	9.65	5.07	3.51	1.56
1894,	30.28	21.05	9.23	5.04	3.50	1.54
1895,	30.20	20.82	9.38	5.07	3.50	1.57
1896,	27.69	19.70	7.99	5.03	3.61	1.47
1897,	25.63	17.71	7.97	5.12	3.53	1.59
1898,	24.80	17.11	7.69	5.11	3.52	1.59
1899,	24.74	16.87	7.87	5.09	3.47	1.62
1900,	24.46	16.10	8.36	5.06	3.33	1.73
1901,	23.40	15.66	7.74	5.02	3.36	1.66

Percentage of Operating Expenses to Gross Earnings, 1892-1901.

YEARS.	Gross Earnings from Operation.	Operating Expenses.	Percentage of Expenses to Earnings.	Net Earnings.
1892,	\$9,798,060	\$7,029,479	71.71	\$2,768,581
1893,	10,832,174	7,501,545	69.26	3,330,629
1894,	11,119,846	7,729,059	69.51	3,390,787
1895,	13,184,312	9,088,086	68.93	4,096,226
1896,	14,844,262	10,563,371	71.16	4,280,891
1897,	15,815,267	10,904,040	68.95	4,911,227
1898,	16,915,405	11,672,731	69.01	5,242,674
1899,	18,151,550	12,378,488	68.20	5,773,062
1900,	19,999,640	13,159,947	65.80	6,839,693
1901,	21,766,340	14,565,141	66.92	7,201,199

Comparative Increase of Railway Mileage and Volume of Traffic.

YEARS.	Railway Mileage.*	Increase	Per Cent.	Passengers Carried.	Increase	Per Cent.
1892,	755	-	-	194,171,942	-	-
1893,	874	119	16	213,552,069	19,380,967	10
1894,	929	55	6	220,164,099	6,912,090	3
1895,	1,078	149	16	259,794,308	39,330,209	18
1896,	1,277	199	18	292,358,943	32,564,635	13
1897,	1,114	137	11	308,684,221	16,325,281	6
1898,	1,538	424	28	330,889,629	22,205,405	7
1899,	1,736	198	12	356,724,213	25,834,584	8
1900,	1,913	177	10	395,027,198	38,302,985	11
1901,	2,177	264	14	433,526,935	38,499,737	10
Totals,	-	1,422	188	-	239,351,993	121

* Length of main track owned.

Capital Stock, Net Income and Dividends, 1892-1901.

YEARS.	Capital Stock	Net Distribable Income.	Dividends Declared.	Percentage on Total Capital Stock.
1892,	\$23,590,536	\$1,905,680	\$1,582,697	6.71
1893,	25,883,575	1,993,399	1,716,637	6.63
1894,	26,971,275	1,812,668	1,610,886	5.97
1895,	27,906,685	2,257,355	1,606,196	5.76
1896,	30,727,818	2,280,776	1,802,817	5.87
1897,	32,670,273	2,593,147	1,965,243	6.02
1898,	38,933,917	2,534,002	2,076,233	5.33
1899,	41,380,143	2,502,942	2,318,398	5.60
1900,	48,971,168	3,037,502	2,409,874	4.92
1901,	54,069,933	3,398,183	3,417,117	6.32

Employees and Equipment, 1892-1901.

YEARS.	Employees	Cars.	Other Vehicles.	Horses.	Electric Motors
1892,	7,185	3,679	552	6,734	-
1893,	8,070	4,040	681	3,531	3,013
1894,	7,451	4,058	1,790	2,014	3,906
1895,	8,048	4,426	1,755	1,436	4,701
1896,	9,130	4,913	1,876	878	5,958
1897,	9,716	5,314	1,953	683	6,908
1898,	10,416	5,734	1,997	605	7,643
1899,	11,944	6,042	2,076	455	8,530
1900,	12,766	6,631	2,371	455	9,545
1901,	14,749	6,997	2,488	-	11,284

companies is due to the leasing of certain track outside of the state from companies that do not report to the Massachusetts board. The mileage given as owned by the companies is exclusive of the track in the subway. The new construction during the last year added 242,703 miles of street railway lines to the Massachusetts roads and 20,823 miles of second main track, making 263,526 miles of additional main track. There have also been added 7,797 miles of side track, making a total addition of 271,323 miles of single track.

The total capital stock and net debt of the street railway companies of the state advanced during the year from \$84,715,097 to \$99,611,185. The average cost of the railways per mile of main track was \$23,953 for construction, \$8,677 for equipment and \$11,666 for lands, buildings, power plants and permanent properties, making a total average cost of \$44,297 per mile of main track.

The gross assets of the companies were \$107,250,655, and the increase, compared with the previous year, amounted to \$8,550,581.

The gross liabilities, including capital stock, were \$103,508,024, which shows a gain over the figures for 1900 of \$8,535,096.

The total income of the companies from all sources was \$23,179,304, and the total expenditure* including dividends, were \$23,-

108,237, leaving a net balance of \$18,933 to be deducted from the surplus of previous years.

The total amount of dividends declared last year was \$3,417,117, an increase of \$1,007,243 over the preceding year. Forty-three out of 110 companies paid dividends ranging from 2 to 10 per cent, and 76 companies paid no dividends.

The total number of passengers carried during the last year by all the companies was 433,526,936, an increase of 38,499,737 passengers over the previous year, and the total number of miles run by street cars was 93,005,225, an increase of 11,254,457 miles over the previous year.

The number of persons injured in connection with street railway operation for the fiscal year was 2,533, of whom 76 received fatal injuries. The number of passengers injured was 1,620, of whom 20 were injured fatally. The injuries to employes were 77, in all of which 17 were fatal. The number of injuries to travelers on the streets was 836, of which 39 were fatal. This shows two more passengers, 14 more employes and 9 less travelers on the streets fatally injured than in 1900.

The report of the commission points out that the conditions and restrictions under which street railway locations have been granted show a range of grant from that in the nature of a gift to that upon conditions calling for extraordinary expenditure by the company. Grants to the same railways are often radically different in the various town through which they pass. In one case, the local board relying upon the advantage to demand future returns in accommodation and low fares, may give the use of the street upon liberal terms; in another, the local board, thinking it best to secure at once full compensation for all that it gives, imposes upon the same company heavy expenditures as a condition of the right to use the streets. As railways have become more interurban in character, the need of greater uniformity in respect to the conditions attached to grants of locations is apparent in order to secure just terms as between the several communities which they serve and the observance of rules of state policy. The effect of the diversity of opinion among local boards reaches beyond matters of purely local interest.

While the street railway service in many instances is very excellent, in others the evils of over-capitalization, of the building of roads with no good reason for their existence, and the practice of paying dividends and the expense of proper maintenance are too apparent, in impaired properties, lack of proper car equipment, insufficient power plants and floor track and road beds. Where these conditions exist, a prompt remedy should be applied through the immediate expenditure of the money necessary to bring the property up to the proper standard. Financial inconvenience or temporary embarrassment to dividend-paying power offers no reasonable excuse for delay. The recent consolidation of companies has brought to more than one weak system the advantages of financial strength and able management, from which may be expected improved equipment and service.

The report states that the number of passengers carried last year upon the entire railway system of Boston shows the readiness of people to make use of every additional opportunity for travel at low cost, and the relatively great increase upon the elevated part of the system proves the popularity of rapid transit. Accommodations are far behind the demand for them, and additional facilities to meet the needs of those without as well as within the city limits, who travel daily from their homes to the business centers of Boston, should be provided as promptly as possible.

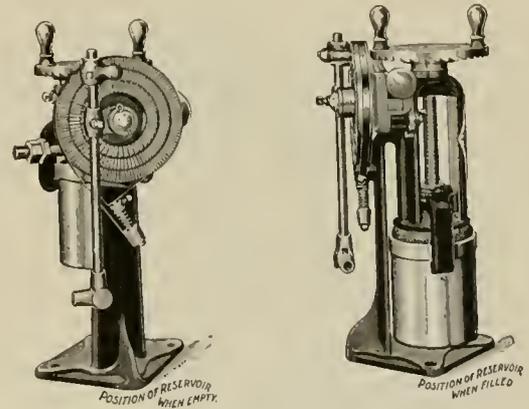
The members of the Board of Railroad Commissioners for the last year were Messrs. James F. Jackson, George W. Bishop and Clinton White.

THE CHICAGO, ELGIN & AURORA NEAR COMPLETION.

The work of trying and insulating the third rail on the Chicago, Elgin & Aurora road is now being pushed and the completion of the road is looked for within a short time. The large power house near Batavia is being rapidly completed and contains 4 generators driven by engines of 2,000 h. p. capacity. The current from this station will be distributed to five sub-stations along the road which will be located at Aurora, Warrenville, Lombard and Maywood.

NATIONAL AUTOMATIC CYLINDER LUBRICATOR.

The accompanying illustrations show two views of the National automatic forced feed cylinder lubricator, made by the Stephenson Manufacturing Co., of Albany, N. Y., which is designed to lubricate the cylinders of all kinds of steam engines, pumps, air compressors and similar machines with regularity and without regard to the temperature, consistency of oil or distance from which it is used. This lubricator operates only while the machinery is running and feeds in proportion to the speed of the machine, thereby avoiding any unnecessary oil in the condensed steam. The connecting arm shown in the illustration is attached to some moving part of the engine and the pawl on this arm gradually turns the ratchet wheel at the back of the lubricator. By suitable mechanism the back ratchet wheel moves the top ratchet wheel at the rate of one tooth to each revolution of the back wheel and the oil reservoir is drawn



NATIONAL AUTOMATIC CYLINDER LUBRICATOR.

up against a stationary piston. This motion of the cylinder forces the oil through an outlet to which the parts to be lubricated are piped. A check valve is placed in the outlet to prevent the escape of oil when the removable reservoir is taken out to be refilled. The quantity of oil to be fed is regulated by setting the pawl on the back ratchet to the different rows of teeth and the feed may be increased to any desired extent by setting the ratchet to take two or more teeth in any row. For high speed engines this lubricator is furnished with an attachment which permits reducing the feed as low as may be desired, and at the same time maintaining a regular and positive feed. These lubricators are used by the North River Electric Light & Power Co., New York, the Troy City Railway Co., the United Traction Co., of Albany, the Union Railway Co., of New York City, the Syracuse Traction Co., of Syracuse, N. Y., the Milwaukee Electric Railway & Light Co., and in other prominent plants.

NEW CARS FOR NORTH JERSEY COMPANY.

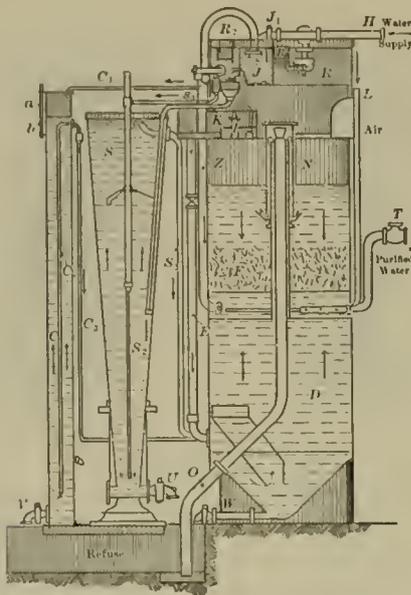
We have just learned some interesting particulars in regard to the 60 cars which the North Jersey Railway Co. has ordered from the John Stephenson Co., of Elizabeth, N. J.

The bodies will have longitudinal seats, and are to be 32 ft. long, with ten windows on a side. The platforms are 4 ft. 6 in. long, making the cars 41 ft. over the dashes. The platforms have open vestibules. In the center of each side between the windows is a panel which affords space for the pipes, etc., of the heater. This is of the hot water type with the store hung beneath the body of the car. The cars are intended for heavy suburban service and are equipped with four large motors.

Two Westinghouse rotary converters of 300-kw. each have recently been purchased by the Manchester (N. H.) Traction, Light & Power Co. They will be located at Hooksett, N. H., and will deliver power for the operation of the Concord and Manchester branch of the Boston & Maine Railroad, this road having entered into a contract for power with the Manchester Traction, Light & Power Co. The machines are to be supplied with three phase alternating current and will deliver direct current at 600 volts.

AUTOMATIC FEED WATER PURIFIER.

The question of good feed water is always of the greatest importance in a power plant, and our readers will all be interested in the purifying apparatus, a sectional view of which is shown in the accompanying engraving. The operation of this purifier is designed to be entirely automatic and no matter whether the impurities consist of salts in solution or mechanically suspended matter, it is claimed that the water issuing from the apparatus will be in perfect condition for the boilers. The only attention required is the filling of the storage receptacles once each day with the proper proportions of lime and soda ash. The purifier consists substantially of an automatically acting lime saturator, shown at the left as a conical tank, a soda chamber, which is a cylindrical pipe-like receptacle, and an automatic filter in the main part of the apparatus. The lime saturator thoroughly mixes the lime with the incoming water, the water being carried to the base of the cone by an internal pipe and



AUTOMATIC FEED WATER PURIFIER.

rising to the top through the more densely saturated solution at the bottom. By the time it gets to the top, the lime water is perfectly clarified, and leaves the saturator through a pipe which carries it to the bottom of the large cylinder. This portion is known as the reaction chamber, and a concentrated solution from the soda chamber is forced into it through a small pipe. The difference in the methods by which the soda and lime are dissolved is because of the greater solubility of soda, which makes it practicable to dissolve a sufficient quantity for 24 hours at one time in the small soda chamber and send it into the reaction chamber as required. The soda solution is forced out of the soda chamber by allowing water to flow in through a small regulating valve, the difference between the specific gravity of the untreated water and the soda solution being sufficient to prevent the rapid mixing of the two.

Much ingenuity has been shown in the details of the apparatus whereby the correct proportions of the mixture in the reaction chamber are secured. There is a floating valve in a distributing tank at the top, by means of which the level of the water is always kept the same, and the arm is connected to three small valves at an equal height, the first one allowing the inflow of the untreated water, the second for the lime water, and the third for the water which is used to force the soda solution into the reaction chamber. The lime is slaked in a chamber adjoining the distributing tank, and the lime paste resulting is carried to the interior of the conical lime saturator to a point about half way from the top. The untreated water, the lime water and the soda water, remain in the reaction chamber at the lower part of the large cylinder until the chemical reaction of the salts has been completed and the purified water then passes through a filter, to be discharged at the relief valve softened and clarified. The sediment that results from the chemical action in the reaction chamber is precipitated to the bottom of this chamber and can be readily drawn off. An automatic wash-

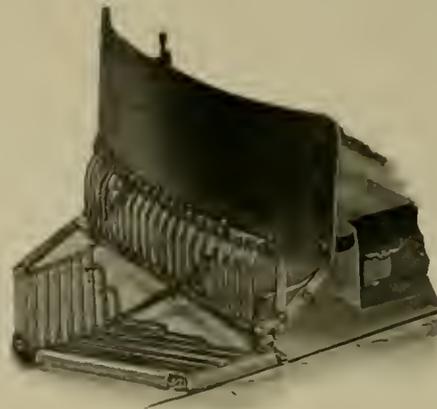
ing arrangement, which is provided for the filter, prevents any clogging up of the apparatus at this point. This is particularly ingenious; a stopping of the filter causes the water to rise until the syphon, N, begins to act, allowing water to escape through pipe O, and drawing air through the pipe, L, which dislodges the sediment; then a definite quantity of washing water is admitted which cleanses the filter bed and carries the sediment out through O.

Two principal advantages are claimed for this apparatus, aside from the fact that it works satisfactorily. One is that it requires absolutely no attention other than the charging once a day with lime and soda, the removing of sediment and the testing of the water to see that no change in its composition has taken place. These operations can be done in a few minutes and the apparatus left to itself for the remainder of the day. The other special advantage is that no chemicals other than ordinary lime and soda are used in the process, and that after the apparatus has been installed in a power house the operating company is at liberty to buy these reagents in the open market. This purifier has been used to a great advantage in a large number of European plants, but its introduction into this country is of recent date.

The rights for the United States are controlled by the Automatic Water Purifying Co., of New York, which will handle all business in this country.

THE CARR FENDER.

The accompanying illustration shows the street car fender designed by Mr. B. M. Carr, of St. Louis. The fender is made of metal, the front of the deck being rubber-covered, and is detachable from the car. The deck projects about 3 ft in front of the car and normally is carried as low as is possible without striking the pavement. The deck has a jointed tubular frame and spring supporting slats, and is held in the service position by means of coil



springs at either side. On the car is a weight which is connected with the deck and with a spring latch in such manner that by operating a lever the motorman may lift the weight and close the latch adjusting the deck in position.

The point of the fender deck being carried low a body on the track is scooped up and as the additional weight comes upon the deck the latch mentioned is released, permitting the counterweight to drop a short distance, which raises the front part of the deck, and thus prevents the object picked up from rolling off again.

The adjustment of the fender is made when the car is taken out of the barn, and in event of accident the action is automatic.

THE "PERFECTION" RAIL BOND.

A typographical error on page 244 of our April issue caused us to state the maker of the "Perfection" rail bond as the Protection Rail Bond Co. This should have been the Perfection Rail Bond Co. The general sales agents are F. B. Badt and G. M. Willis, with headquarters at No. 1504 Monadnock Block, Chicago.

The Grand Rapids, Grand Haven & Muskegon Railway Co. inaugurated an interurban express service between Grand Rapids and Muskegon, in April.

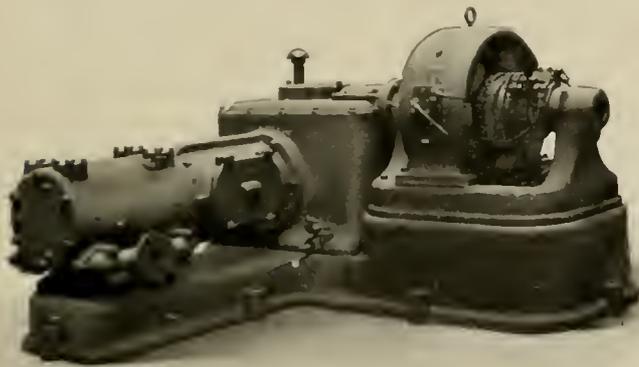
MOTOR-DRIVEN AIR COMPRESSORS.

The very general adoption of pneumatic tools in shops where electric current is available has resulted in a constantly increasing demand for electrically-driven simple and compact compressing units, to meet which the Christensen Engineering Co., of Milwaukee, Wis., has designed a complete line of motor-driven compressors ranging in capacity from 7½ to 1,000 cu. ft. of free air per minute. Of these the smaller sizes are made for portable as well as stationary use.

The type M compressor, which we illustrate herewith, is built in capacities from 50 to 1,000 cu. ft. of free air per minute.

The motor and the compressor are designed to be compact and self-contained. The air is compressed in the cylinder, shown on the left, by a double acting piston which is operated by means of a connecting rod and steel crank shaft; the latter is mounted in bearings located within the frame of the machine. This shaft carries on the motor end a helical gear which is driven by a pinion on the armature shaft of the motor. The whole machine is mounted on a substantial cast iron base. Both the cylinder and the valve heads are water jacketed throughout and the clearance spaces have been reduced to the lowest practicable limit.

The suction and discharge valves, which are identical and interchangeable, are arranged in cast iron heads bolted directly to the



CHRISTENSEN TYPE M MOTOR DRIVEN AIR COMPRESSOR.

cylinder, and consist of seamless cold drawn steel cups, arranged so that each is removable independent of the other. No springs are used with these valves, they being operated by the compressed air itself and re-seated by gravity. Their peculiar construction renders a small lift possible, and the noise from their operation is reduced to a minimum.

Care has been taken in the design of all the moving parts to render but little adjustment necessary and lubrication easy and effective. The main bearings are made extra long, the crosshead shoes are of large size, the piston rod works in a self-adjusting packing box and the piston rings are of improved form.

The crank shaft is extended at the motor end to carry the gear which is driven by a pinion on the armature shaft of the motor. The gear and the pinion have the helical herring bone type of tooth and are machine cut.

The gear case and the crank chamber are connected and form an enclosure which is partly filled with oil, with which all the working parts are lubricated, including the air cylinder. The latter is connected with the oil chamber so that the proper quantity of oil for lubricating the surface between the cylinder and the piston is automatically supplied and no sight feed lubricator is required. The motion of the crank shaft in the oil causes continuous lubrication of the main bearings, the crank pin bearing of the connecting rod, the cross head guide, the piston rod, the wrist pin in the cross head and the piston. Oil is also supplied automatically to the bearings at the pinion end of the motor. The gear and pinion operate continuously in the oil bath. The machine will remain lubricated as long as the oil is kept up to a level determined by a filling plug on the side of the crank chamber, and one filling inlets for several weeks run.

Either an alternating or a continuous current motor may be used. The illustrations herewith show the continuous current multipolar

type that the Christensen company builds for this service. The lower frame of the motor is of cast iron and the field is composed of low carbon cast steel with detachable steel pole pieces. The motors are series wound and are started and stopped without using resistance.

By unscrewing a few bolts the armature and the field coils of the motor can be removed or exchanged. The gear, pinion, valves or cylinder heads may also be removed without disturbing any other parts. Access to the cross head and wrist pin is obtained by doors on the side of the slide frame. The crank chamber is completely closed, but the upper part may easily be removed to give free access to all the working parts while a smaller hand hole covering is provided for inspection of the interior.

The governor is automatic starting and stopping the motor compressor as the predetermined minimum and maximum air pressures.

A DISGRACEFUL AFFAIR.

April 24th, Senator H. D. Money, of Mississippi, was ejected from a car in Washington, D. C., for refusing to either pay his fare or produce a transfer. On the senator's refusal to pay his fare the conductor followed the usual rule in such cases by stopping the car and attempting to put off the passenger. Mr. Money resisted so vigorously that a fireman, who was on board the car went to the assistance of the conductor. Just as he was ejected from the car the senator drew a small pen knife with which he stabbed the conductor in the hand. The senator then went before a justice of the peace and swore out warrants for the arrest of the conductor and fireman, but in making his charge against them, the senator admitted that he had insisted on riding without paying his fare, but claimed that the conductor saw him get off another car and therefore knew that he was entitled to a transfer, although he had none to present. The following day Senator Money was placed in custody on information sworn out by O. D. Shaner, the conductor who ejected him from the car. The information charged the senator with assaulting the conductor during the disturbance and the conductor produced witnesses who corroborated his version of the story. The case was settled May 7th out of court, the senator promising not to prosecute either the conductor or the fireman. Both of these men kept their jobs as it was generally considered that the conductor was doing no more than his duty.

STEAM TURBINES IN LONDON.

A contract for Westinghouse steam turbines for the Metropolitan Railway Co., of London, has just been given to the British Westinghouse Electric & Manufacturing Co., of Manchester, which company is now filling a similar contract for the Metropolitan District Electric Traction Co.

There will be a general similarity in the two stations and it will be easy to arrange for connecting the two and making them interchangeable, as far as the supply of current is concerned, which feature was required by the terms of the franchises of the two roads. The Metropolitan power station will be located at Neasden, in the northwest of London, and will contain three sets of 3,500 kw. capacity each. The Chelsea station of the Metropolitan District Railway will contain four sets of 5,000 kw. each. The electrical machinery for both stations will also be supplied by the Westinghouse company. The current will be three-phase alternating and of 10,000 volts, to be transformed in sub-stations to direct-current for use in the car motors. The aggregate power of the two plants will be 30,500 kw. It is hoped that in a year and a half the equipment will be complete and in working order. Both roads are underground and the change to electric traction will be an important and desirable step in the solution of London's transportation problem.

About 10:30 p. m., on April 26th, a severe gale blew down the two smoke stacks at the power house of the old Heim line in Kansas City, doing about \$1,200 damage, which was covered by cyclone insurance. One stack was 36 in. in diameter and the other 40 in., both being 85 ft. high. The power plant had not been in use for two months so that no delay to traffic resulted. The stacks will be rebuilt and the station used when the season for park travel opens.

PERSONAL.

MR. TIREY L. FORD has been appointed general counsel of the United Railroads of San Francisco.

MR. E. S. BREED has assumed the duties of superintendent of the Berkshire Street Railway Co., Pittsfield, Mass.

MR. R. E. DANFORTH, general manager of the Lake Shore Electric Ry., has resigned to become manager at Rochester, N. Y.

M. BIENVENCE, chief engineer of the Paris Metropolitan Underground R. R., is making a tour of American cities to inspect the best approved traction systems.

COL. ALLAN C. BAKEWELL, general manager of the Sprague Electric Co., has recently been elected second vice president of the Pennsylvania Society of New York.

MR. S. P. WOLVERTON, JR., has assumed the management of the Sunbury (Pa.) & Northumberland Electric Railway Co., succeeding Mr. W. L. Keplinger, resigned.

MR. FRED I. GRISWOLD has resigned as superintendent of the Battle Creek lines of the Michigan Traction Co., and will have charge of the Allendale Hotel at Gull Lake, Mich.

MR. THOMAS DOLAN has resigned as a director of the Union Traction Co. of Philadelphia, declining to accept a membership on the board of directors of the new Philadelphia Rapid Transit Co.

MR. DAVID L. BEAULIEU, formerly connected with the Worcester (Mass.) Consolidated Street Railway Co., has been appointed superintendent of the Lansdale & Norristown (Pa.) Street Railway Co.

MR. F. C. RAPP, who for two years has been general foreman of the shops of the Indianapolis Street Railway Co., has resigned that position to become general foreman of the works of the Dorner Truck & Foundry Co., Logansport, Ind.

MR. WILLIAM H. BROWNE, for seven years general manager of the Royal Electric Co., Montreal, Canada, in February last was chosen general manager and treasurer of the Stanley Instrument Co., of Great Barrington, Mass.

MR. OTTO W. UTHOFF, who for the past four years has represented the Columbia Incandescent Lamp Co. in the eastern states, was recently appointed manager of the St. Louis office of the Ohio Brass Co., having charge of the southern and western states.

MR. C. M. MILLS, formerly electrician in the shops of the Metropolitan Street Railway Co., of Kansas City, has been appointed superintendent of the Bozeman Street Railway Co., Bozeman, Mont.

MR. HOWARD R. PORTER, formerly connected with the Cincinnati Traction Co., has been appointed superintendent of the Paducah (Ky.) Railway & Light Co., and will assume the duties of his new position June 1st.

Mr. A. M. MOORE has been appointed master mechanic of the Georgia Railway & Electric Co., of Atlanta, and not chief engineer, as was erroneously announced. Mr. Moore was formerly master mechanic of the Atlanta Rapid Transit Co.

MR. J. A. BENDURE has accepted the general managership of the Lima (O.) Electric Railway & Light Co. and will supervise to a large extent the construction of the company's projected 70-mile interurban which will connect the smaller towns between Lima and Toledo.

MR. WARD S. ARNOLD, who for some years past has been with the General Electric Co., on May 1st became sales engineer of the Chicago office of the Stanley Electric Manufacturing Co. Mr.

Arnold is a brother of Mr. H. J. Arnold and is a well-known factor in the electrical trade of the western territory.

MR. J. I. MANGE has been appointed electrical superintendent of the Oneonta, Cooperstown & Richfield Springs Ry., a 16-mile interurban running out of Oneonta, N. Y. Mr. Mange has been connected with the engineering staff of the Lachine Rapids Hydraulic & Land Co., of Montreal, Que., his present address is at Hartwick, N. Y.

MR. A. L. DRUMM, who has been connected with the Stone & Webster syndicate of Boston, has been appointed assistant general manager of the Union Traction Co., of Indiana. Mr. C. W. McGuire will continue as assistant to the president, and Mr. Charles A. Baldwin will assume the duties of general passenger agent and assistant superintendent.

MR. LOUIS H. MOUNTNEY has been appointed superintendent of the Lewisburg, Milton & Watsonstown Passenger Ry., Milton, Pa., succeeding Mr. W. W. S. Butler, who recently resigned. Mr. Mountney was formerly superintendent for the American Railways Co. at Springfield, Ill., and later was with the Lima (O.) Railway & Light Co.

MR. CHARLES A. SPOFFORD, of New York City, formerly secretary of the Milwaukee Electric Railway & Light Co., has been appointed to assist Mr. Yerkes in the management of the London underground railway system, and will supervise to a large extent the installation of electric traction on the Metropolitan District Ry. Mr. Spofford will arrive in London about June 1st.

MR. GEORGE C. SIKES has resigned as secretary of the Chicago council committee on local transportation, his resignation being effective June 1st. The retirement of Mr. Sikes is to be regretted since he had devoted a great deal of time and study to the traction problem in Chicago, and the tendency of his work was toward a more equitable solution that is popular with the mayor.

MR. W. M. M'FARLAND, acting vice president of the Westinghouse Electric & Manufacturing Co., delivered a lecture on "Electric Power Distribution in Manufacturing" at Cornell University on May 9th. The several different systems of distribution and their relative advantages were discussed and the manner of applying electric motors to machinery illustrated by a large collection of stereopticon views.

MR. WILLIAM G. EVANS, who has been secretary of the Denver (Col.) City Tramway Co. for many years, will succeed Mr. W. N. Byers as vice president, the latter resigning that position to attend to other business interests, but remaining a director of the Denver company. Mr. John A. Beeler, formerly chief engineer, has been made general manager of the system and will superintend the details of the company's new construction.

MR. N. M. GARLAND, formerly representative in the north-eastern states of the Emerson Electric Manufacturing Co. of St. Louis, and who is well and favorably known among the electrical fraternity in that section, on May 1st assumed the management and control of the New York office of the Ohio Brass Co. of Mansfield, O. This appointment has been made owing to the fact that Mr. Alfred B. Edes, formerly manager of this office, has been appointed sales manager of the company, and will hereafter be located at the main office in Mansfield.

MR. JOHN J. STANLEY, vice president and manager of the Utica (N. Y.) & Mohawk Valley Railway Co., will succeed Mr. McCormack as general manager of the Cleveland Electric Railway Co., the appointment being effective May 15th. Mr. Stanley will retain his position as vice-president of the Utica road, but in the capacity of manager will be succeeded by Mr. C. Loomis Allen, formerly superintendent of the Syracuse Rapid Transit Railway Co. Mr. Stanley, in accepting the general managership of the Cleveland line, returns to a position which he held at the time of the Everett-Moore syndicate's securing control of the Cleveland Electric Ry. He was asked to remain when the road came under the control of the Everett-Moore interests, but declined.

MR. C. N. DUFFY, auditor of the Chicago City Ry., left on May 20th to attend a meeting of the committee on standard form of reports for electric railways of the Street Railway Accountants Association at Atlantic City on May 22d. The other members of this committee are Mr. W. F. Ham, of Washington, and Mr. Elmer M. White, of Hartford.

MR. J. W. BUTLER has been appointed manager of the outing department of the Cleveland Electric Railway Co., his duties being to arrange and book parties from societies, conventions, Sunday schools, etc., to the numerous parks and pleasure resorts on the lines of the Cleveland Electric Ry. Mr. Butler has had 20 years' successful experience in handling excursions for railways, and it was he who ran the first railway excursion into the World's Fair at Chicago for a Chicago newspaper. Mr. Butler's headquarters will be at No. 620 Electric Building, Cleveland.

MR. GEORGE F. CHAPMAN has resigned as general superintendent of the North Jersey Street Railway Co. to accept the appointment of general manager of the United Railroads of San Francisco. Mr. Chapman has been connected with the North Jersey Company and its predecessors for the past 12 years. For 8 years he had charge of the lines at Elizabeth, and 4 years ago was made general superintendent of the entire system, comprising lines in Newark, Elizabeth, Jersey City and the Oranges. Mr. Chapman enjoyed a high degree of popularity alike with the officials of the company, the employes and the public.

MR. C. M. SHIPMAN, formerly superintendent of the Essex County division of the North Jersey Street Railway Co., has been appointed general superintendent of that company to fill the vacancy caused by the resignation of Mr. G. F. Chapman. Mr. James Smith, formerly superintendent of the Union County division, has been transferred to the Essex County division; Mr. G. D. Leacock, formerly assistant superintendent of the Roseville division, has been appointed superintendent of the Union County division; Mr. J. A. Campion, formerly assistant superintendent of the South Orange division, has been transferred to the Roseville division; Mr. James McDonough, formerly assistant superintendent of the Springfield Ave. division, has been assigned to the South Orange division, and Mr. W. B. Taylor has been appointed assistant superintendent of the Springfield Ave. division. All the appointments were effective May 10th.

MR. JOHN F. CALDERWOOD, who has been for two years comptroller of the Twin City Rapid Transit Co., of Minneapolis, has resigned to become assistant to President J. L. Greatsinger, of the Brooklyn Rapid Transit Co., and will assume the duties of his new position this month. In his capacity as assistant to Mr. Greatsinger, Mr. Calderwood will be prominently identified with the practical and financial operation of the Brooklyn system, and may also occupy the president's chair in the absence of Mr. Greatsinger. Mr. Calderwood is a well-known member of the Street Railway Accountants' Association of America, and is also a member of the Institute of Secretaries of London.

MR. BERNARD CORRIGAN has been elected president and general manager of the Metropolitan Street Railway Co. of Kansas City, succeeding in the dual capacity Walton H. and Conway F. Holmes, who have been so long and prominently identified with the development of the system. Mr. Corrigan is one of the most generally known men of Kansas City in business and political circles. He is a Canadian who came to Kansas City in 1868 with his two brothers to engage in the building of railways at a time when the transportation facilities of the middle-west metropolis were of the most primitive sort. The Corrigan in 1875 organized a company which purchased all the street railway lines in Kansas City with the exception of the mule line to Westport, which was owned by Nehemiah Holmes. In 1886, the Corrigan Consolidated Street Railway Co., operating the Union Depot Horse Ry., the Kansas City Horse Ry., the Jackson County Horse Ry., and the Corrigan Horse Ry., aggregating 20.7 miles of horse and mule lines, sold its interests to the Metropolitan company which had been chartered in that year and at once undertook the conversion of the horse car lines to the cable system. On retiring from the street railway field Mr. Corrigan engaged in the contracting busi-

ness, and constructed a large part of the Kansas City, Pittsburg & Gulf R. R., and later, an extension of the Choctaw line in the Indian Territory. He is also largely interested in real estate in the Kansas Cities, and is a stockholder and director in the First National Bank. Mr. Corrigan also succeeds Conway F. Holmes as president of the Kansas City Electric Light Co. It is believed that the resignation of Mr. Holmes and the election of Mr. Corrigan as president of the two companies will soon be followed by a consolidation of the street railway and lighting properties under the name of the Metropolitan Traction & Lighting Co.

MR. IRA A. McCORMACK has resigned as general manager of the Cleveland Electric Railway Co. to become assistant general manager of the Harlem division of the New York Central & Hudson River R. R. in which capacity he will have charge of the tunnel and New York City terminals. Mr. McCormack is a native of Pittsburg, and has spent the greater part of his life in connection with the management of steam and electric railways. His first position, after graduating from the schools of Pittsburg, was that of telegraph operator for the Pittsburg & Connellsville Railroad Co., upon the duties of which he engaged in 1872. From 1873 to 1886 he was employed by the Pittsburg, Fort Wayne & Chicago Railroad Co. in the various capacities of brakeman, conductor, freight and ticket agent and general yard master, resigning in the latter year to accept a position as general yard master with the West Shore R. R. He was made trainmaster for the West Shore, and subsequently held a similar position with the Pittsburg & Lake Erie at Pittsburg. Mr. McCormack removed to New York City in 1892 where he was trainmaster for the New York Central for a short time before engaging with the Hall Signal Co. of Chicago in the work of putting up electric signals on the Chicago & Northwestern and the Illinois Central railroads in preparation for the extra traffic of the World's Fair year. When this work was completed he became trainmaster on the Lake Shore & Michigan Southern Ry. between Buffalo and Cleveland. In July, 1895, by the appointment of Mr. Rossiter, president of the Brooklyn Rapid Transit Co., Mr. McCormack was made general superintendent of the Brooklyn system, a position which he held with notable success until October, 1899, when he resigned to become vice president and managing director of the Syracuse (N. Y.) Rapid Transit Railway Co. April 1, 1900, he was appointed general manager of the Cleveland Electric Ry., since which time, through his practical experience and peculiar adaptability for the work, he has been able to effect many improvements for the better in the Cleveland system.

Mr. McCormack was tendered a luncheon, May 4th, at the Enclid Club by Mr. Horace E. Andrews, president of the Cleveland Electric Railway Co. Among the guests were the following prominent steam railroad men: W. C. Brown, third vice president of the New York Central & Hudson River Railroad; Edgar Van Ethen, second vice president of the New York Central, in charge of the Boston & Albany Railroad; C. E. Schaff, general manager of the Big Four Railway; George P. Daniels, general traffic manager of the New York Central; A. J. Smith, general passenger agent of the Lake Shore; P. S. Blodgett, general manager of the Lake Shore; A. H. Smith, general superintendent of the New York Central, and W. H. Marshall, general superintendent of the Lake Shore Railway Company.

OBITUARY.

MR. McCLELLAN HERSH, a former general agent of the Union Traction Co. of Philadelphia, and an ex-member of the Pennsylvania Legislature, died in Philadelphia, May 4th. Mr. Hersh was born at New Oxford, Pa., in 1853. In his early business career he was identified with the Collins expedition to construct a railroad in Brazil, but soon returned to Philadelphia where his business interests were varied and extensive.

MR. WELSH H. GOODRICH, secretary of the Omaha Street Railway Co., died May 11th, of pneumonia, after a short illness. Mr. Goodrich had been connected with the Omaha Street Railway Co. since 1887, being one of the large stockholders and an officer of the company. He was a regular attendant at the A. S. R. A. convention and had an extensive acquaintance among the street railway men, all of whom will regret to learn of his death. A wife and three children survive.

A NEW TYPE OF ST. LOUIS CAR.

The St. Louis Car Co. recently delivered to the Oneonta, Coopers-town & Richfield Springs Railway Co. several interurban cars which differ in many respects from the kind usually seen. It will be noticed from the accompanying illustration that the entrance for passengers is at the center of the car. One end of the car forms the ladies' compartment and the other end is the smoking compartment and the compartment for baggage.

The extreme length of the car is 56 ft. and its greatest width, 9 ft. The ladies' compartment is 20 ft. long and the motorman's cab, which is partitioned off from this, is 3 ft. in length. This compartment contains 12 seats of the St. Louis Car Co.'s, walk-over pattern, covered with plush. It is also provided with a water cooler, toilet room and hot water heater. The smoking compartment is 13 ft. in length and is furnished with 10 walk-over seats. Beyond this is the baggage compartment, which is 10 ft. long and has sliding doors on both sides.

The center platform is 4 ft. wide and has double steps on both sides. The passenger compartments open onto this platform by single sliding doors. The interior of the car is cherry and it has



NEW TYPE OF INTERURBAN CAR—ST. LOUIS CAR CO.

solid bronze trimmings. The sash are in two sections, the upper stationary while the lower drops to the arm rails which are provided with casings to cover the sash pocket when the sash is lowered. The car is mounted on double trucks built by the St. Louis Car Co., of the M. C. B. type. They are equipped with double plate wheels and Christensen air brakes.

THE LABOR QUESTION IN PROVIDENCE.

In March employes of the street railway properties controlled by the United Traction & Electric Co., of Providence, R. I., presented a form of agreement which they wished the company to accept. In substance this provided:

1. The company to treat with its employes of the Amalgamated Association of Street Railway Employes through the officers of the Association.
2. Differences between the company and the men to be submitted to arbitration.
3. Final answers to questions submitted to either party to be made in 24 hours.
4. All new employes to join the union within 30 days after entering the service of the company.
5. A regular day's work to be 10 hours, performed within 12 consecutive hours, except on Sundays, when it shall be 8 hours.
6. Notice of extra men required to be given in advance if possible.
7. New men to receive 20 cents per hour for first year and 22½ cents per hour thereafter.
8. Assignments of trainmen to be made according to length of service. Extra men reporting to receive 25 cents per hour until excused.
9. The men on any line to be preferred in assigning runs to the men from other lines. Men on cars running less than half a day to be paid 30 cents per hour.
10. The railroad company agrees to meet a committee of the association at some future date to be decided by both parties for the purpose of arranging a different system of conductors turning in

their receipts. And in order to prevent any friction or misunderstanding, and for the smoother working of the service, all time tables that may be changed or instituted (except special time tables, which may be run under 24 hours without submission), shall be submitted to the association and posted in the sub-stations at least 24 hours before going into effect. All time tables must conform strictly to the provisions of this agreement. Should, however, the association be able to show the company where the runs on any time table can be completed in less hours than specified on the company's time table, or short runs consolidated in one run, without changing the service, the company shall adopt the changes suggested by the association.

11. All complaints against any motorman or conductor shall be accompanied by a deposit equal to that man's pay for one day; if the motorman or conductor complained of is found not at fault, he shall receive his day's pay for same. Any member of this association under this agreement laid off for punishment or discharged, and after investigation found not at fault, shall be reinstated in his former position and be paid for the total number of days that he is laid off by the company at the number of hours per day that his run on the time table calls for, and an extra shall be paid an amount

equal to the amount of wages paid to the extra who took his place during the period he was laid off. In case the association suspends a member who is an employe of the company for any violation of their laws or rules, they shall request his suspension in writing, signed by the officers of the association. The officers of the company shall suspend an employe thus requested at once without pay, until such time as the association requests his reinstatement.

12. Agreement to be in force until changed by mutual consent of parties.

13. The business agents of the association to have access to all employes when it does not conflict with the latter's duties.

The reply of the company by its general manager, A. T. Potter, was as follows:

"The demands of the Amalgamated Association of Street Railway Employes in the proposed agreement submitted to the United Traction Co. are certainly far-reaching and comprehensive.

"Not only is it proposed to submit all differences between the company and its employes to arbitration, but, by the terms of the agreement, the operation of the road is practically taken out of the hands of the company and placed in the hands of the association.

"A street railway is operated through two agencies: The time tables which schedule the time and routes of the cars, and the motormen and conductors who run the cars, and the association demands that both these agencies be placed under its supervision and control.

"Under the proposed agreement no changes in the time of running cars which the officers of the company may think advisable in the interests of the public or the company can be made without the approval of the association, and when the association finds that short runs can be consolidated into one run, or that runs on any time table can be completed in less than the schedule time, the company must adopt the changes suggested by the association. In the words of the paper submitted: 'All time tables must conform strictly to the provisions of this agreement.'

"Such is the proposition submitted to the officers of a company charged with a grave responsibility to the public and to the owners of the property. Must the time tables of railway companies in the future be finally made up and revised by associations of this kind,

regardless of the convenience and welfare of the public and the interests of the shareholders?

"But the most important factor in the operation of a street railway are the motormen and conductors who run the cars. Not only does the company rely on these men for the efficiency of the service, but they are the trusted agents of the company, upon whose care and faithful service depends the safety of hundreds of thousands of our people. In the selection, oversight and superintendence of these men, the officers of the company are charged with the highest moral and legal responsibility, but it would be impossible for them to fulfill this obligation if the men are instructed and directed by an outside and irresponsible authority.

"In the proposed agreement the association unhesitatingly demands that it shall manage this part of the company's business, its supervision extending to almost every detail.

"All men now in the service of the company, or who enter the employments of the company, must be members of the association. By this provision the officers of the company are cut off from selecting the best and most careful men for a service which involves danger to life and limb, and the selection is restricted to men who by chance may be members of the association. It is possible that the association may prove as unpopular as some recent unions, in which case the road could not be operated for want of conductors and motormen.

"It is further proposed that the association fix the pay of the employes, and they have prepared and inserted in the contract which they present for signature, a schedule of payments accompanied by such restrictions and conditions that the company is entirely relieved of all responsibility respecting the wages to be paid their employes.

"So likewise in regard to the hours of labor; they determine what shall constitute a day's labor, with special provisions for Sundays, legal holidays and such times as the company is obliged to provide for extra travel, and how and when the men shall be assigned their work.

"Having thus provided the company with time tables, the men who shall be employed, the pay they shall receive, and the hours they shall work, in other words, having got the road into operation, the association then proceeds to regulate the discharge of the men.

"If a complaint is made to the management by any passenger or citizen regarding the misconduct of any motorman or conductor, it must be accompanied by the deposit of a sum equal to the man's pay for one day, which he shall receive if not found in fault.

"Then follows this provision: That the company shall suspend its own employe without pay, and until such time as the association asks for his reinstatement, whenever it shall request his suspension for any violation of the association rules. This proposition is seriously propounded for the favorable action of this company, that it will proceed at once to suspend without pay its most efficient and trustworthy employes, whenever they disregard any rule which the association may choose to make. The carrying into effect of this provision is not only a violation by the company of every principle of right and justice in its dealings with its employes, but it may result at any moment in the suspension of half of the company's men, and the consequent interruption of the running of the road.

"It is further provided that an agent of the association shall have the right to interview all employes at the stations whenever it does not conflict with their duties.

"This agreement to continue in force and remain binding on the respective parties until changed by mutual consent.

"Such is the general purport of the demands submitted by the Amalgamated Association of Street Railway Employes to the United Traction and Electric Company.

"The officers of the company are charged with the responsible duty of the transportation of the public with convenience and safety. In the performance of this important undertaking they are clothed with certain powers, which are essential and necessary. They have no legal or moral right to surrender or delegate these powers; such a course of action would be a wrong committed against the public, whose safety is entrusted to them, and against their own stockholders.

"Corporations have rights and obligations which are just as sacred as individual rights and obligations, and both are equally protected by the same laws.

"The association has the undoubted right to seek the promotion of any lawful purpose through organization, but it has no authority to interfere with the lawful rights of any other person or corporation.

"Inseparable from all rights are corresponding obligations to respect the rights of others, and this applies to corporations as well as to individuals. Among the fundamental rights secured by law to individuals and corporations is the right to make contracts. This right lies at the foundation of all business and trade. The wage worker is free to make any contract for his services with whomsoever he chooses, and a corporation, in the absence of statutory restrictions, is free to contract for the services of whomsoever it chooses.

"It will be the policy of this company in the future, as it has been in the past, to engage the services of the most capable and careful men, regardless of any association. The company has no objection to any of its employes being members of any association, but neither the membership nor non-membership in any association will have the least influence in the selection of its employes. No employe will be discharged because he is a member, or because he is not a member of any association. Our employes may rest assured that their relations to the company and their continuance in its service will depend upon the faithful performance of their duties, and will not be affected by any threat against or demand made upon them by any association.

"The true relation between employer and employe rests upon mutual confidence, which it is a most serious matter to disturb, because it is so difficult to restore this confidence once lost.

"This company trusts that by stating to its employes in a frank and plain way its position, to strengthen that mutual confidence which has always existed.

"The submission to these demands signifies, in substance, that the street railway system now owned and operated by the traction company shall in the future be operated by this association.

"For these reasons the officers of the United Traction Company must decline to take into consideration the proposals contained in the draft of agreement submitted."

"The employes appear to have, on reconsideration, accepted the company's view as the reasonable one, and at this writing the question may be taken as settled.

EXCURSIONS AROUND GRAND RAPIDS.

The Grand Rapids Railway Co. has published a well illustrated pamphlet entitled, "Where and How to Go," which gives directions for visiting numerous points of interest in and about Grand Rapids, Mich., which are reached by the lines of this company. One of the main points of interest is Reed's Lake, where the company has established several pleasure resorts, which are handsomely equipped for summer entertainment. North Park and the Soldiers' Home Park are other points of interest, and the pamphlet contains concise instructions as to the best methods of reaching these and other points of interest and also the time required for the different trips as well as the fare charged. A tour of the city may be taken in these cars, including a trip of 21 miles, which costs but 20 cents.

TROLLEY ROUTE OVER HAMPTON RIVER BRIDGE.

The Exeter (N. H.), Hampton & Amesbury Street Railway Co. has opened a new route connecting the street railway systems in Newburyport, Amesbury, Haverhill, Lawrence and Lowell, in Massachusetts, with the lines centering in Portsmouth, Nashua and Exeter, in New Hampshire, the connecting link of railway crossing a new bridge across the Hampton River, which has been erected at a cost of \$100,000. The road will give communication between a formerly isolated section of the Massachusetts beach and the stretch of beaches and headlands on the New Hampshire coast line well known to pleasure-seekers, and the opening of the Hampton River bridge has an important bearing on the project of a broad ocean boulevard to skirt the New Hampshire seacoast. The structure was erected by the Granite State Land Co. and lacks 200 ft. of being a mile in length. A direct route from Boston to Hampton Beach is afforded.

The electric railway between Norristown and Pottstown, Pa., is nearly ready to be opened for general traffic. It is understood that power for the operation of this line will be furnished from the Collegeville plant of the Schuylkill Valley company.

A TEST OF THE PLANT OF THE UNION TRACTION CO. OF INDIANA.

One of the most elaborate tests of electric railway stations ever undertaken was that which has been conducted by the junior and senior classes of the School of Electrical Engineering of Purdue University, Lafayette, Ind., on the system of the Union Traction Co. of Indiana. The power house and transmission system of this company, which operates 109 miles of interurban and 54 miles of local track, were fully described and illustrated in the "Review" for April, 1901, page 293.

The credit for the admirable arrangements and manner of carrying out this test is due to Prof. W. E. Goldsborough, director of the School of Electrical Engineering at Purdue, Mr. A. S. Richey, electrical engineer of the Union Traction Co., and Mr. Percival Fansler. There were 64 men engaged in the work during the tests proper which covered a period of three days. A great deal of the preliminary work, including the making of schedules and placing of meters, etc., was done by 10 students of the senior class who were preparing theses upon subjects connected with railway topics. The tests began at 4 a. m., Thursday, April 17, and continued until Sunday, April 20th, at 2 a. m., simultaneous readings of the various testing instruments being taken at intervals of 15 minutes. On certain special tests of shorter duration the readings were taken at much shorter intervals.

Some of these duties required especial vigilance. This was notable in the case of watching the ammeter of the booster and battery circuit for twenty-two hours each day and throwing a switch backward and forward as the needle passed zero to the right or the left. To the right of zero the needle showed the current was flowing from the battery out to the line, while to the left of zero the ammeter needle indicated that the battery was being charged. The tests made were very complete and covered every department of the power station, sub-stations and cars. The boilers and steam engines in the generating station were tested, the coal being weighed and the water measured and the temperature taken at stated intervals. Special watchers were also assigned to duty in the generating room and in all sub-stations where readings were taken at stated intervals. Men were also assigned to each car upon which readings were taken every 15 minutes and additional wattmeter readings at the beginning and end of each trip. The time and number of stops were also recorded. Another crew determined the efficiency of the power distributing circuits including high and low tension feeders and track.

During the general tests there was no way to find out the amount of fuel and water consumed by the numerous auxiliary engines. After the test these were coupled to one boiler and the results taken, which were deducted from the general results. The record covers complete runs between the principal stopping points all along the road and gives complete running data for all the cars on all parts of the track. Special prominence was given to determining the acceleration and characteristics of the cars. About 11,000 readings were required for each run and several runs were made with both two and four motor equipment.

ELECTRIC TRACTION IN GREAT BRITAIN.

(LONDON LETTER.)

The electric traction question in London has this month become involved in further complications by an amalgamation of relatively small competing interests into one large concern with the avowed intention of rivaling and therefore threatening Mr. Yerkes' plans. Almost in the same breath Mr. J. Pierpont Morgan announces his great shipping combine and his schemes for providing London with a complete network of electric traction consisting of 40 miles of new tubes in connection with 90 miles of electric tramways. The latter scheme is the result of the amalgamated interests of the Northeast London Railway, the London United Tramways, the London United Electric Railways & Tramways Co., and the City & Northeastern Suburban Railway. Behind all this is the fact that Mr. Morgan is a large stockholder in American electrical companies, and has, besides, recently acquired the controlling interest in the British Thomson-Houston Co., Ltd., through purchases of stock from the German and French shareholders.

When it is added that Mr. Morgan has secured as allies in his transit schemes, Mr. Arnold Hills (of the Thames Steamboat &

Thames Ironworks fame), Mr. Clinton Dawkins, Messrs. Siemens Bros. and the Hon. Egremont Mills, this forms on the surface quite an imposing announcement, and more especially when considered from the point of view of its possible competition with the Yerkes interests (we say possible, because none of these Morgan schemes are yet fully authorized, with the exception of part of the tramways network of the London United, 16 miles in operation and 42 miles in construction.)

Mr. J. Clifton Robinson, manager and engineer to the London United Tramways, in the interview granted to the representative of the Morning Leader, summed up the Morgan scheme thus: "A scheme which not only meets in the most emphatic way the recommendations of the Joint Committee, but offers the only true solution of the burning question of the hour—the relief of overcrowded London."

If Mr. Robinson be right, then Mr. Yerkes must be wrong. The solution of this knotty problem is at present engaging the attention of Parliament; the following points, however, may be found of interest in connection with the rival schemes. The greatest recommendations in favor of any company making a bid for the control of London's electric transit, or indeed part of it, are a sound financial basis, tried efficiency in business methods, practical experience in dealing with electric traction, ingenuity in adapting new schemes to the existing transit network.

With regard to the first point, it is stated by Mr. Robinson that the Yerkes' millions "simply wouldn't be in it with their funds." This is doubtless true and the sufficient and yet modest capital of the company formed by Mr. Yerkes (by agreement with Messrs. Speyer Bros., Speyer & Co. and Old Colony Trust Co., of Boston) and registered in London as the Underground Electric Railways Company of London, Limited, with a capital of £5,000,000, will probably be quite put in the shade by the capital of the Morgan syndicate.

With respect to the second and third, we have in Mr. Yerkes the successful organizer of electric traction systems of Chicago and other cities, a man with a wide and varied experience, who has devoted the best years of his life to the question at issue, and who has made his plans pay good dividends. A sound practical spirit runs through his gigantic enterprise for London's transit, which although not conceived from motives of philanthropy, shows a wise understanding of the needs of the millions born and unborn. Mr. Yerkes proposes to run his railways to the boundaries of London over ground where business is assured, leaving the speculative development of transit in new regions to others—the County and District Councils with their Tramways, for instance—a sound business policy that recommends itself to shareholders. He secures his position in the heart of London (which he rightly places between Charing Cross and Piccadilly) and utilizing the existing Circle Railway as a starting point, intersects it across busiest London at three points, and radiates from the circle to the confines of Greater London like a spider's web, knowing full well that all subsequent extensions will feed his lines. Further, Mr. Yerkes' scheme renders an invaluable service to the public, not of London alone, but of Great Britain, by interconnecting all the termini of the great trunk railways by means of his electric lines and their elaborate system of passenger interchange stations.

Further, not satisfied with providing this thorough network of trains with frequent stops, Mr. Yerkes has a scheme already sanctioned by Parliament, for giving London a deep level express service, affording facilities for traveling from north to south and east to west with considerable rapidity and at most one or two intermediate stops, which will be varied on alternate journeys. The harmony of this scheme, so carefully and thoroughly thought out and organized by one brain inspires confidence in its operation by and by.

Mr. Morgan cannot claim experience in electric traction, nor has the question absorbed his interest during the best years of his life; his energies have been expended in other fields. The plan which Mr. Robinson indorses as the sole solution of the burning question of the day has many features to recommend it, the most important being its connection with the tramway network of the London United. But here Mr. Yerkes' lines and those already in existence would perform practically the same service with the advantage that most of them, having been already sanctioned by Parliament, they will be put in operation within the shortest possible time. Finally, Mr. Yerkes has made the best use possible of

the existing underground lines as a basis, without unnecessary competition or duplication and the vast area covered by the Metropolitan Railway in connection with the system of the Underground Electric Railway Co., will work in with the imminent electrification of the suburban traffic of the great trunk lines, whose termini are served by Mr. Yerkes' lines.

Just as these notes are being written the announcement is made that the Committee of the House of Lords has found that the preambles of Mr. Yerkes' Charing Cross, Euston & Hampstead Railway and of the Edgware & Hampstead bills (which, by arrangement, is to form an end-on line) have been proved.

D. N. D.

ABOUT STORAGE BATTERIES.

An interesting pamphlet has recently been published by the Gould Storage Battery Co., of New York, from which we take the following "Facts about the Gould Storage Battery."

The Gould plates are of the Plante type, and are made by "spinning," that is, sheet lead blanks are placed in steel frames which reciprocate between two rapidly revolving shafts on which are mounted alternating steel disks and spacing washers (the gage of the spinning disks determining width of the rib on the finished



plate), and a uniform pressure being maintained by the rolls, the lead is displaced and spun into ribs. The plates are sub-divided into sections varying in number and size with the total dimensions of the plates, the sections being separated by the diamond-shaped bars which are formed at the extremity of the ribs by reason of the disks being round and the lead blanks plane.

The characteristics of the Gould support plate are: Mechanical stability, which results from the unspun cross-bars between sections and the ribbing. Purity, pure lead being used in order to better resist the acid solution, and to reduce secondary actions in the plate. Great density, by reason of the process of manufacture. Integral construction, being of a single piece of lead. Uniformity; large surface presented to active material, from 200 to 400 sq. in. per pound of lead. Uniformity of current distribution, both general and local. Sufficient thickness of the lead base to insure long life; the thickness of the ribs vary from .005 in. to .049 in., depending upon the work expected of the plate. Peroxidation of the entire surface of the plate. Spacing of grooves so as to retain the active material.

For the active material are claimed the following characteristics: It is electrochemically formed. Molecular porosity permitting the peroxide to be surrounded by twice its volume of acid and spongy lead by six times its volume of acid. Uniform distribution of active material, there being no large unused surfaces on the plate. Small volume of material per unit area. Large area of contact with support plate. Large capacity per unit area. Durability. Small excess of active material. Provision for increased renewal. Cohesiveness.

The Gould Storage Battery Co. designs its batteries for stationary work with 250 sq. in. per ampere of discharge. The plates of ordinary size vary from the 4x4 in., with a contact area of 320 sq. in., to the 15 1/2 x 15 1/2 in., with a contact area of 4,800 sq. in. The accompanying illustration shows a pair of 10 1/2 x 10 1/2 in. Gould plates.

The Toledo, Bowling Green & Southern Traction Co. has received nine of its new cars for interurban service and has awarded contracts for its new car house at Findlay. The company is negotiating for an entrance into Toledo over the tracks of the Toledo Traction & Light Co.

ANOTHER FAKE ACCIDENT WORKER.

One evening about February 1st, a young man was found lying between the tracks on one of the lines of the Metropolitan Street Railway Co., of Kansas City. He was carefully carried to the sidewalk by the train crew, to whom he said his name was William Postum and that he had fallen in getting off of a car and had badly sprained his hip and back. He was taken to a hospital in an ambulance, and after receiving treatment for a week was discharged. The street railway company paid his expenses and gave him a small sum to sign a release.

The injured man carried papers showing that he was a railway postal clerk, running between Kansas City and St. Louis, and was well dressed and of pleasing personal appearance.

About March 1st a newspaper report that one William Postum had fallen from a railroad train at a small town about 40 miles from Kansas City and was being cared for by the company's doctor, caused the claim department of the Metropolitan to write the railroad company. The latter ordered a more careful investigation into the Postum case, but found that in the meantime Postum had left his bed and disappeared.

About the middle of April, Postum was seen in another railroad hospital, where he had been brought apparently suffering from a badly sprained ankle and severe bruises, alleged to have been received in attempting to board a train which started without warning. The hospital authorities were notified but Postum, knowing he had been recognized, succeeded in getting away.

Postum is described as being 5 ft. 10 in. tall, weighing 160 lb., of light complexion, with hair that tends to curl.

NEW PLANS OF LAKE STREET ELEVATED.

The Lake Street Elevated Railway Co., Chicago, has completed arrangements with the Chicago Edison Co., whereby the latter will furnish a greater part of the power used on the elevated road by a new method which, it is expected, will effect a considerable economy in the operation of the road and improvement in the service. The plan consists in taking the alternating current at a pressure of 9,000 volts, from the Harrison street sub-station of the Edison company, and to transmit it underground on lead-covered cables to a distributing point at Lake and Rockwell Sts., where it will be changed by means of transformers and rotary converters to a direct current of 550 volts for use on the third rail system. The installation will include two rotary converters of 1,000 kw. capacity each and a switchboard provided with oil-break switches operated by small motors, running on low tension currents. The Chicago Edison plant, with the additional apparatus, will furnish power for the operation of the Lake St. road from the river to West 52d St. at all times, and during the middle of the day and night, as far as Harlem Ave. in Oak Park, while the extra power required during the rush hours will be furnished from the Cicero and Proviso stations until the projected new sub-station shall be built to supply the line west of 52d Ave.

CONSOLIDATION IN INDIANA.

Mr. George F. McCulloch, president and general manager, and others prominently identified with the Union Traction Co. of Indiana, have effected the organization of the Indiana Northern Traction Co., with \$3,500,000 capital stock, to acquire and extend interurban lines and construct new lines forming a consolidated system touching Indianapolis, Anderson, Logansport, Delphi, Kokomo, Lafayette and other important Indiana towns. The seven directors of the new corporation are: Charles A. Baldwin, W. H. Bloss, E. C. Carpenter, Henry Moon, Albert S. Richey, A. W. Brady and Charles Berry, all of whom are connected with the Union Traction Co., and George F. McCulloch will be president of the entire system. The Indiana Northern has completed the acquisition of the Logansport, Rochester & Northern Traction Co.'s property and the Logansport & Kokomo Ry., which gives it control of all the street railway interests at Logansport with the exception of the Logansport Railway Co. and the Wabash River Traction Co. The local lines in Lafayette are next to be acquired, and a line will be built from Lafayette to Logansport by way of Delphi.

MODERN FENDERS.

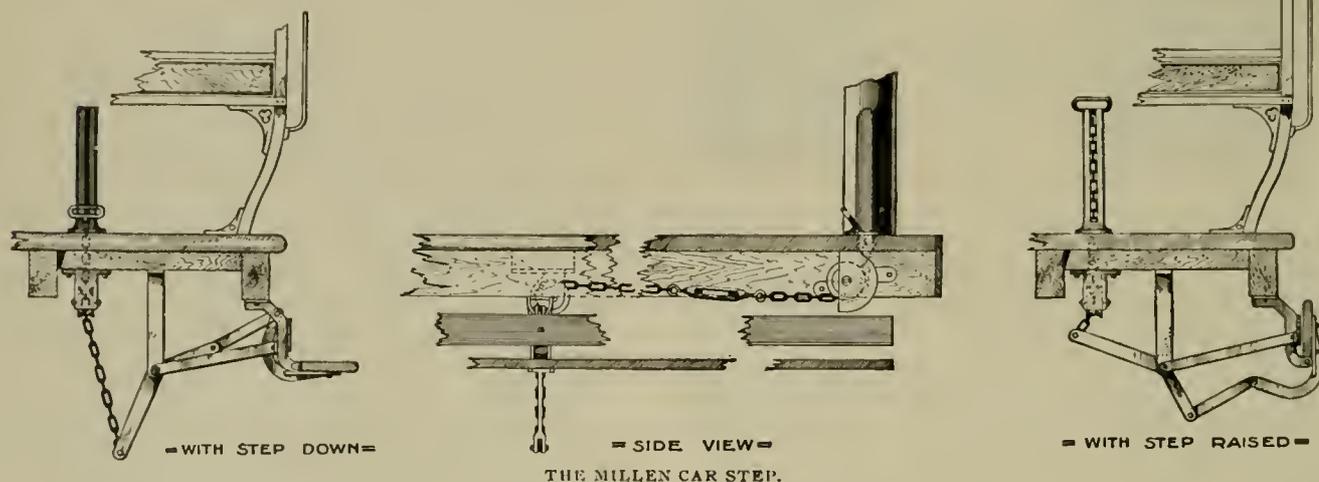
The use of fenders on street railways has become practically universal and in most cities is prescribed by law. Some time ago the prevailing idea of a fender was some kind of a large wooden buffer of the general style of the locomotive pilot which would prove useful in clearing the track of obstructions but was more of a protection to the car than to the person or object struck by it. Of recent years great progress has been made in the design of this class of apparatus and the best fenders of the present day are designed to pick up and carry safely any person or animal struck by the car. It has been stated that during the time when car fenders were the subject of the greatest discussion that the number of applications received at Washington for these safety devices exceeded that of any other single class of patents. During the evolution of the types of fenders now in use it will be noticed that but a comparatively few styles have survived.

Among the most used and effective fenders of the present time are those of the Consolidated Car Fender Co., which are known as "Providence" fenders. These fenders are made in several varieties suitable for all kinds of cars, and we are informed that over 10,000 electric cars are provided with fenders of this type. This company is publishing a catalog describing its various fenders and other apparatus, and a list is given of electric roads using "Providence" fenders exclusively which includes 156 names.

The general appearance of the various types of "Providence"

lifted up and folded against the back dasher in a very compact manner so as not to occupy above 12 in. of space beyond the buffer. The time required for this change is merely a fraction of a minute and need not be considered. It is often necessary, however, to remove the fender entirely from the head end of the car in order to effect a coupling between two cars. When this is necessary this fender can be removed by simply lifting it out of its sockets. When the fender has been removed from the car the intermediate brackets on which it is supported can be shoved under the car entirely out of the way, leaving the end of the car free to push another car in front or to pull a trailer. Another reason for using fenders at both ends of the car is that while it does not require more than a minute to change from one end of the car to the other it requires the services of two men which are not always available.

The model B "Providence" car fender has been designed specially for use on low cars. It was originally intended for use on the closed cars of the Metropolitan Street Railway Co., of New York, and it is equally well adapted to any moderately low car. The steel fingers at the lower part of the fender are not curved as much in this type as in model A, and in adjusting the fenders on the cars the upper wood cross bar can be placed as close as 15 in. to the rail without being struck by the steel fingers when the fender is dropped by the motorman. When not in use on the rear end of the car the model B fender is taken up and fastened to the dash board which lifts it out of the way of the draw bar when carrying a trailer. It also takes up but very little room in the car



fenders is very similar, the difference being chiefly a matter of size to suit cars of different dimensions. The two principal parts of these fenders are a kind of scoop for picking up the person or object struck, and a cushion of springs to prevent injury by the force of the impact. The material is flat spring steel and the scoop part is arranged so that while its front edge normally travels at a few inches above the roadbed, a device is employed whereby the motorman can drop the edge of the fender down to the ground so that the rubber wheels which are carried at the front of the fender rest upon the track. In this position it is impossible for any object struck to be run over. These fenders are made in four styles known as models A, B, C and D.

Model A can be used on any car but is specially adapted to a car of moderate height. The curves in the steel fingers of the lower part of the fender are designed so that when the front end of the fender is dropped by the motorman, the rubber rolls will rest on the track and the curve in the steel fingers will just clear the track. It is of course impracticable to have the rubber rolls on the ground and track all the time so the fender is adjusted to normally clear the roughest part of the roadbed except when brought into use by being dropped by the motorman. Another important feature of this fender is the ease with which it may be folded or taken off from the car when desired. On many roads operating under rapid headway there is scarcely time to change the fenders from one end of the car to the other on reaching the end of the route and for this reason many companies prefer to equip their cars with fenders on both ends. The rear fender in this case may be

barn when folded. Model B is in greater use than any other of the different styles of "Providence" fenders and out of the 10,000 electric cars so equipped probably about one half of them use the model B equipment.

Model C is a new pattern recently brought out by this company which has the advantage of being adjustable so as to ride at any desired distance above the rail, for example, from ½ in. to 18 in. The front of this fender can be dropped to the rail instantly from any position by the motorman, who simply presses a bolt in the platform of the car. The shape of this fender is such that when properly adjusted to the car it will hold a person or child without injury until the car can be stopped. Its holding capacity has been considerably increased by the use of spiral springs which support each side of the fender. Like the other models, model C does not project to exceed 12 in. beyond the buffer of the car in its folded position and it is also easily removable from the car altogether by simply raising it out of the socket.

The model D fender is specially adopted to interurban cars and it is built much larger and stronger than the other models described. It is said to be large and strong enough to pick up a horse and carry it until the car can be stopped, and this is claimed to be the only fender that will pick up and hold the object struck when the car is running at a very high rate of speed. Few persons are struck by interurban cars, but the great danger on these lines is running over animals. The pilot of the form used on steam locomotives will generally remove the animal from the track but if it fails to do so the car will probably be derailed, which en-

FINANCIAL.

PHILADELPHIA CO., PITTSBURG.

The board of directors of the Philadelphia Co. has submitted its report for the fiscal year ending March 31st, showing most gratifying results, since for the purpose of economical operation the several traction and street railway companies have, by operating agreement, been placed under the management of the Southern Traction Co. whose corporate name has been changed to the Pittsburg Railways Co. As has previously been noted the company has acquired, as was authorized by the stockholders Dec. 14, 1902, 232,022 shares of the preferred stock and 246,499 shares of the common stock of the Consolidated Traction Co.; 50,000 shares of the preferred stock and 50,000 shares of the common stock of the Southern Traction Co.; 6,000 shares of the Southern Heat, Light & Power Co. and the shares of several smaller street railway companies. The Monongahela Street Ry. and the Suburban Rapid Transit Street Ry. have been leased to the Consolidated Traction Co.; the Pittsburg & Birmingham Traction Co.'s line to the United Traction Co., and the property of the Monongahela Light & Power Co. and the Southern Heat, Light & Power Co. to the Allegheny County Light Co. The report of the fiscal year is as follows:

	1902.	1901.
Gross earnings from operations.....	\$1,166,227.22	\$1,057,133.27
Operating expenses and taxes.....	630,807.65	464,309.73
Net earnings from operations.....	535,419.57	592,823.54
Other income	83,719.38	16,140.26
Total earnings and other income	619,138.95	608,963.80
Deductions from income.....	69,996.27	35,497.84
Total income	549,142.68	573,465.96
Fixed charges	331,281.54	264,339.72
Net income	217,384.00	286,497.52

BROOKLYN RAPID TRANSIT.

The financial report of the Brooklyn Rapid Transit system, including all companies, for February and for the eight months ending February 28th, has been submitted as follows:

	1902.	1901.
Gross receipts	\$861,696.02	\$843,394.25
Expenses, including taxes.....	716,432.03	584,461.49
Net receipts	145,263.99	258,932.76
Decrease	113,668.77	
For eight months ending Feb. 28.		

	1902.	1901.
Gross receipts	\$8,395,448.45	\$7,899,100.87
Expenses, including taxes.....	6,016,664.05	5,150,406.38
Net receipts	2,378,784.40	2,748,694.49
Decrease	369,910.09	

The fact that a large percentage of the earnings from operation has been returned to the property for improvements and extensions explains the decrease in net, while the gain in gross, as reflected in the report, indicates that the business of the system is constantly increasing. Henceforth such betterments will be amply provided for from the proceeds of the recent sale of \$5,000,000 bonds, and with the operating cost charged only with legitimate expenditures, a handsome surplus will undoubtedly be shown for the stock. Two hundred new cars are soon to be put in commission on the Brooklyn Rapid Transit system, a fact which will materially influence the earning capacity of the road.

MANHATTAN RAILWAY CO.

The report of the Manhattan Railway Co. for the quarter ending March 31st shows a gain in the number of passengers carried of 7,588,331, and for the nine months ending with March, a gain of 18,000,000. The gratifying increase in business is principally due to the improved service since electric traction has been installed on the Second and Third Ave. branches, and a commensurate gain may be expected as electricity replaces other motive power on the remainder of the system. The financial report of the Manhattan company is as follows:

	1902.	1901.	Increase.
Gross earnings	\$2,878,236	\$2,502,043	\$376,193
Operating expenses and taxes	1,400,378	1,348,136	52,242
Net earnings	\$1,477,858	\$1,153,907	\$323,951

Other income	121,957	200,287	*78,350
Total income	\$1,599,795	\$1,354,194	\$245,601
Fixed charges	658,330	653,357	4,978
Balance	\$941,460	\$700,837	\$240,623
Dividends	480,000	480,000	
Surplus	461,460	\$220,837	\$240,623
Passengers carried	58,037,249	59,448,918	7,588,331
From July 1 to March 31:			
Gross earnings	\$7,868,661	\$6,917,680	\$840,981
Operating expenses and taxes.....	4,117,478	8,935,544	191,934
Net earnings	\$3,691,183	\$2,992,136	\$699,047
Other income	514,511	595,211	*80,710
Total income	\$4,205,694	\$3,587,347	\$618,347
Fixed charges	2,043,871	2,030,138	13,733
Balance	\$2,161,823	\$1,557,209	\$604,614
Dividends	1,440,000	1,440,000	
Surplus	\$721,823	\$117,209	\$604,614
Passengers carried	157,560,097	139,569,670	17,990,227
*Decrease.			

NEW ORLEANS RAILWAYS CO.

The New Orleans Railways Co. has been organized with a capitalization of \$80,000,000 to effect a consolidation of the street railway and electric light companies of New Orleans. The capitalization is divided into \$40,000,000, 4 1/4 per cent sinking fund mortgage bonds, \$10,000,000 4 per cent cumulative preferred stock and \$20,000,000 common stock. Of the bonds \$20,000,000 will be issued to acquire securities of existing companies, \$12,846,000 being reserved to retire existing bonds. Seven million dollars for proposed new construction and improvements.

GENERAL ELECTRIC CO.

The 10th annual report of the General Electric Co. for the year ending January 31, 1902, shows profits (including \$938,584.77 derived from the sale of securities), amounting to \$8,598,241.34, after expenses and the sum of \$1,131,583.98 expended on factory plants and machinery have been deducted. The sales, royalties and sundry profits amounted to \$32,479,428. Dividends amounting to \$1,955,657 were declared and the present surplus and undivided earnings are now \$15,287,141.

The Metropolitan West Side Elevated Ry., Chicago, in April carried an average of 109,246 passengers per day, a gain of 12,228 per day over the corresponding period of last year. The showing was made under normal conditions, and with only five out of seven stations completed on the new extension.

The earnings of the Chicago Union Traction Co. show a gain of \$54,000 for April, \$66,000 for March, and \$62,000 for February.

The Twin City Rapid Transit Co.'s report for March shows net earnings of \$151,423, an increase of \$25,106; and surplus after payment of charges and proportion of preferred stock dividend, \$75,406, an increase of \$20,353.

During the four weeks ending April 26th, the United Traction Co. of Albany gained in receipts \$4,279.56 over the corresponding period last year. Of the amount named, \$3,774.82 was gained on the Albany division and \$504.75 on the Troy lines.

The American Railways Co., of Philadelphia, reports that for the quarter ending March 30th, the gross receipts have shown a uniform increase of about 23 per cent. The company is making extensions of its various systems as warranted by the growth of the cities and increase in traffic.

The St. Louis Transit Co. reports for the month of March, total gross receipts of \$500,117 as against \$461,352 for the same month last year, an increase of \$39,765. From the beginning of the year to April 1st the earnings amounted to \$1,386,251, an increase of \$77,029.

CHICAGO FRANCHISES.

May 8th the United States Circuit Court sustained the demurrer of the City of Chicago to the bill in equity filed June 25, 1901, by William L. Elkins, of Philadelphia, praying an injunction restraining interference with rights of the Chicago street railways under the so-called 99-year act passed by the Illinois Legislature in 1865, and a definition of these rights.

Mr. Elkins joined the Chicago street railway companies, in which he is interested, as defendants, so as to give the federal court jurisdiction of the case on the ground of diverse citizenship of the parties, but in its ruling of May 8th the court held that the allegations in the bill were not sufficient to give the court jurisdiction, but leave to file amended bills was granted.

Two amended bills were filed May 12th on behalf of Mr. Elkins, making direct complaint that resolutions passed by the city council have been effective as legislative impairments of the charter rights of the companies, and declaring the action of the council in planning the seizure of the properties of the street railway companies to be a violation of the Federal constitution. It is further alleged that the compulsory issue of transfers is an infringement upon the charter rights of the company. The complainant alleges that all resolutions passed by the city council with reference to franchise forfeiture are based on the idea that the traction property will absolutely revert to the city on July 30, 1903.

STRIKES OF THE MONTH.

A general strike on all but three of the lines of the United Railroads of San Francisco was declared at 9 p. m., April 19th, and continued until April 26th, when a compromise was effected. Over 3,000 men were out, their demands being a flat rate of 25 cents per hour, the reinstatement of 28 men who had been discharged, it was alleged, for joining the union, and a complete recognition of the union by the company. Passenger traffic was practically at a standstill, although the mail routes were operated throughout the strike without interruption. No cases of violence were reported. By the terms of settlement the discharged men were reinstated, the wage increase was granted, but the recognition of the union by the company was not conceded.

Motormen and conductors in the employ of the Lima (O.) Electric Railway & Light Co. went out on a strike April 24th, demanding an increase in wages of from 14 to 16 cents an hour in the case of conductors, and from 12 to 16 cents in the case of motormen. Several riots resulted from the company's attempting to run the cars manned with non-union men, and a number of arrests of the strikers were made. The company granted the demand for a wage increase, on April 28th, since which time cars have been running as usual.

The strike of the employees of the Jamestown (N. Y.) Street Railway Co., which began nearly a year ago, has been amicably settled. The details of the settlement have not been given out.

HOOSAC VALLEY OPENS NEW LINE.

The Hoosac Valley Street Railway Co., North Adams, Mass., has opened a new interurban to Cheshire, the first car being run over the line on the morning of May 5th, with 46 passengers, including the city officers and prominent townspeople of North Adams and Cheshire, who were the guests of Mr. C. Q. Richmond, president, and Mr. W. T. Nary, superintendent of the Hoosac Valley company. The opening of the road, which is a model one in point of construction and equipment, was conducted under the personal supervision of Mr. Nary and was an occasion for public celebration both cities. Cars are running over the new extension on a half-hour schedule.

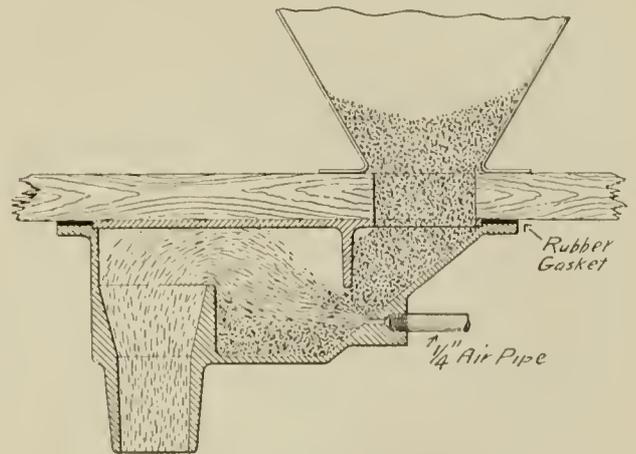
An attractive souvenir pamphlet has been published by the London Street Railway Co., of London, Ont., on Springbank Park, which is reached by the company's lines. The park commissioners are making an unusual effort in the direction of beautifying the summer resort. The walks and drives are being added to and the buildings, among which is a very large pavilion, are kept in perfect order. The railway company is arranging to provide a series of attractive performances and entertainments which will out rival those of any previous season.

NEW PUBLICATION.

THE INVESTORS' MANUAL FOR 1902. The Economist Publishing Co., Chicago. The Economist "Investors' Manual" is always of great value to persons interested in the large financial and industrial corporations of Chicago, and particularly to those seeking information concerning the street railways of the city. The issue for 1902 contains complete statements covering all the Chicago street railway properties, and is illustrated by maps of the various systems, which will be found very convenient for reference. The book comprises 100 pages and the index shows over 500 different corporations, including the principal steam railroads of the country.

PNEUMATIC TRACK SANDER,

The accompanying diagram represents the new pneumatic track sander manufactured by the Nichols-Lintern Co., of Cleveland, O., and this device is specially recommended for city, suburban and heavy service equipment. The necessity for sanding tracks at certain points is unquestioned and it becomes of importance to have cars equipped with a track sander which will not fail when an



NICHOLS-LINTERN TRACK SANDER.

emergency arises. The makers claim that this device is absolutely air and water tight and that it is instantaneous in operation and constant in action, as well as being economical in the use of sand. There are no levers or valves to get out of order and the device can be placed at any desired point and can be applied to the car without cutting or changing any of the woodwork. The ease with which sand can be applied with this device is one of its chief merits and it is claimed that the actual consumption of air is less on cars equipped with this sander than those without it because less air is used for braking purposes and the air used by the sander is insignificant in amount.

FAKE ACCIDENT IN PHILADELPHIA.

Three men are under arrest in Philadelphia, having confessed to a conspiracy to bring fraudulent damage suits for \$10,000 against the Union Traction Co. D. Slutsky, the principal in the affair, entered suit against the company for that amount on November 17, 1900, alleging he had been injured on July 22, 1900, while alighting from the company's car, through the negligence of its servants. The case has since been postponed a number of times pending investigations, with the result that the three conspirators were arrested May 10th. According to the sworn confessions of the trio, the two confederates of Slutsky were to receive \$50 from him for posing as witnesses of his alleged accident and for assisting him to a drug store after he had feigned a fall.

The Scranton (Pa.) Railway Co. has installed a new engine of 1,500 h. p. capacity, which was made by the Alhs Chalmers Co. This addition gives the company sufficient power to put all its cars into commission.

HALF FARES.

We regret to learn that Mr. Harry Niles, who for several years has been electrical engineer for the street railway at Mexico City, Mex., died on May 10th. Mr. Niles was formerly at Indianapolis and went to Mexico with the late Thomas H. McLean.

The American Railways Co., of Philadelphia, which owns the Chicago & Joliet Electric Ry., contemplates building an electric line from Summit to Lyons in Cook County, Ill., to connect with lines running into Chicago.

The Rochester (N. Y.) & Eastern Rapid Railway Co. will soon begin the construction of its line to Geneva, over a route 41 miles in length, 8 miles shorter than that of the steam lines. The power house will be located at Canandaigua.

The Metropolitan Elevated Railroad, Chicago, carried 109,246 passengers per day, on an average, during April, an increase over the corresponding month last year of 12,228. The Douglas Park extension contributed about 9,000 fares a day.

The Canton-Massillon Electric Railway Co., has increased the wages of conductors and motormen, the new scale being as follows: Seventeen and one-half cents an hour for the first six months of service; 18 cents an hour for the remainder of the first year; 19 cents an hour for the second year, and 20 cents an hour thereafter.

All wooden bridges on the suburban electric railway running out of Bucyrus, O., are being replaced with steel structures. The entire road is being ballasted with crushed stone and new and heavy cars have been ordered. The run between Bucyrus and Mansfield, a distance of 35 miles, will be made in one hour and 20 minutes.

The electric generating station of the Metropolitan Railway, London, will be furnished with Westinghouse steam turbines, a contract for such equipment having been awarded to the British Westinghouse Electric & Manufacturing Co., of Manchester, which is filling a similar contract for the Metropolitan District company.

The Columbus (O.) Railway Co. will install an engine and generator of 1,800 h. p., increasing the capacity of the plant by half. A traveling steel crane will be installed, a new steel roof built over the power house and other improvements made, aggregating a total expenditure of \$100,000. The company has relaid its South High St. line with heavy rails.

The application of the United Traction Co., of Albany, for permission to extend its lines across the grounds at the Watervliet arsenal in constructing its proposed new road in Watervliet has been granted by the War Department with the proviso that the company construct a tunnel under the arsenal grounds. These terms have not yet been accepted.

The Oakland (Cal.) Transit Co. has inaugurated a new wage scale, effective May 1st, increasing the wages of conductors and motormen from 21 cents an hour to 24 cents. The company contemplates a series of summer excursions for the benefit of the men and their families, on which occasions music and other entertainment will be afforded gratuitously.

Two disastrous fires occurred on April 29th, one destroying the carhouse of the Niagara Falls Park & River Railway Co. at Chipewawa, with several freight and passenger cars, and an observation car; the other, at Broad Ripple, Ind., destroyed the carhouse of the Broad Ripple Traction Co., together with two double truck cars and other rolling stock aggregating in value \$20,000.

The New Jersey & Hudson River Railway & Ferry Co., still continues its practice of issuing an attractive artistic calendar each month. That for May, in several colors, being especially appropriate to Decoration Day. On the reverse of the card are printed the common and botanical names of some 25 varieties of wild flowers which grow in profusion along the company's lines through Bergen County.

The York County Traction Co., York, Pa., has nearly completed an extension from New York to Dallastown, Red Lion and Windsorville, and will continue the line to Delta, 35 miles from York. Later, another extension will be built, including Wintertown and Shrewsbury in the southern part of York County. The company owns six acres of fine woodland at Red Lion which will be improved and equipped with park conveniences to serve as a resort for the people of York and nearby towns.

The Tennis Construction Co., of Philadelphia, has purchased the West Chester Street Ry., and will extend the system at once to Downington, Kennett, Coatesville and Parkesburg. The line to

Downington has been partly built, and will be completed by the new owners in a few weeks. Power houses for the proposed interurban lines will be erected at Downington, Coatesville and Kennett Square. The name of the West Chester Street Railway Co. will be changed to the Brandywine Traction Co., under which title the proposed interurban lines will be operated.

The merger of the Hamilton & Lindenwald Electric Transit Co., the Cincinnati & Northwestern R. R., and the Miamisburg & Germantown Traction Co. with the Southern Ohio Traction Co. has been ratified, and the consolidated properties will be operated under the title of the Cincinnati, Dayton & Toledo Traction Co., with a capitalization of \$5,000,000. Under the terms of the merger the Southern Ohio Company will hold \$2,000,000 of the new stock, and in addition, \$1,200,000 in bonds. It is proposed to expend \$2,000,000 for extensions of the system, giving a direct route from Toledo to Cincinnati.

The exhibit submitted by the St. Louis Transit Co. to the State Board of Equalization sets forth the aggregate value of the company's property at \$5,178,006.27, and comprises among other items the following: 146.06 miles of double track in Missouri valued at \$1,251,770, and 58.33 miles of single track valued at \$252,495; rolling stock to the value of \$1,183,167.50, and buildings and miscellaneous property to the value of \$2,490,603.77. The following items are included in the list of rolling stock: 90 passenger cars and 1,120 motor cars, and 42 sweepers and scrapers. The company uses 350.45 miles of trolley wire, valued at \$52,567.50.

Policemen and firemen in Albany will probably lose the privileges they have enjoyed of riding free upon the street cars in that city while engaged in the performance of their duties. The Court of Appeals has rendered a decision to the effect that in this respect firemen and policemen are public officers and debarred from riding free by the constitutional provision which prohibits public officers from using passes. Further, the act of 1895 is declared unconstitutional because in compelling the transportation companies to give policemen free rides it deprives the companies of their property without due process of law and takes private property for public use without compensation.

American methods and British workmen are performing feats in the direction of rapid work, which have hitherto been unknown in England. The record in bricklaying at the British Westinghouse Co.'s works at Manchester was a revelation and this has been followed by some unusually expeditious work in the construction of the stack of the Mersey Railway Co. at Liverpool. This is about 250 ft. in height and work upon it was commenced about Christmas time. It has now been completed for some time and stands as a record-breaker in expeditious building. The work has been carried out by the British Westinghouse Co., which has the contract for converting the Mersey railway tunnel from steam to electric traction. The work has been under the direction of Messrs J. Stewart & Co.

The New York & North Shore Ry., a 7-mile electric line, running between Flushing and Jamaica, L. I., has been sold under foreclosure proceedings instituted by the New York Security & Trust Co., to E. C. Miller of Philadelphia, for \$100,000 over its liabilities. The controlling interest in the North Shore Ry. was owned by the New York & Queens County Railway Co., and it is stated that the plan of reorganization contemplates a consolidation of the North Shore and New York & Queens County properties, and the construction of lines from Flushing to Whitestone, Willet's Point, Bay Side and Manhasset for which franchises have been secured by the North Shore company. Reports are in circulation that the Interborough Rapid Transit Co., which was recently incorporated with \$25,000,000 capital and in which the promoters of the Rapid Transit Subway are interested, has opened negotiations for the acquisition of both the New York & Queens County and the North Shore systems.

ARNOLD TO ADVISE CHICAGO.

It was announced on May 21st that the committee on local transportation of the Chicago city council had decided to retain Mr. B. J. Arnold to advise the city concerning the engineering problems which have arisen in connection with the street railways. Mr. Arnold, as our readers will remember, is consulting electrical engineer for the New York Central, and for some time has been at work on plans for equipping that company's New York City terminals for electrical operation.

STREET RAILWAY PATENTS.

This list of patents is furnished by T. Reed Clift, Patent Attorney, Washington, D. C.:

No. 696,408, April 1, John A. Brill, Philadelphia, Pa. Convertible railway car.

No. 696,400. Same.

No. 696,404, April 1, Joseph A. Mead, Cleveland, O. Station indicator.

No. 696,653, April 1, Wm. G. Price, Kingston, N. Y. Brake.

No. 696,752, April 1, John R. Robertson, New York City. Means for automatically controlling motors and brakes.

No. 696,001, April 1, Charles B. Fairchild, New York City. Car brake.

No. 697,070, April 8, Oliver Colborne, Chicago, Ill. Car truck.

No. 697,122, April 1, Thomas E. C. Wilson, Liverpool, Eng. Life guard.

No. 697,208, April 8, Elisha J. Hunt, New York City. Folding step for cars.

No. 697,238, April 8, Troy Cope, New Waterford, O. Switch operating device.

No. 697,283, April 8, Francis F. Shaffer, Cumberland, Md. Car brake.

No. 697,293, April 8, Oscar C. Thomas, Adams, N. Y. Folding car step.

No. 697,308, April 8, John C. Wuerth, St. Louis, Mo. Street indicator for street cars.

No. 697,591, April 15, Amos Youngblood, North Augusta, S. C. Operating railroad switches.

No. 697,674, April 15, Thomas P. Shanahan, Gloversville, N. Y. Automatic trolley catcher.

No. 697,795, April 15, Pembroke A. Brawner, Chattanooga, Tenn. Brake shoe.

No. 698,069, April 22, Lewis O. Sprout, Fostoria, O. Railway torpedo.

No. 698,197, April 22, Thomas E. Stucky and Edward Ware, Indianapolis, Ind. Adjustable trolley supporter.

No. 698,206, April 22, Charles Lilleberg, Chicago, Ill. Railroad crossing.

No. 698,239, April 22, John H. V. Young and Ralph W. Barr, Akron, O. Tramway switch.

No. 698,259, April 22, Henry W. Covert, Waterford, N. Y. Convertible car.

No. 698,395, April 22, John A. Miller, Omaha, Neb. Guiding device for trolleys.

No. 698,421, April 22, Henry Tesseyman, Dayton, O. Brake Shoe mechanism.

No. 698,518, April 29, Frederick Kennington, Leeds, Eng. Adjustable roof or cover for tram cars.

No. 698,754, April 29, Wm. Smith, Bastrop, La. Station indicator.

No. 698,915, April 29, Millard Field, Boston, Mass. Car fender.

No. 698,954, April 29, Clarence P. Hulst, Milwaukee, Wis. Car fender.

No. 698,965, April 29, Wm. Kingsland, London, Eng. Connection of strikers to motor vehicles for mechanically operating switches.

No. 698,986, April 29, Albert J. Michel, Scranton, Pa. Car replacer.

ALLEGED BRIBERY IN CHICAGO.

Pending the appeal taken from a decision of the Circuit Court regarding the running of transfers between the lines of the Union and the Consolidated companies, the Chicago Union Traction Co. has refused to give transfers. The principal difficulty has been with residents of the suburb of Avon, and some 500 suits against the company are pending. In the first two cases tried the verdict was for the company and the Avon "car baiters," as they are termed, unearthed an alleged scheme of jury bribery which involves a large number of people. The case of the first jury was taken up by the grand jury and indictments found against seven men.

In considering the case of the second jury the grand jury found six more indictments including two against men who had been indicted in the previous case. The third suit which was brought against the company resulted in finding the latter guilty and a maximum penalty of \$2000 was imposed. In the fourth case, tried May 15th, the jury disagreed.

ADVERTISING LITERATURE.

THE STERION COPPER, BRASS & BRONZE CO., No. 65 and 67 N. Ashland Ave., Chicago, May 1st issued its Bulletin No. 13 describing and illustrating the copper commutator bars made by it.

THE ELECTRIC STORAGE BATTERY CO. has just issued its Bulletin No. 71 containing "The Storage Battery in the Commercial Operation of Electric Automobiles," by W. H. Palmer, Jr. This is a reprint of the article appearing in the Electrical World and Engineer for Apr. 12, 1902.

THE CENTRAL ELECTRIC CO., of Chicago, has published a 1902 edition of its "Fan Motor Catalog," in which is listed a full line of desk, bracket and ceiling fans for all currents and voltages. This catalog also includes power motors, sewing machine motors, battery fans, ventilating fans, etc. Anyone desiring a copy of this catalog can procure it by addressing a request to the Central Electric Co.

THE OHMER CAR REGISTER CO., of Dayton, O., has published a pamphlet giving fac-similes of 10 or more letters from well-known street railway managers affirming their satisfaction in the working of the Ohmer system. The letters state that economy in time is effected by the Ohmer register and that moreover it assures a more accurate accounting of the fares collected than does any of the old fangled methods.

"GRAPHITE," published by the Joseph Dixon Crucible Co., Jersey City, N. J., in the interest of Dixon's graphite productions, contained for May, in addition to the usual quota of technical articles, humorous matter and illustrations, the result of the annual election of the company's officers, as follows: E. F. C. Young, president; John A. Walker, vice president and treasurer, and George E. Long, secretary. The company reports larger sales for 1901 than for any previous year, and larger net earnings.

THE GENERAL ELECTRIC CO., has recently issued the following publications: Bulletin No. 4284 (superseding Bulletin No. 4196), "Prices Paid for Street Arc Lighting in the United States," "The Relation Between Electric Meters and Central Station Revenue," by Caryl D. Haskins, reprinted in pamphlet form; Catalog and Price Lists, Nos. 7553 and 7554 (superseding Nos. 7546 and 7523) on "Parts of Magnetic Blow-out Automatic Circuit Breakers," and "Sockets and Receptacles;" Flyers Nos. 2097 and 2098, "Plain Type Arc Lamps" and "One-Piece Fuseless Rosette;" Price List No. 5098, "Snap and Push Button Switches."

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York, has published a leaflet entitled "Tests," showing the results of recent tests of Keystone hair insulators of this company's manufacture, which have proved to possess exceptional insulating qualities. A table is given condensed from a paper by Mr. John E. Starr, of the Starr Engineering Co., New York, presented at the Convention of American Warehousemen at Buffalo in October, showing the transmission of heat through various insulating structures and commending the qualities for which the Keystone hair insulator is especially remarkable.

THE CROCKER-WHEELER CO., Ampere, N. J., has recently issued the following bulletins: No. 13 (superseding Nos. 6 and 12) "Engine-Type Generators," third supplement to bulletin No. 13, giving partial list of the users of the Crocker-Wheeler engine-type generators. No. 14, (superseding Nos. 4 and 9) "Belt-Type Machines—Large Sizes." No. 16, (superseding Nos. 4 and 11) "Belt-Type Machines—Bipolar Motors." No. 17, (superseding No. 3) "Motor-Dynamos and Dynamotors." No. 18, "Electric Plant of a Graphite Factory," describing the electrical equipment of the Joseph Dixon Crucible Co. No. 20, (superseding Nos. 4, 10, and 15) "Belt-Type Machines—Small Multipolar Sizes."

RUMSEY & CO., Seneca Falls, N. Y. Illustrated catalog and price list of hand and power pumps. The catalogue contains descriptions of hydraulic and pumping machinery made by Rumsey & Co., for all purposes. The book is bound in stiff cloth covers and it forms an excellent book of reference for the subjects which it covers. This company manufactures all styles of pumps from the smallest eastern pump to heavy power pumps, directly operated by steam engines or electric motors. Each of the different styles of pumps is well illustrated and a table accompanies each different type of pump giving the different sizes, capacities, and all the necessary data for the purchaser, including a price list. The book covers 260 pages and includes a telegraphic cipher code and a well arranged alphabetical index.

Creaghead Flexible Brackets

ARE STANDARD

CREAGHEAD ENGINEERING Co.

ENGINEERS and MANUFACTURERS

OVERHEAD LINE MATERIAL.

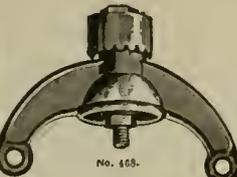
For Single and Double Wire.



West End Cap and Cone and Solid Types of Insulators.



Trolley Splicers, Strain Ears, Feeder Ears, etc.



Ears for Round Figure 8, and Groove Forms of Trolley Wire.



Solid Type Insulators.



Type D. For Single and Double Wire.



Complete Equipment for Overhead Construction.

THE CREAGHEAD ENGINEERING CO.
ENGINEERS AND MANUFACTURERS
WRITE FOR CATALOGUE
CINCINNATI, OHIO.

THE SPRAGUE ELECTRIC CO. has issued its Bulletin No. 301 on Landell motors for driving ventilating fans and blowers and its catalog No. 304, entitled, "Landell Fans for 1902."

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has recently issued to the trade an attractive folder on Westinghouse lightning arresters. It contains an excellent description of the new Westinghouse low equivalent arrester, which has been received with general favor.

THE AMERICAN STEEL & WIRE CO. has issued two handsome catalogs of 80 pages each, one devoted to "Crown" and "United States" rail bonds, and the other to springs. Both catalogs are liberally illustrated and contain minute descriptions of the products represented. "Crown" rail bonds were first manufactured in 1897, since which time they have been adopted by 555 electric railways in the United States, and many of the most important street railways in Europe, Asia and South America. It is claimed for "Crown" bonds that they are most easily adjusted, all the work incident to applying the bond being done upon one side of the rail, and the labor and expense of re-laying pavement or concrete on both sides of the rail thereby avoided. The saving thus effected will frequently equal the cost of the bonding. The many shapes in which the "Crown" bond is furnished render it highly practicable for the purpose of double-bonding tracks at each joint, and sketches are given showing how the different shapes may be used. The "United States" rail bond is made with solid terminals and flat strips of copper, and is so designed that it can be used inside the splice-bar of a rail joint when the plate is only one-quarter of an inch from the web of the rail. The company's catalog No. 5 in relation to springs invites the reader's attention to recent innovations in the equipment of the factories at Worcester, Mass., Waukegan, Ill., and San Francisco, Cal. As manufacturer of all grades of steel from the raw material the American Steel & Wire Co. is in a position to meet all requirements and to insure satisfactory results from the use of its comprehensive product.

RIDLON'S REPRESENTATIVE, for May, 1902, has just been issued and contains eight pages of spicy advertising matter interspersed with many witticisms. This issue is a railway edition and is devoted specially to devices and supplies for electric railways.

THE NEW PROCESS RAW HIDE CO., of Syracuse, N. Y., has published a small catalog on its new process noiseless pinions and metal gears. The special field of the new process noiseless pinion is to fill the demand for a noiseless drive that will run silently and still be durable. The raw hide pinions are entirely lacking in any metallic sound and are used extensively on electric railway motors, automobiles, pumps, hoists and other machinery. The catalog contains a brief description of the method of curing the hide and making the pinions, and also contains a complete price list of gears and pinions of all sizes.

THE LORAIN STEEL CO. advises us that on May 27th its New York offices will remove from the present location in the Battery Park building to the nineteenth floor of the Century building, 74 Broadway, New York City.

THE STIRLING CO. of Chicago announces that after May 20th its New York office will be removed from the Havemeyer building to Room 907, Engineering building, 114-118 Liberty St., New York City.

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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. XII. JUNE 20, 1902. NO. 6

Five or six years ago the street railway fraternity was much interested in data on the operation of storage battery cars and considerable was published concerning the results at Hanover, Germany. The subject is no longer a live one in this country since the only storage battery line successfully operated here was converted for the overhead trolley about two years ago, and now we learn that the use of storage batteries for street cars has been forbidden in Germany and the companies operating accumulator cars directed to arrange for their supersession within a limited time. Whether the new Edison battery will cause a reversal of this edict remains to be determined.

The attention of intending exhibitors at the St. Louis Fair is directed to the letter, appearing on another page, from a committee of the Chicago Trade Press Association to the director of concessions of the Louisiana Purchase Exposition. At previous expositions of this character facilities for securing photographs of exhibits by the technical and trade journals have been very unsatisfactory, not, it is believed, because there was any intention to inconvenience the press, but because the question had not been placed before the management until it was too late for the latter to act. To those who visit expositions the exhibits speak for themselves, but others, who are perhaps equally, if not more interested, learn of the technical features and details principally through the journal especially devoted to the industries to which the exhibits belong. To an exhibitor who wishes to derive the greatest good from the expense incurred by taking part in expositions it is quite as important that the periodicals covering this field be given proper facilities, as it is to the paper itself.

The present tendency in nearly all business houses where extensive records are necessary is to utilize the card index so far as it is possible to do, and the same thing can be done to advantage in shops as well as in offices and storehouses. In connection with the description of the new repair shops for the street railway system at

Providence, given in the Review for May, 1902, there were shown the forms used for conveniently keeping detailed records of the equipment as well as the price and stock cards.

It is quite impossible to answer the question, Does it pay to do our own work? without complete and accurate shop accounts, and the day has gone by when the management can afford to take things for granted. About seven years ago the writer visited the shops of a steam railroad and noticing a locomotive on which extensive repairs were being made, inquired as to the cost of this work. The reply of the foreman was to the effect that they didn't know, and didn't want to know. This is not the most approved modern view as to the desirability of keeping shop costs, and doubtless has far fewer advocates today than at that time.

The failure to properly keep costs in the shop results in loss to the company in two ways, by permitting inefficiency and waste to continue unchecked and by misleading the management as to the economy of conducting a manufacturing business.

At some of the conventions of the American Street Railway Association objection has been made that too much time was given to excursions and other entertainments, at the expense of the business meetings of the Association, but now the tendency seems to be toward cutting out too much of the entertainment part of the program which was always such an attractive feature of street railway conventions; at the 1901 convention, the annual banquet was practically the only Association entertainment. In the past the Association has not always done full justice to the papers presented at its conventions, for the reason that the subjects treated were not such as could be discussed without previous preparation; now, however, that the papers are printed and published to the membership in advance of the meeting there is ample opportunity for those particularly interested to prepare for discussion, and at the last convention it was evident that this opportunity was greatly appreciated.

Besides thus increasing the opportunity of the Association for working, the number of days for meetings has been reduced from four to two. At Boston, in 1898, meetings of the associations were held on four days; at Chicago and at Kansas City there were but three days for meetings, the fourth day being set apart for the inspection of exhibits; at New York, last year, the time was cut still another day, one day for the exhibits and but two for association meetings. No one regrets the time specially given the exhibits; the only regret is that "supplymen's day" was not instituted several years earlier, for the exhibits are one of the convention's greatest attractions, but it seems to us that by limiting the Association meetings to two days only which necessitates two sessions per day there is danger of crowding out the social features which are really almost as important as the business part of the program.

Street railway men are hard workers and for many of them the convention is the only opportunity for a vacation; such it will no longer be if the Association continues to shorten the time for its meetings and still increase the output.

At the present time the indications are more favorable than ever before for a speedy settlement of the street railway question in Chicago. The appointment of a competent engineer to advise the city was a step in the right direction and had it been taken two years earlier the interests of all would have been better served, save perhaps those who hoped to make political capital out of the situation. Up to now there has been no one representing the city who knew what was reasonable to ask of the railway companies, and the latter were very wise in declining to enter into a controversy with irresponsible parties. The companies have, however, been anxious to arrange with the city for extensions of their franchises, in order that they might be free to make improvements in their systems, involving great expenditures such as could not be made as long as the franchise term was undetermined. Almost immediately after the announcement that Mr. B. J. Arnold had been retained to advise the city the street railway companies signified to the council their willingness to consult with the city's representatives and furnish all information within their power.

The street railways have no doubt as to the validity of the 99-year act, under which their trunk lines could be operated until 1958, but they could not be expected to make any extensive improvements so long as the city disputed the force of this law. It now appears probable that a decision on the 99-year act cannot be had very long

before the time when the city claims the franchises expire; the federal circuit court has refused to take jurisdiction of the suit brought by non-resident stockholders of the Chicago Union Traction Co., and as the question of the jurisdiction of the federal courts cannot be passed on by the United States Supreme Court for several months, and the case may eventually have to be tried in the state courts, the wisdom of not waiting for the adjudication of the question is apparent.

What is a satisfactory method of protecting grade crossings will doubtless be a live question so long as such crossings exist. The most common practice at the crossings of street railways with steam lines is to send the conductor of the street car onto the railroad to see that the way is clear before permitting the car to cross, but this is recognized to be merely a precaution and not an absolute preventive. An accident in Chicago on June 14th, when a train of two street cars became stalled on a railroad crossing by reason of the trolley jumping the wire, and was demolished by a steam train, serves to remind us of an ever-present danger. In the instance mentioned the watchman heard the steam train approaching and the crew and passengers of the street cars made their escape in time.

Absolute security against crossing accidents can be had only by separating the grades of the two roads, and this is usually only practicable in cities by elevating the steam railroad tracks and much has already been done in this line; though the necessary investment is large it is believed that the roads which have elevated their tracks find that the money saved in accident claims and watchmen's wages is sufficient to pay interest on the cost, to say nothing of the time saved. Next to abolishing the crossing a block signal is best, and where by reason of the great number of trains such a place seems impracticable, a suitable inverted trough made of metal arranged over the crossing so as to catch the trolley when it leaves the wire is an additional precaution. Some months ago we illustrated a device of this kind which had been prescribed by the New York State Railroad Commission.

The conditions with which transportation companies in large cities have to contend are perhaps only fully appreciated by the claim departments of the companies, and the executive officers who have to analyze reports for their stockholders. In nearly every city there is a special name for the lawyers who make a practice of handling discreditable personal injury cases against corporations—but whatever the name by which the "ambulance chaser" is known, his methods are the same and he is no better than the hold-up man who uses more violent means to his end. The methods of the personal injury lawyer are a stench in the nostrils of the public and the tolerance of bar associations towards this class of practitioners has resulted in seriously lowering the legal profession.

A mistaken sentimentality on the part of the jurors gives the poor man a verdict, even where it was beyond cavil his own carelessness that caused the injuries; and if the cause is not sentimentality, as we believe it is in most cases, the jurors give way to blind, unreasoning prejudice. Yet the jury is not wholly to blame. Jurors have no means of becoming acquainted with the facts behind the suit; they are not aware of the visit of an agent of the ghoul-lawyer to the injured person; they do not know that these people watch the columns of the newspapers for accounts of accidents and that the injured are run down as legitimate quarry even to their deathbeds at the hospitals. Jurors do not hear the insidious pleading of the shark-lawyer's agent to be allowed to file suit against the company, nor the instructions to hide the truth in many cases, in order to get a rich haul through the courts.

It makes no difference to the accident lawyer whether the injured person was a trespasser or not at the time he was hurt; it matters not whether he took risks which no sane person should take. "Let's bring the suit anyway," says the lawyer. "It will only cost \$10 to file it. You can't lose anything, and we may get a good settlement from the company without even a trial."

The damage suits that such lawyers refuse to handle are unknown. There is no question of good conscience, no troubling theories as to legal ethics. The proposition is a simple one—how much can we make the company pay to avoid expensive litigation, or the risk of a jury's injustice?

The real cause of the abuse lies in the fact that there is no risk worth mentioning in bringing such suits, and the lawyer agrees to divide the spoil. This fact suggests a simple remedy, make the man

who is the chief cause of the groundless litigation bear the pecuniary burden that is now borne by the company. As it is now the personal injury attorney is repaid by one successful suit for his efforts in a great many. He stands to lose nothing—not even respectability—in case of failure. Today the nature of this traffic is so well known, that even the men engaged in it will not defend it; they deny that their practice lies in this direction, while scouring the city for such cases.

The remedy is a matter of legislation. It pertains to legal practice and it would protect defendants from unconscionable suits, while taking no rights from plaintiffs who sue in good faith. It would be a complete bar to speculative litigation of the hold-up character.

In a word: the attorney's fees and costs of all actions should be made part of the judgment. Where the plaintiff failed in his suit, judgment should be rendered against him for all the expenses, including records, briefs, abstracts, counsel fees, etc., to which the other side has been put, the total of which often reaches a large sum. This is no hardship, because the defendant has been declared innocent of the charges of negligence and the plaintiff was at fault in bringing suit. In case the plaintiff succeeded in getting a verdict, in the same way the defendant should pay his costs in addition. Technically, "costs are awarded to the successful party."

In most states all that a party who successfully resists unjust damage claims may recover at the court costs, which are trifling. The main item, such as heavy attorney's fees, must be borne in order to escape worse penalties. The whole matter could be arranged by amending the practice acts. Such we believe is the law in Ontario. In New York the courts are authorized to punish the plaintiff in flagrant cases by giving judgment for the defendant for a percentage of the damages claimed, but even this can have but little effect in most of the fraudulent suits. Whether "costs shall be awarded to the successful party" in all cases, or only in actions of tort, is a debatable question, but there is no doubt that the effect of such a provision in the jurisdictions where it has been adopted has been to discourage frivolous or fraudulent litigation.

On the proper showing, the defendant should also be entitled to security for costs. In dealing with unscrupulous parties this is essential. Such provisions would be very discouraging to the fake personal injury man, but to none else. With zeal worthy of a better cause he will argue that the poor would be unable to bring suits and prosecute them; the poor, however, are protected by statutes giving them the right to sue as paupers. In legitimate suits, plaintiffs could still count on their friend the "damage shark," but he would carefully avoid "hold-up" litigation, knowing that he might be asked to furnish bond and be in the position of the biter bit.

Neither is the just suitor in danger of being assessed exorbitant costs, for that is attended to by a court official known as the "taxing officer," all items of the bill of costs being checked over by him in presence of counsel, and the judge giving final decision on the disputed points and fixing the total, for which a certificate is granted.

It appears to us that a concerted effort on the part of the corporate representatives and attorneys might be effective in stemming the constantly increasing tide of personal injury litigation and the other suits directed against corporations. Here is the opportunity for a "claim agents' association," and since there is no such organization among street railway men it is suggested that every member of the American Street Railway Association send its claim agent to the Detroit convention.

The London Journal of Gas Lighting is apparently out of its element in discussing electrical questions, although it is one of the leading periodicals in its own special field. In a recent issue it seems to have taken up the subject of electric traction in a manner which is somewhat surprising to the electrical railway man, and argues that "electric power which cannot beat steam on main lines of railways cannot beat horses on town tramways from the point of view of remuneration." This will certainly be news to the street railway man. From the fact that electricity has superseded horses in street car work to such an extent that the horse car is viewed in this country almost as a curiosity, it can easily be deduced that electricity in this service has been found to be more economical and, generally satisfactory than horses. As a matter of fact the use of electricity has doubled the traffic and consequently the receipts of street railways, and has further cut down the ratio of operating expenses to gross receipts to a marked extent; therefore, such a statement from a conservative paper is extremely out of place.

Handling Traffic at the Inter-State and West Indian Exposition, Charleston, S. C., Jan. 1 to May 31, 1902.

The Exposition at Charleston, S. C., which came to a close last month was devised, as its name partly suggests, for the purpose of exploiting the resources, industries and attractions of the states along the Atlantic seaboard south of Mason and Dixon line. The results predicted—and in a large measure secured—by the holding of this fair, were, the opening up of new foreign markets for the south principally in the West Indies, and the advertising and promoting of the silk, tea, cotton, tobacco and mineral resources and industries of the eastern southern states and the Mississippi Valley.

Although the Charleston Exposition was not designed on lines as broad as the Chicago World's Fair, the Omaha Exposition, the Pan-American or other similar enterprises of the past decade, it was thoroughly representative, and has been the means of bringing the attention of the world to the remarkable growth and development

Leading from one side of the Court of Palaces was the Midway with its many booths and buildings given over to amusement and pleasure. Here were the Old Mill, Thompson's scenic railway, stage for fireworks, etc. Opening from the opposite side of the main court was the section given over to art, transportation and machinery, stock and other exhibits and also the various state buildings. A miniature railway built according to the patents and designs of Cagney Brothers, of New York City, ran the length of the grounds and reached all the points of attraction.

Practically all of the exhibits pertaining to machinery and transportation were grouped in Machinery Hall and in the Transportation Building adjoining it. While not extensive, the contents of these buildings were instructive and worthy of careful study. The industrial activity of the South was well set forth by the number



THE CHARLESTON EXPOSITION AT NIGHT.

along industrial and commercial lines that have taken place in the South during recent years.

The site selected for the buildings and industrial palaces covered 200 acres of land on the eastern bank of the Ashley River within the corporate limits of the city of Charleston and about three miles from the business center of that city. The architectural and artistic landscape effects were typically southern in motif. Many of the chief buildings revealed traces of old southern colonial design, and southern palms and southern flora were left scattered through the grounds in the rich profusion of their natural state. Wide gravel and asphalt walks were laid out in all the sections, affording easy approach to buildings and providing attractive vistas, and these shaded walks with the beds of blooming flowers interspersed with groups of palms and live oaks formed an attraction hardly less delightful than the contents of the buildings. Occupying the central position of the site were the sunken or floating gardens where were planted rare tropical foliage, century plants, palmettos and flowers arranged in groups and beds with appropriate railings designed of mermaids, dolphins, sea shells and graceful and artistic statuary and figures. In the center of the gardens was placed an electric fountain, lending the final touch of perfection to the scene.

The illumination of the grounds and buildings was elaborate and artistic and some of the effects secured, especially in the sunken gardens, were entirely unique. The water from several streams winding in and out between the flower beds, finally flowed into a central lake through the pipes of a Maenomes Pan. In the center of the garden was a group representing the "triumph of electricity over water power." These effects were enhanced by many incandescent lights judiciously arranged, while the entire outline of both shores was accentuated by gaily colored lamp globes. Supplementing these main illuminations in the center of the gardens were thousands of incandescent lamps varied here and there with electric arc and acetylene gas lights outlining all the buildings and statuary, and scattered through the foliage, the whole making a scene of brilliancy and weird effects seldom equaled.

The artistic conception of the exposition called for five main sections designated as the Art, Natural, Transportation, Midway and Live Stock. The most important buildings, namely the Cotton, Commerce and Architectural Palaces were grouped about the central Court of Palaces, an open space of over a mile in circumference. Connecting these buildings were colonnades and groups of smaller booths and structures containing the United States Government exhibits, minerals and forestry displays, negro exhibits, etc.

and variety of mechanical implements and machinery displayed by southern firms.

When it was decided to hold the South Carolina Interstate & West Indian Exposition in the city of Charleston, the street railway management controlling all the city and interurban electric lines serving the territory adjacent to the site selected for the exposition, was called upon to solve several perplexing questions. Serving a normal population of 55,000, and carrying an average of 12,000 passengers per day, the Consolidated company was confronted with the problem of so expanding its facilities as to enable it to transport to and



SUNKEN GARDENS.

from the exposition grounds from 75,000 to 100,000 people per day, when necessary. This was the estimated attendance for the special days, but as matter of fact, there was very little upon which to base an estimate of the total attendance or the average daily attendance, and this uncertainty added new complications to the task of preparing street railway accommodations for the influx of visitors.

In arranging for extensions to its tracks, new terminals, increased power capacity and additional rolling stock that were decided to be essential to the safe and economical handling of the exposition crowds, the management of the Charleston Consolidated Railway, Gas & Electric Co., following the example of the street railway companies of Buf

falo in preparing for the Pan-American Exposition, determined to make all the improvements so far as consistent, permanent, instead of merely for the life of the exposition. By thus taking advantage of the opportunity offered, many permanent betterments to track, power house and cars have been made, that will greatly increase the future earning power and valuation of the property, and this has been accomplished without excessive outlay over the expenditure that would have been necessary for merely temporary extensions to plant.

The decisions reached by the Consolidated company in meeting the imposed conditions will be suggestive and valuable to managements everywhere who may be called upon to prepare for sudden and heavy increases in traffic, and with the constantly growing disposition of the American people to arrange expositions, fairs, carnivals, conventions and gatherings of all descriptions, this phase of



MACHINERY BUILDING.

street railroading is coming to be almost a science in itself. (For those seeking information on this subject, reference is especially made to the "Review" for June 15, 1901, page 335, where will be found the only complete published description of the plans adopted by the International Traction Co. of Buffalo, for handling the Pan-American crowds.)

At Charleston the same company that owns the street railway lines also owns the electric lighting and gas properties of the city, and was therefore in a position to undertake the work of lighting the exposition grounds and supplying power to exhibitors. This contract it secured and in re-arranging the power generation and distribution scheme, this load had to be provided for. The company owned two power houses: One small station on Sullivan's Island for furnishing power to what is termed the Sea Shore division, covering Mount Pleasant, Sullivan's Island and the Isle of Palms, and also for supplying electric lights for these islands; the second and main power house of the company is in the northern section of the city, not far from the Exposition site. In this plant are concentrated all the generating apparatus for both lighting and street railway purposes in the city and suburbs. To meet the needs of the Exposition as regards power and light, it was decided to install at this station two new three-phase alternating 60-cycle generating units, having a combined maximum capacity of 1,600 kw. From these machines current was transmitted to the grounds at 2,400 volts initial pressure.

By means of a 500-kw. converter and transformer in Machinery Hall at the Exposition, part of this current was changed to 550-volt direct current for use in motors at the different booths. At times of excessively heavy traffic, current from this converter was used to help out the street railway line running to the Exposition grounds. Ordinarily, however, the regular direct current units at the main power house were found adequate to handle the extra Exposition traffic in addition to the regular travel of the company, and no new direct current apparatus was purchased for the railway load.

The final disposition of the three-phase units has not been fully settled, but it is probable they will be retained at this station and used in the regular commercial and city lighting business. One was leased for the six months of the Exposition with the option of purchasing it at the end of that period. The rotary converter will undoubtedly be transferred to the Island station of the company, and will take current from the three-phase units for the use of the Sea Shore street railway division.

The present equipment of the company's two stations and the method of distributing current are noted elsewhere in this article.

The Exposition grounds covering 250 acres were about three miles from the hotel and business center. To reach the grounds a new double track line had to be built from the center of the city, and for doing this work it was thought best to organize a separate com-

pany known as the Exposition Traction Co. It was at first proposed to charge an additional 5-cent fare on this new line, but as there was some fear expressed that the double fare would injure the prospects of the Exposition, the company elected to accept the loss and abolish the additional fare, giving a straight 5-cent rate from any part of the city to the grounds.

The Exposition line was built with second-hand 60-lb. T-rails, as only a portion of it will be required after the Exposition closes.

The arrangement of the Exposition terminal will be understood by reference to the diagram. The main Exposition line passes the gate of the Midway, and then continues on and makes a loop in front of the main entrance. Passengers are discharged at one side of the loop, and board the cars at the other side. The line and loop are enclosed with the American Steel & Wire Co.'s wire fencing and entrance and exit are through turn-stiles.

Going from the Exposition passengers purchased tickets at booths and dropped them in turn-stile boxes before entering the cars. Going toward the Exposition, fares were collected on the cars by the conductors but an inspector was stationed at Line St., the main transfer point, and where the bulk of the Exposition traffic was obtained, in order to insure that all fares were properly registered before the car left that point.

By the arrangements mentioned, the company was sure that none of the Exposition fares into the city, and none of the fares below Line St. going out, these including all fares from the hotel and depot districts, would be missed by reason of the crowded condition of the cars.

Mr. T. W. Passailaigue, superintendent of the Consolidated company, states that the most annoying feature of handling a temporary increase of traffic of this kind, is that there is a class of men who make a business of following up Expositions, and other events likely to draw many visitors, with the view of securing employment on the street railways. Inasmuch as these men are seeking only temporary employment, they lack steadiness and reliability and by their carelessness cause serious loss to the company. He finally adopted the rule of engaging only experienced motormen and only green conductors, and by adhering to this regulation, he avoided a great deal of trouble. As an extra inducement to good men to apply for position on the cars, the company arranged to guarantee all extra men at least a half-day's pay each day, whether they were



COTTON PALACE AT NIGHT.

assigned to a car or not, provided, of course, they reported at the barn each day. This insured each man at least enough to pay his board and necessary incidentals.

The volume of Exposition traffic was very erratic, dropping, for instance, from 50,000 passengers, carried on President's Day to 12,000 the following day, and the company had to maintain a considerable force of extra men to call on in emergencies. The company feels the amount of money paid to the employes when they were not actually working, was well invested, for it provided a body of trained conductors and motormen, who could always be called to man the cars on short notice.

Another department that was directly affected by the increase in business, due to the Exposition, was the auditor's. In order to properly show on the company's books certain expenses and receipts directly chargeable to the Exposition business, the general accounting scheme had to be made somewhat more comprehensive to take in certain new accounts. Mr. P. J. Balaguer, the company's auditor, was fully equal to the task laid down, and there has been not the slightest hitch or confusion in the auditing and accounting department and the books show the exact results of the Exposition as far as the Consolidated company is concerned.

As previously stated, a separate Exposition Traction Co. was formed to care for the Exposition traffic, but as finally arranged, all receipts for the Exposition period went directly into the Consolidated company's account.

A separate item was opened on the books for car tickets which were sold at booths and collected at the street railway turn-stiles just outside the Exposition grounds. The tickets were numbered consecutively, and were treated much the same as register readings on the cars. Each ticket seller was charged with a certain number of tickets and reported every day the opening and closing numbers of the strip of tickets given him in the morning. Mr. Balaguer devised a blank form that greatly facilitated the work of making these daily ticket reports. The form was printed on a slip 10½x4 in. and had spaces enabling the ticket seller to enter at the end of every

the regular business of the company, the exhibitors being regarded as new customers.

For the six months of the show most of the car routes were changed to meet the temporary conditions, and to permit all lines to connect, either directly or by transfer, with the Exposition grounds. The final adjustment of the routes gave universal satisfaction, and some of the principles followed in planning the arrangement would seem to be applicable to almost any average city under similar conditions.

Briefly described, the routes included an outer and an inner belt line, one direct line from the hotel and depot district to the Exposition grounds, a line serving a portion of the hotel and depot section and transferring to the main Exposition line, and a suburban park line carrying visitors to the cemeteries and parks. In addition there



TRACK LAID IN SAND—SULLIVAN'S ISLAND.

was the Sea Shore line, running on some of the islands in the harbor, and connecting with the city lines by ferries owned by the Consolidated company. The different routes were designated as follows:

The Belt Line making the circuit of the city, taking in some of the better residential streets, a portion of Meeting St. (a leading business street) passing the Post Office and City Hall, and lower part of Broad St. (the money center), East Bay (headquarters of the wholesalers) and the docks and shipping.

The Broad St. Line, making an inner circuit, covering another good residential section, and many important business streets.

The King St. Exposition Line, running on the central street of the business section, covering especially the retail district, and within easy reach of the hotels and depots, and making the most direct route to the Exposition grounds.

The Meeting St. Line, traversing one of the more important business thoroughfares, running parallel to King St., and transferring to the King St. cars by cross lines at two points; this line reached a number of the leading hotels and the Post Office, and the finer residences in the southern portion of the city.

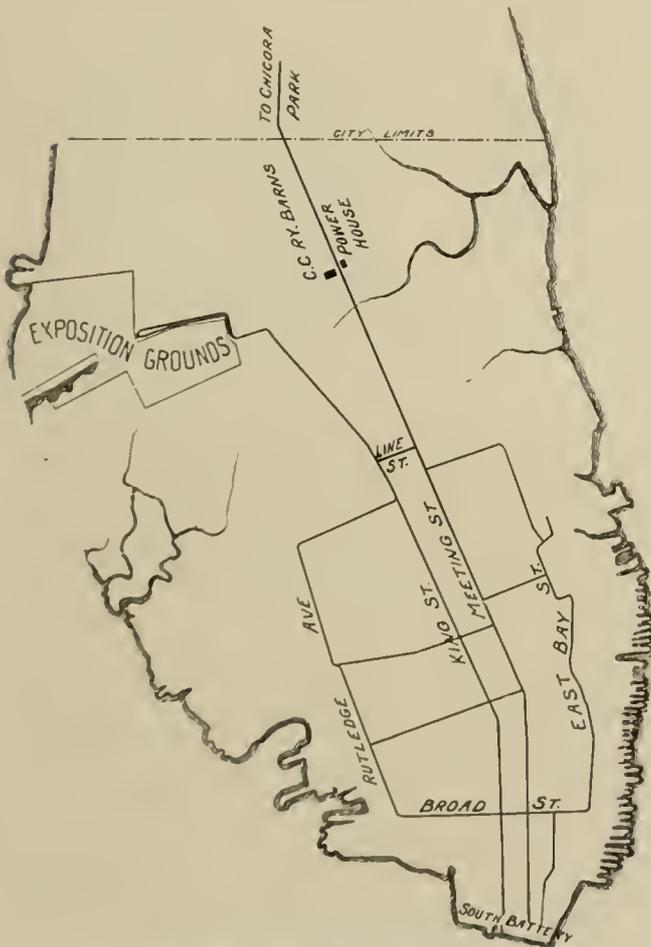
The Suburban and Chicora Park Line, running out Meeting St. and serving the cemeteries and Chicora Park.

The Sea Shore division, affording visitors a fine opportunity to see Charleston from the harbor, Fort Sumter and Moultrie, and the Isle of Palms.

The schedule on these various routes ranged from a minute to an hour, according to the demands of the traffic.

It should be added in this connection that the city of Charleston is laid out similarly to the city of New York. It is on a long, narrow strip of land, running practically north and south between two rivers which come together at the southern point of the city and form a magnificent bay. The southernmost point of the city is called the Battery, which, unlike New York's "Battery," is given over to fine residences and is the aristocratic section of the town.

In the matter of rolling stock, the Consolidated company was exceptionally well prepared for the Exposition demands. It had a number of long closed double truck cars, that had been used on the Sea Shore division as trailers. These were brought to the Charleston side, equipped with two G. E. 57 motors each, and put on the Exposition line. The company owns 26 double truck cars, equipped with two G. E. 57 motors to each car; 16 single truck cars, fitted



CHARLESTON STREET RAILWAY LINES.
(All city lines are double track.)

two hours of the day, the "number commencing," the "number ending" and the "difference." In this way he was able to account for all tickets in his possession. In another column was entered "Cash from Tickets" and the blank as a whole therefore gave a complete record of the street railway tickets sold and cash received by each seller. The readings from the turn-stiles through which the passengers passed as they deposited their tickets before entering the cars were kept and reported in the same way, and furnished an additional check on the seller's reports.

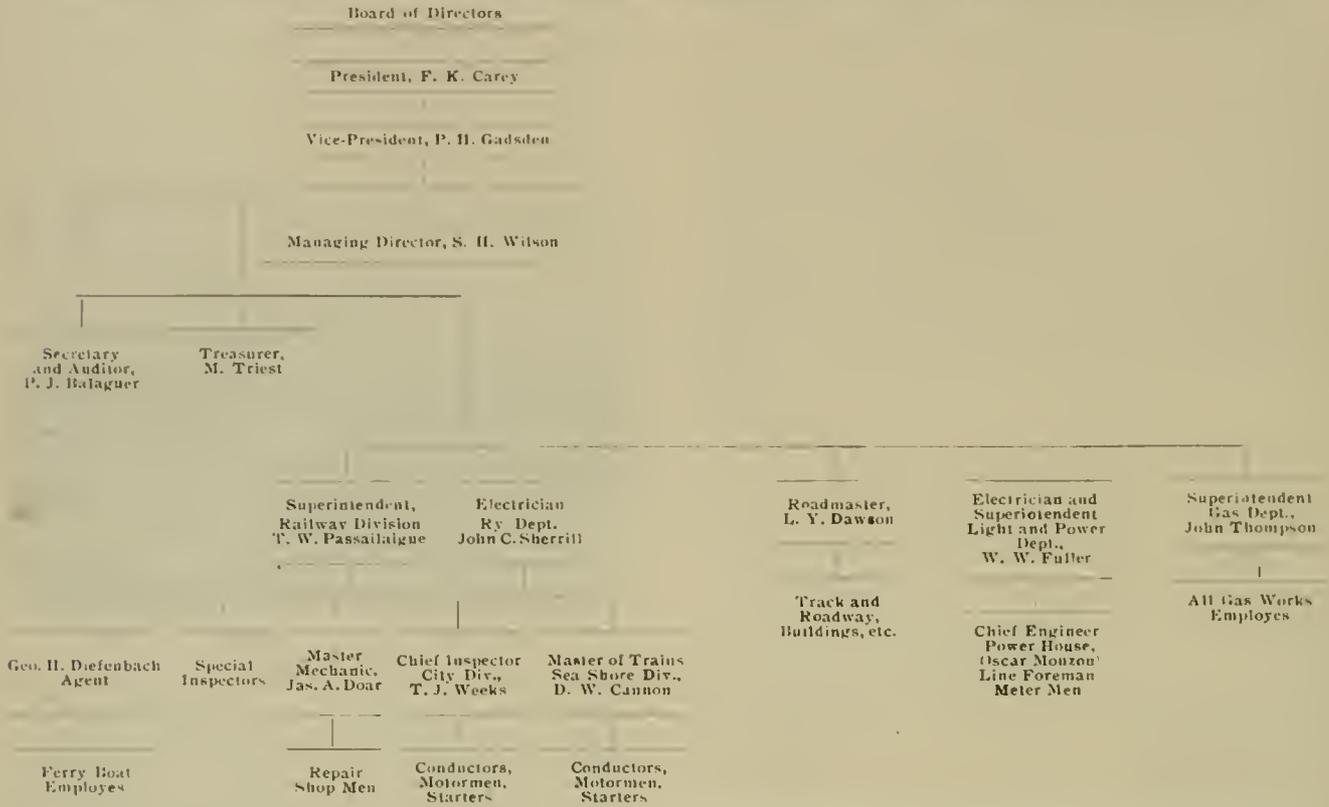
The business of lighting the grounds was handled the same as

with two G. E. 1,000 motors to each car, and 26 single truck cars, fitted with one G. E. 1,000 motor to each car. It might be noticed here that many of the southern roads are still using a single motor to the car, a practice as may be imagined that is not conducive to low cost of maintaining electrical equipment. But these older equipments are still capable of doing good work, and many of the companies do not feel justified in sacrificing them in favor of more

One 250-kw. alternator and one 150-kw. alternator supplying lighting current at 1,150 volts. These are belted to two Harrisburg engines, one rated at 450 h. p. and one at 250 h. p.

One 500-kw. alternator and one 300-kw. alternator supplying current to the Exposition at 2,400 volts, 60-cycles, three phase distribution. These are belted to Harrisburg engines, one rated at 750 h. p. and one at 450 h. p. These three-phase units as previously

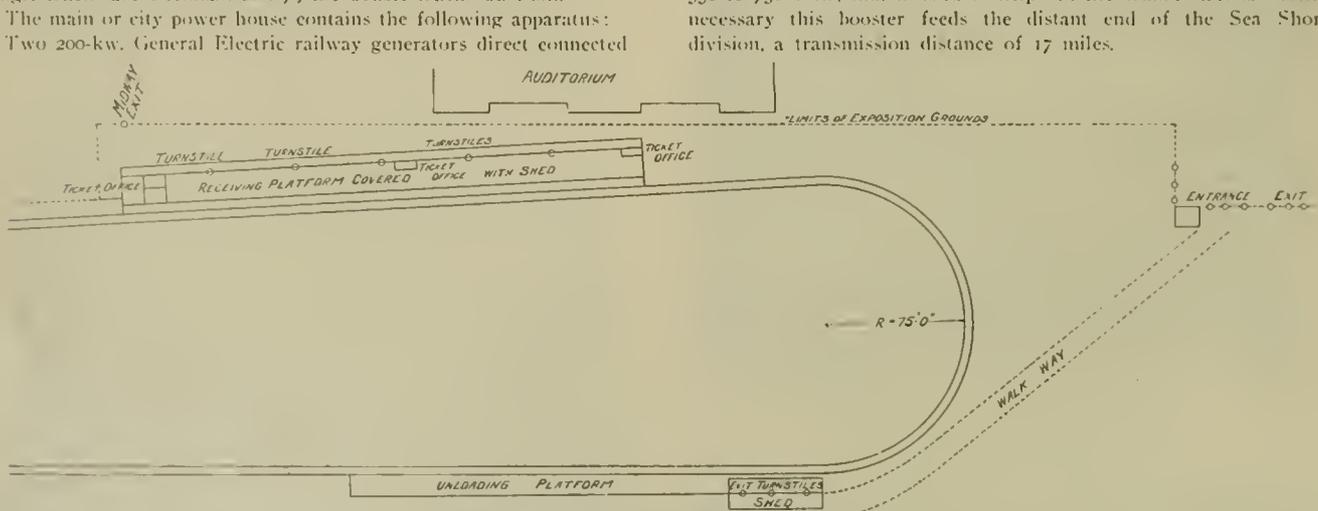
DIAGRAM OF ORGANIZATION OF THE CHARLESTON CONSOLIDATED RAILWAY, GAS & ELECTRIC CO.



modern apparatus. On level roads, as at Charleston, the single motor under an 18-ft. body serves every purpose, although armatures, bearings and other parts are naturally subjected to greater wear and tear. The cars at Charleston are of various makes. The single trucks are Peckham No. 7; the double trucks du Pont.

mentioned will probably be retained for the regular lighting service and also for furnishing light and street railway power on the islands in the harbor.

At the city station there is also a 300-kw. motor driven booster, 550 to 750 volts, that is used to help out the Island station. When necessary this booster feeds the distant end of the Sea Shore division, a transmission distance of 17 miles.



TERMINAL LOOP, CHARLESTON EXPOSITION.

to a 350-h. p. Ball & Wood tandem compound engine, 16 and 27x16 in.

One 525-kw. railway generator, direct connected to a 750-h. p. Ball & Wood compound marine type engine, 22 and 48 1/2 x 24 in.

One 225 kw. railway generator, belted to a 350-h. p. Harrisburg standard engine, 16 and 30x16 in.

One 325-kw. railway generator, belted to a 550-h. p. Harrisburg standard engine, 17 and 35x18 in.

The Island station, which serves the Sea Shore division of the street railway system and also furnishes lighting current, contains one 225 kw. railway generator belted to a Harrisburg engine; and also the necessary lighting apparatus for lighting the islands, particularly the Isle of Palms, where a hotel, pavilion and pleasure resort has been established.

The following statistical statements are furnished us through the courtesy of Mr. Balaguer:

REPORT CHARLESTON CITY DIVISION, CHARLESTON RAILWAY, GAS AND ELECTRIC CO.

	Year Ending Feb. 28, 1902.	Year Ending Feb. 28, 1901.
Total number paying passengers carried.....	4,281,332	3,867,053
Car trips.....	262,273	267,326
Car miles.....	1,431,040	1,286,705
Car hours.....	184,680	172,954
Receipts per trip.....	\$.883	\$.728
Receipts per mile.....	\$.162	\$.151
Receipts per car hour.....	\$ 1.250	\$ 1.125
Gross receipts.....	\$ 231,739	\$ 104,595
Operating expenses per car mile.....	\$.093	\$.087
Operating expenses per trip.....	\$.510	\$.416
Operating expenses per car hour.....	\$.725	\$.644
Output in kw. h., City Ry. division.....	2,495,318	2,150,512
Output in kw. lighting and power.....	1,939,786	1,446,976
Output in kw. total.....	4,435,054	3,597,488
Total coal consumed at station (lb.).....	28,162,228	21,307,514
Coal in lb. per kw. h.....	0.3	5.93
Cost of coal consumed.....	\$ 46,447	\$ 32,627
Power plant wages.....	\$ 10,112	\$ 9,699
Oil and waste.....	\$ 1,561	\$ 1,063
Cost water.....	\$ 558	\$ 1,744
Power plant maintenance.....	\$ 4,576	\$ 2,087
Output cost at station per kw. h.....	\$.0143	\$.0131

General expenses	37,997.03	10,842.73	9,703.12	58,542.88
------------------	-----------	-----------	----------	-----------

Total operating expenses	\$ 106,392.12	\$ 48,463.27	\$ 86,480.18	\$ 334,335.57
--------------------------	---------------	--------------	--------------	---------------

Net earnings	\$ 107,136.87	\$ 48,366.32	\$ 50,679.03	\$ 215,185.22
--------------	---------------	--------------	--------------	---------------

Fixed charges				\$ 153,437.49
---------------	--	--	--	---------------

Net income				\$ 61,747.73
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Comparative Statement of Earnings and Expenses for Months of March and April, 1902.

	Railways.	Electric.	Gas.	Total.
--	-----------	-----------	------	--------

Operating expenses:				
Gross receipts	\$ 83,779.05	\$ 28,072.10	\$ 27,825.24	\$ 139,676.39

Maintaining way and structures	\$ 5,401.44	\$ 1,234.41	\$ 1,834.85	\$ 7,359.70
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Maint. Equipment	4,769.31	1,167.60	489.26	6,426.26
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Transportation and manufacture	26,357.28	8,171.55	12,923.31	47,452.14
--------------------------------	-----------	----------	-----------	-----------

General expenses	10,245.93	2,858.94	1,997.98	15,102.85
------------------	-----------	----------	----------	-----------

Total operating expenses	\$ 49,773.09	\$ 12,321.59	\$ 17,245.40	\$ 76,340.95
--------------------------	--------------	--------------	--------------	--------------

Net earnings	\$ 37,005.00	\$ 15,750.51	\$ 10,579.84	\$ 63,335.44
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Fixed charges				\$ 25,231.67
---------------	--	--	--	--------------

Net income				\$ 38,103.77
------------	--	--	--	--------------

E. T.-1.

D. P. Co.—27514

EXPOSITION TRACTION COMPANY.

Ticket Agent's Statement

190

Agent

Window No.

Time		STRAIGHT TRIP TICKETS				Cash From Tickets
		Whole		Half		
A. M.	N.E.					
7	N.C.					
	D.					
9	N.E.					
	N.C.					
	D.					
12	D.					
Total Tickets,						
Total Cash,						

TICKET RECORD.

THE CHARLESTON CONSOLIDATED RAILWAY, GAS AND ELECTRIC COMPANY, CHARLESTON, S. C.

Comparative Statement of Earnings and Expenses, for Fiscal Year Ending February 28, 1902.

	Railways.	Electric.	Gas.	Total.
--	-----------	-----------	------	--------

Gross receipts	\$ 303,528.99	\$ 95,832.59	\$ 149,159.21	\$ 549,520.79
----------------	---------------	--------------	---------------	---------------

Operating expenses:				
---------------------	--	--	--	--

Maintaining way and structures	\$ 4,319.49	\$ 1,568.88	\$ 8,657.13	\$ 23,745.31
--------------------------------	-------------	-------------	-------------	--------------

Maintenance equipment	21,729.35	3,495.98	2,812.62	28,007.05
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Transportation and manufacture	123,646.44	32,586.58	68,307.31	224,540.33
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EVERETT-MOORE SYNDICATE.

On June 4th it was announced that, up to that date, 26,000 shares of the Everett-Moore holdings in the Detroit United Ry. had been sold by the syndicate at prices ranging from 71 to 80%. The stock has been absorbed piecemeal by New York, Cleveland and Detroit capitalists, the parties to whom an option on the Everett-Moore holdings in the Detroit property was originally offered at 70 having failed to take advantage of the offer. Members of the banker's committee in charge of the syndicate's affairs are quoted as stating that Messrs. Everett and Moore retain from 12,000 to 15,000 shares in the Detroit United Ry., and will continue to manage the property.

The syndicate has also disposed of 40,000 shares in the Toledo Railways & Light Co. to Kean, Van Courtland & Co., of New York, at \$22 per share; this leaves 40,000 shares still in the hands of Messrs. Everett and Moore, but there is a probability that the control of the business will be in the hands of the purchasers. The stock was purchased at \$14 per share, so there has been a profit of \$8 per share on the stock since it went into the hands of the syndicate. The only change that will be made is to increase the board of directors by two in order to give the purchasers a representation in the company.

SALE AT PROVIDENCE, R. I.

On May 27th the terms under which the United Improvement Co., of Philadelphia, would acquire the United Traction & Electric Co., of Providence, were announced. There has been organized a Rhode Island corporation known as the Rhode Island Co. to take over such properties as the United Improvement Co. may buy.

The announcement to the United Traction stockholders is that the Rhode Island Co. will guarantee 5 per cent on the Traction company's stock and in addition will give one share of its own stock for every four shares of Traction stock. The stock at present pays 4 per cent and is quoted at 121.

It is understood that the Philadelphia concern expects to combine in the Rhode Island Co. the Providence Gas Co. and the Narragansett Electric Lighting Co.

The Milwaukee Electric Railway & Light Co. has awarded a contract amounting to \$200,000 for the structural steel to be used in the erection of its new office building and terminal station.

Oil as Fuel.

Data from New Orleans, Mobile and Other Cities Regarding the Utility and Efficiency of Beaumont Oil as Fuel in Street Railway Power Stations—Saving Secured—Oil Burning Apparatus.

The discovery of quantities of petroleum in California and the Gulf States, particularly Texas, has brought prominently before steam users the topic of the general utility and economy of oil as fuel. The California product is as yet confined to a comparatively limited territory but the owners of the Texas wells make announcement that they are prepared to furnish fuel oil to any section of the country and in practically unlimited quantities.

Supplementing the discussion before the Southwestern Gas, Electric & Street Railway Association on the utility and advantages of oil as fuel in street railway power houses, we present some statistical data not heretofore published. We have direct reports from New Orleans and Mobile, Ala., where oil is being used regularly for firing boilers in street railway power stations, and from these and the data furnished at the last meeting of the Southwestern Association the following conclusions may be drawn:

Experience has demonstrated that the Beaumont oil is a practical fuel for street railway and lighting plants, its economy in competition with coal depending entirely upon the price of oil and the price of coal at any given locality. As determining the relative steam producing qualities of oil and coal the following is given as a summary of the results obtained in the several power stations reporting: One pound of oil will evaporate from 13 to 16 lb. of water from and at 212 deg. F.; that is, the calorific value of oil is from one-third to one-half greater than that of the ordinary run of mine coal of grades customarily used for power purposes; oil is as safe as coal and causes no greater wear and tear on the boiler parts; in a plant burning oil exclusively there will be no dirt, odor or smoke and no ash or other residue; where oil is used the services of all firemen and coal passers can be dispensed with and but one man is required on the boiler room floor.

Aside from considerations of relative economy there of course arises the important factor of the future supply of oil.

The so-called Beaumont oil fields comprising a section of western Louisiana and Texas within a radius of 100 miles more or less from Beaumont, Tex., are now supplying most of the oil used for fuel in this country. The initial discovery that oil existed in considerable quantities in this region was made Jan. 10, 1901, when the drills at the Lucas well suddenly and without warning penetrated a large reservoir of oil and a stream of oil rising to a height of 160 ft. immediately began to flow, a steam gage attached to the pipe at the well registering a pressure of 104 lb. per sq. in. Other wells were at once opened up and today there are about 200 distinct wells in action. Many of these are what are known as "gushers" and from them the oil rises under natural pressure. From others the oil is lifted by pumps. According to authentic reports the Beaumont fields at the present day have a combined average capacity of 6,000,000 barrels per day, or 2,100,000,000 barrels per year. How long this supply will last is purely a matter of conjecture. The claim is made that many of the wells formerly gushers, now require to be pumped, but the owners of the fields emphatically state that this is no evidence of the failure of the supply. They point out that it was never expected the wells would continue as gushers inasmuch as the pressure must needs be exhausted as soon as a sufficient number of openings tap the subterranean chamber but that the drop in no way forebodes a lack of oil. As evidencing their faith in the future supply it may be said many of the well owners are making long time contracts for furnishing large quantities of fuel petroleum. It is of interest to note that the United States Navy has been granted an appropriation of \$20,000 to be expended in conducting experiments with fuel oil.

From a pamphlet issued by Tate-Jones & Co., of Louisiana, we take the following data concerning Beaumont oil:

Specific gravity	22 deg. Baume.
Weight per gallon	7.66 lb.
Weight per barrel (42 gallons)	322 lb.
Flash point	180 deg. F.
Fire point	200 deg. F.

Theoretical calorific value: 1 lb. of oil will evaporate 15½ lb.

water, or 48½ lb. of oil will equal in calorific value 100 lb. of ordinary Western coal.

From the same pamphlet we quote the following regarding the use of fuel oil:

"The oil used must be of sufficiently high fire test. If this condition is observed it will dispose entirely of the objection on the score of safety frequently urged against this fuel. In fact, oil with a fire test of say 180 deg. or 200 deg. F. is as safe as coal, which has been known to ignite from spontaneous combustion. Oil with a fire test of 250 deg. to 300 deg. F. may be stirred with a red hot poker without being ignited, or a shovelful of hot coals thrown into it will sink and be extinguished.

"The oil must be supplied to the burners under a sufficient pressure; this is best accomplished by means of small pumps and pressure chamber.

"The oil should be pre-heated to facilitate atomization.

"The burner should feed the oil in a finely atomized condition; a properly constructed burner will show no dark stream of oil entering the furnace from its tip; instead the oil will emerge from it in almost imperceptible spray or vapor.

"The atomizing action above mentioned is best made by the use of steam. Compressed air has been used for this duty, but it is not so satisfactory as steam, not only because it is more expensive, but because a portion, if not all the contained water when steam is used, is dissociated in the fire and recombines later this activity as a distributor of the heat and preventing excessively high temperatures at any one point in the furnace. For this reason steam-blast is generally thought to be easier on the boiler plates and to make a 'softer' flame.

"The steam should be superheated before going to the burner.

"Just the right proportion of air should be admitted to the fire box or combustion chamber to completely burn the fuel. In the practicability of admitting just the right amount lies one of the advantages of liquid over solid fuel.

"The combination heater and pressure chamber should be fitted with a proper arrangement of relief valves to permit any excess of oil to return automatically to the storage tank. This storage tank and all pipes, as far as possible, should be underground.

"Fully as important as any of these matters is it that the setting of the boilers be good. The combustion chamber should be tight to obtain the highest possible temperature, so that every particle of the oil be entirely consumed. To get this result, the chamber must be of refractory, non-conducting substance which soon becomes heated to incandescence. Further, the flame from the burners should be directed against a wall or checker-work of fire brick.

"With care taken on this last point, with a proper adjustment of oil, air and steam, and with the ordinary conditions of good boiler practice, the combustion chamber should show a clear, white incandescence with hardly any flame apparent, and there should be no smoke or foul-smelling unburnt gases issuing from the stack. Such stack products show a waste of fuel.

"In burning oil and natural gas, experience has shown that an excess of oxygen varying from 4 to 12 per cent has been found to give best results. In burning oil where the conditions are in general more uniform, the tendency ought to be towards the smaller rather than the larger quantity. We should look, therefore, in good practice, to obtain, say 6 to 7 per cent of free oxygen in the emerging gases."

RESULTS AT NEW ORLEANS, LA.

The New Orleans & Carrollton Railroad, Light & Power Co. began using oil as fuel in the spring of the present year and after preliminary tests decided to fit both its railway power houses for oil firing. Oil is now used exclusively as fuel at both stations, although a supply of coal is kept on hand against a possible emergency arising from shortage in the oil supply or damage to the oil firing apparatus.

At the Claiborne power house the largest railway station of the company, the fuel oil is kept in two 14,000-gallon storage tanks

buried in the yard near the plant with their tops about 4 ft. below the surface of the ground.

Oil is fed to these tanks from the main pipe line of the oil company, the oil company having built a 15-mile pipe line along the river front, running the length of the city, with branch lines at frequent intervals to the plants of the individual customers, the petroleum being distributed much the same as gas or water. The oil company receives the petroleum from the Texas fields in tank steamers, from which it is pumped into a 55,000-barrel elevated tank on the dock at New Orleans. The oil is allowed to settle in the tank for a time in order to get rid of the water that is always found in more or less quantity in the oil. After the water is drained out the oil flows from the tank to the main pipe line and into the small storage tanks of the customers.

When oil was first suggested as a possible fuel it was customary to feed it to the boilers by gravity from stand pipes or elevated tanks in or near the boiler room, but this method has been largely abandoned owing to the objection of the fire underwriters to the storing of quantities of oil above the grate level of the burners.

At the Claiborne station the oil is again allowed to settle for two or three days in the buried tanks before it is fed to the boilers, one tank being used while the other is settling. The oil is drawn from these reservoirs by two suction pumps which feed the fuel to the

sudden contraction and expansion inasmuch as there is no necessity for opening the furnace doors to fire after the burners are lighted.

The method of firing at the Napoleon avenue station is very similar to that just described.

The even steam pressure secured with oil firing is made evident from the accompanying card recorded during an average day's run at the Claiborne station, the total current output of this station for the same 24 hours being about 11,500 kw. h.

The actual performance of the oil is given in the following table prepared after a test at the Napoleon avenue power house.

OIL TEST AT NAPOLEON AVE. POWER HOUSE ON BABCOCK & WILCOX BOILER, NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO., MARCH 26, 1902.

Readings Are Hourly Averages.

Time, hour ending	11:45 a.m.	12:45 p.m.	1:45 p.m.	2:45 p.m.	3:45 p.m.
Boiler pressure (actual readings—gage 4 lb. light) lb.	129.25	127.66	127.33	126.33	108.
Temperature feed water, Deg. F.	86.25	86	86	80.66	79.33
Draft:					
Stack, In. ....	.32	.36	.36	.30	.30
Back of boilers, boiler side of damper, In. ....	.245	.253	.276	.26	.273
Furnace, In. ....	.25	.23	.29	.27	.24
Ash pit, In. ....	.24	.23	.27	.27	.24
Temperature waste gases, Deg. F.	372	370	370	360	365
Temperature oil, Deg. F.	114	113	115	115	115
Temperature boiler room, Deg. F.	79	79	79	79	78
Water per hour, Lb.	6,834	6,414	6,202	6,997	7,101
Oil per hour, Lb.	514	510	514	522	510
Water per lb. of oil from and at 212°, Lb.	15.56	14.72	14.14	15.81	16.27
Boiler h.p. developed.	230.5	216.3	200.1	237.1	240.7

Average evaporation per lb. of oil during 5 hour' run, 15.30 lb.

For this and other tests the company reached the decision to adopt oil as fuel.

In April last Mr. H. A. Davis, assistant superintendent of the New Orleans & Carrollton Railroad Light & Power Co., made an extensive report to his company on the saving that was being effected by the use of oil. This report has been placed at our disposal and from it we make the following abstract.

Mr. Davis in the introduction to his statement explains the basis of the report thus:

"In order to determine the approximate saving in burning oil over coal at our two railroad power stations, I have taken the month of February, 1902, to get the average amount of coal consumed per kilowatt hour in both stations as this was the last month we burned coal entirely alone.

"At station No. 1 the average coal consumed per kilowatt-hour was 3.79 lb. and at station No. 2 it was 3.66 lb. This I believe will be a fair average for both stations.

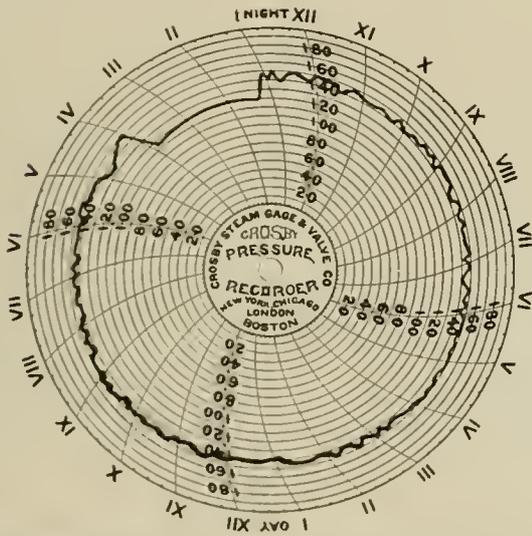
"The consumption of oil in pounds per kilowatt-hour was got from the first 17 days in April, 1902, during which time we burned only oil and no coal. This average for station No. 1 was 2.74 lb. per kw. h. and for station No. 2 2.60 lb. per kw. h.

"It will be evident therefore the difference in efficiency between the two stations in both cases is about 5 per cent.

"I have also taken the output in kilowatt hours during the month of March, 1902, for both stations as a basis for comparing oil and coal, assuming that we had burned oil for the entire month."

The comparative results are as follows:

	Oil.	Coal.
Station No. 1, total output for month of March,	286,760 kw. h.	
Average consumption of fuel per kw. h.	2.74 lb.	3.79 lb.
Total fuel consumed	2,518 bbl.	543 tons
Total cost of fuel (oil at 45 cents a barrel and coal at \$3.20 per ton)	\$1,133.10	\$1,737.60



STEAM PRESSURE DIAGRAM OIL FIRE NEW ORLEANS.

burners at about 45 lb. pressure. A small pipe coil heater taking steam from the pump exhaust is interposed in the pipe between the pump and the boilers serving to raise the temperature of the oil about 15°, or from 76°, the tank temperature, to about 90°, the temperature at which it goes to the burners. The boiler equipment consists of two 350-h. p. and two 450-h. p. Edgemoor water tube boilers and there are eight oil burners under each boiler. The boilers were originally fitted with Hawley down-draft furnaces and these were not removed when the oil apparatus was installed.

The burners are known as the Von Phul pattern which employs live steam as the medium for spraying the oil. The burner is made entirely of brass and comprises a 1/8-in. pipe within a 1/2-in. pipe, the smaller pipe being for oil and the larger one for steam. The tip of the oil pipe enters the tip of the surrounding steam pipe and as the oil flows out in a small stream the steam picks it up and forces it out into the fire chamber in a blast of finely atomized oil, which, when lighted, makes a white flame. This blast does not of course touch the boiler tubes but is directed against fire bricks laid on the grate bars, and piled up at the back of the fire chamber in an open work wall, that is, alternate long and short bricks laid with openings between to allow circulation. In case of failure in the oil supply these bricks can be removed and a coal fire built in less than half an hour.

The flow of oil to the boilers is regulated by hand valves.

The wear and tear upon the boiler structure is found to be less at this plant with oil than when coal was burned. This is partly explained by the fact that the temperature under the boiler remains practically constant and there are no racking stresses produced by

Station No. 2, total output for month of March, 330,420 kw. h.	Oil.	Coal.
Average consumption of fuel per kw. h.	2.60 lb.	3.66 lb.
Total fuel consumed	2,827 bbl.	629 tons
Total cost of fuel (oil at 45 cents a barrel and coal at \$2.55 per ton).	\$1,272.15	\$1,603.95
Saving in cost of oil over coal, Station No. 1.		\$604.50
Saving in cost of oil over coal, Station No. 2.		331.80

Total both stations.	\$936.30
Labor saved by burning oil instead of coal at both stations:	
Four coal passers at \$45 per month.	\$180
Two firemen at \$55 per month.	110
Total.	\$290

At station No. 1 the watch requirements were changed from 8 hours to 12 hours and the salary of the two watchmen was raised from \$55 to \$60 per month; at station No. 2 the salary of the boiler cleaner was increased from \$45 to \$50 per month, making an increase in pay roll of \$15 per month, which deducted from \$290 leaves a saving in cost of labor at both stations of \$275 a month with oil as fuel.

The grand total saving in labor and fuel for the month was therefore \$1,211.30; or, at this rate the saving in oil as fuel over coal at both stations for the year would be \$14,535.60.

RESULTS AT MOBILE, ALA.

The Mobile Light & Railroad Co. has been using oil fuel under a portion of its boiler equipment since last fall with results satisfactory in every way.

The following is data secured from a test at this station:

COMPARATIVE TEST OF COAL AND OIL IN STIRLING BOILER—MOBILE (ALA.) LIGHT & RAILROAD CO., OCTOBER, 1921.

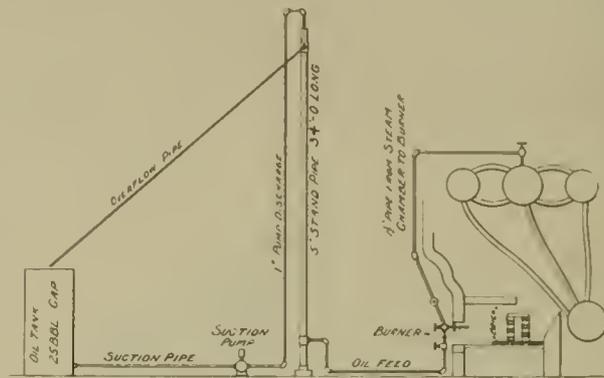
	Alabama Coal.	Beaumont Oil.
Duration of test	24 hours	13 hours 45 min.
Average steam pressure	122 lb.	122 lb.
Average temperature feed water	154.4 deg.	109 deg.
Total water evaporated	168,315 lb.	92,206 lb.
Total fuel fired	15,080 lb.	7,091 lb.
Weight of ash	1,258 lb.	...
Per cent of ash	8.30	...
Weight of combustible	13,822 lb.	...
Heating surface of boiler	3,549 sq. ft.	3,549 sq. ft.
Water evaporated:		
Per lb. of fuel actual conditions	7.18	13.10
Per lb. of combustible actual conditions	7.83 lb.	...
Per lb. of fuel from and at 212°	7.91 lb.	13.84
Per lb. of combustible from and at 212°	8.62 lb.	...

Coal used was "Belle Ellen" Alabama mostly slack run-of-mine. The following comparative values of Beaumont oil and various grades of southern coal derived from tests at the power house of the Mobile (Ala.) Light & Railroad Co. will be of interest. All coals are run-of-mine.

	Water evaporated per lb. of coal from and at 212	Oil equivalent to ton of coal, gallons.	Oil equivalent to ton of coal, barrels.
Bloekton Underwood	9.67	183.5	4.36
Bessemer Slope No. 1	9.68	172	4.08
Bessemer Slope No. 2	8.32	158	3.76
Pratt	7.83	148	3.54
Milledale	9.39	178.5	4.26
Rarior	9.26	176	4.20
Black Creek	8.76	167	4.00
Mountain Valley	6.55	125	2.96
Tide Water	6.73	128.5	3.05
Standard Coal Co.	8.04	152.5	3.62

At the present time Beaumont oil can be purchased at the oil fields for 30 cents a barrel; at New Orleans for 45 cents a barrel; at Charleston, S. C., for 60 cents a barrel, in Illinois for from \$1.00 to \$1.25 a barrel, at Philadelphia for about \$2.00 per barrel.

The method of feeding in this case is set forth in the accompanying sketch. At this plant the stand pipe method of feeding is used. The pipe is 5 in. in diameter and 34 ft. high. Oil is pumped in at the top and flows to the burners by gravity. The burner is of the "Jurnal" pattern which is similar to the design used at New Orleans with the exception that the flow of oil from the burner is controlled automatically. The inner or oil tube is movable within the large steam pipe by means of wheel and screw at the outer end. By adjusting the position of this tube the quantity of oil flowing from the end of the burner is regulated. The steam for the burner is taken through a reducing valve. Under working conditions the inner tube is adjusted so that the oil pressure is just a trifle greater than the pressure of the steam and a fine stream of oil flows. Any variation in the steam pressure on the boilers will be followed by a corresponding change in the quantity of oil flowing. Thus, if the



METHOD OF FEEDING OIL TO BOILERS IN MOBILE.

steam pressure drops, more oil will flow thus increasing the degree of heat and maintaining the proper steam pressure. The burners are hung in the center of the fire doors from eye bolts tapped in over the doors. As in the case previously described the blast from the burner is directed against fire bricks laid on top of the grate bars and built into a wall at the back of the fire chambers the bricks being laid loosely without cement. We are indebted to Mr. J. A. Maloney, chief engineer of power station, Mobile Light & Railroad Co. for the data on oil fuel at this station.

RESULTS AT EL PASO, TEN.

Mr. H. T. Edgar, before the National Electric Light Association in convention at Cincinnati last month gave the following information relative to Texas fuel oil at the electric light station, El Paso, Tex.

The oil is stored in steel tanks buried in the ground, and is drawn from the tanks through a 1½ in. iron pipe, which discharges through a 1 in. pipe into a small chamber about 14 in. in diameter and 2 ft. 6 in. long, placed by the pumps. The oil enters this chamber at one end, passing through a partition of very fine wire gauze, and at the other end comes in contact with a coil heated with the exhaust steam from the pump, thus raising the temperature of the oil to about 145 deg. F. The oil is sprayed from the burners by steam, and in order to insure a steady pressure an auxiliary air chamber is required. It is stated that a very great saving has been made at the El Paso station through the substitution of oil for coal. It is claimed by the advocates of fuel oil that four barrels of 42 gallons are equal to one ton of good bituminous coal. Results of tests made by the waterworks company of El Paso show that the cost of burning fuel oil is but half the cost of burning coal, when the coal costs \$5 per ton and the fuel oil 70 cents per barrel.

Following the reading of the paper on this subject by Mr. W. W. Reed, at the Southwestern Gas, Electric & Street Railway Association, which was abstracted in the "Review" for May 20th, there was considerable discussion which went to show the unusual importance of this subject to companies operating in the vicinity of oil wells.

Mr. Spencer, of Jennings, which is an oil town, was called upon and stated in reply that he was using Beaumont oil and that it put his plant in paying condition very quickly. He formerly used coal costing from \$4.50 to \$4.75 per ton and was now paying from 35

to 40 cents per barrel for oil. One of the points of difficulty which he had experienced was in the selection of the best burner. His company has been testing a large number of burners but he believed that none of them are entirely satisfactory. He attended the convention in the hope of receiving some suggestions from those who had gone into these experiments farther than he had been able to.

Mr. Guthrie, of San Angelo, stated that his company had put in an oil burning plant about nine months ago and found it a great saving, although the oil at that place cost about 60 cents. This company uses the gravity system of feeding and has found it very satisfactory. The speaker stated that he did not see very much difference in the burners or how the system could be more ideal as there was not a sign of smoke or any deposit on the boiler and the company is now saving about \$200 per month out of its former total expense of \$500. He had not been able to notice any deterioration in the plant due to the use of oil. There are some signs of sulphur but as far as the boiler is concerned, it is in a good deal better condition than when coal was used, for the reason that the heat was more regular and there was no inrush of cold air from opening the doors of the fire box. Mr. Guthrie suggested that the various consumers of oil might form a combination and buy a well of their own. He had investigated the matter and found that a good well could be bought at a reasonable price.

Mr. Miller stated in regard to the strength of boiler tubes after oil had been used that boiler inspectors always inspected them when they were cold. It has been suggested that constant burning of sulphur would eventually cause the iron to absorb sulphur and become what is known as hot-short. That it would be tough when it was cold and "short" when it was hot. There was no corrosion or pitting on the outside of the tube and the speaker was surprised to find that the presence of sulphur in the stack did not show any signs of destroying it. He knew from experience that the cheaper grades of coal will destroy a stack.

Mr. Reed stated that the stack was the only place where he had seen the effect of sulphur at all. He had a steel stack and at the joint can be seen where the deposits of sulphur had run down and discolored the stack. Whether it had produced any injurious effects or not he did not know, but thought it had not.

Mr. H. T. Edgar stated in looking the matter up he found that oil had been used as fuel all over the United States and Canada since 1885 and there was considerable data on this subject. Fuel oil was in use under nearly all the boilers at the World's Fair in Chicago and it had been burned in California for some time. One trouble with fuel oil which he mentioned was that if the fires go out and the oil is not shut off immediately it will run out of the burner and get into the fire box, which causes a great deal of trouble. He had seen a case where it had blown the damper out of the chimney. Another feature which appeals especially to the small plants is that the plants are liable to be shut down and the steam to run down, in which case it is impossible to start up with the oil alone for lack of steam to atomize it. In case nothing is done to the boilers except putting a layer of fire brick on the bars it is only a matter of a few minutes to make up a fire in the fire box and get up enough steam to atomize the oil.

Mr. Jennings stated that in his plant he had arranged a small reservoir so that the fire could be started with the gravity feed, and while oil was wasted in this way for perhaps 15 or 20 minutes, at the end of that time enough steam will be raised to start the boilers. This small reservoir contained from 15 to 18 gallons of oil which was delivered through the pumps and in this way the fire was started without injuring the fire boxes.

Mr. Guthrie did not understand why insurance companies have a prejudice against gravity feed as the same pressure is established by the use of pumps and no danger exists if a small tank is used. His company kept a 500-gallon tank above the roof and pumped oil into it every evening.

President McGregor explained that the companies feared the quantity of oil used and the rapid production of gas when a fire occurred. He had had some quarrels with the insurance companies himself on these points but had later had an experience at his plant that satisfied him, as it burned the roof off the power house. The fireman cut off the oil from the tank and there was a pressure in the pump cylinders, so that in disconnecting the burners the oil shot out in range of a torch and the flame went up and destroyed the roof of the house. In two or three minutes it reached the engine room and burned off the roof of the boiler room. There was danger of

the creation of gas from the heat which occurred. A leak or accidental turn of the stop cock in a gravity feed while the boiler was still warm might cause serious results.

Mr. Payne spoke of a burner in which air was used to atomize the oil instead of steam. This burner had not been used at all in Texas although it is in use in Europe and has been experimented with in northern and eastern states of this country. As it is very easy to store air under pressure there would be no trouble in starting up in the morning without any fire. In regard to the damage done by sulphur, Mr. Payne believed that the result of the Houston Electric Light Co. in the use of oil was a very sufficient test because there the conditions of greatest danger were called forth by the boilers being operated up to the limit of their capacity. After working every boiler in this way for several months no trouble had resulted although the surface of the tubes were whitened to some extent either by the sulphur or by the oil flame itself. His boilers had not given any trouble although both the tubes and stack showed signs of the presence of sulphur in white streaks.

Mr. Ludlow was then requested by President McGregor to address the convention in regard to fuel oil. He had noticed in a report of the paper under discussion that the statement was made that the test was hardly fair because the steam used for atomizing the oil was not deducted from the result. The test he was about to refer to was probably correct because the gas for producing the steam used for atomizing was computed in the test both as to the cost of oil and the number of pounds of water evaporated, it having been generated in the boilers under which the test was made. The test referred to was that of the plant of the Dallas Electric Light Co., on a Babcock & Wilcox boiler of 317 h. p. rating. At the time the test was made oil was worth 59 cents per barrel delivered in Dallas and coal was \$3.15 per ton. The evaporation at 212 degrees was 13.77 lb. of water per pound of oil while with coal they had attained an evaporation of 8.87 lb. of water per pound of coal. The tests covered an eight hour run and the actual saving was \$3.62 without including the fireman at \$2 additional. This plant has since adopted the system used during the tests and a saving of approximately \$2,000 per month on its fuel bills and \$26 per day on firemen had resulted. Ever since fuel oil fields were discovered in Beaumont all kinds of arguments have been advanced in regard to the damage done to the boilers, flues, etc., from sulphur. The speaker challenged anyone to substantiate the statement that sulphur had done damage in boilers or flues. Any damage which had been done would be found due to the installation not being properly made. A number of mistakes had been made in installing oil burning plants; for example, one plant had put in a solid brick wall and the flames were shot up against the tubes of the water tube boiler with such intensity that the tubes were damaged and had to be replaced. The construction of another plant was also defective in that the heat was deflected and shot down with such intensity on the foundation that it was melted out and had to be replaced. These instances were cited to show the damage which might result from improper installations. The speaker had installed a number of plants which never gave a particle of trouble until inexperienced experts undertook to improve them. One party for whom he had installed a plant wanted to see what could be done with oil and undertook to carry a load on three boilers for which five were formerly used. The three boilers did the work, but some damage resulted to the boiler brickwork and stack, as they were heated much beyond what was required for the ordinary capacity of the boilers. The speaker stated that Beaumont oil had been fought all the way through. A fight has been waged against it in Texas notwithstanding the people of that state have an opportunity of getting their fuel cheaper than any other place in the country. It is a fact that oil is being used at a cost of from \$1 to \$1.25 per barrel in Illinois and economically at that, yet the people of Texas complain even when they get it at from one-quarter to one third of this price. It is difficult to make public all the points in connection with the saving due to oil because most plants for reasons of their own do not care to give the public the benefit of their experience. Nevertheless, enough information has been given out to warrant the assertion that the saving with oil is from one to two thirds as compared with coal.

The Steubenville (O.) Traction & Light Co. on May 24th formally opened its new interurban between Steubenville and Toronto. The advent of the trolley was celebrated with great enthusiasm by the citizens of Toronto in which the people of the other city shared.

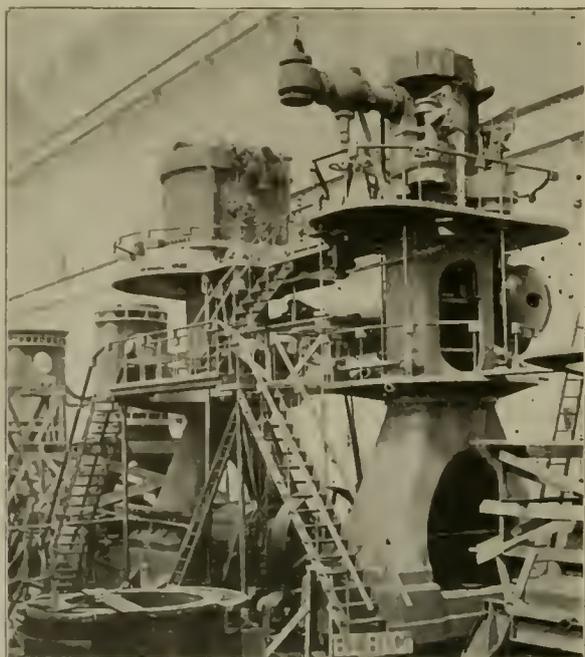
ADDITION TO THE CHARLESTOWN STATION, BOSTON ELEVATED RY.

In March, April and May, 1900, the "Review" published an extended description of the system of the Boston Elevated Ry., and at that time power was furnished from seven generating stations, the fifth in point of capacity being the Charlestown station located near the Sullivan Sq. terminal of the elevated line. As was noted in the "Review" for May, 1902, page 265, the traffic on the elevated road has been far heavier than was anticipated and the two units provided for at the Charlestown station, one of which will soon be



CHARLESTOWN POWER STATION, BOSTON ELEVATED RY.

operating, will greatly relieve the other stations. The equipment of the old station consisted of three 500-h. p. horizontal water-tube boilers and two horizontal cross-compound Allis engines rated at 1,000 h. p. each. These engines are direct connected to multipolar generators of 800 kw. capacity.



ENGINE ON THE ERECTING FLOOR.

The new unit referred to as being about ready for operation is a Westinghouse vertical cross-compound engine, which was ordered through the Boston office of Westinghouse, Church, Kerr & Co. The cylinders are 44 and 87 in. in diameter with 60-in. stroke, and the engine runs at 75 r. p. m. It is given a nominal rating of 4,500 h. p., using steam at 160 lb. initial pressure with a vacuum of 26 in., and has an ultimate capacity somewhat exceeding 7,000 h. p.

The high-pressure cylinder is fitted with poppet valves for use with superheated steam and the low-pressure cylinder with a corliss valve gear of Westinghouse design. The cast-steel flywheel is 28 ft. in diameter with 26-in. face, and weighs 150,000 lb. The shaft is of hydraulically forged steel, 37 in. in diameter with an 18-in. hole in the center. The total weight of the complete engine is, approximately, 1,125,000 lb.

The armature of a Westinghouse direct-current generator is carried on the main shaft between the high and low pressure cylinders. This is one of the four largest direct-current railway generators in New England. It is a 24-pole machine of 2,700 kw. capacity. The commutator and armature are 12 ft. and 15 ft. in diameter, respectively, and the total weight of the generator is about 338,000 lb.

An interesting feature of the switchboard installation, which was also designed by the Westinghouse company, is to be found in connection with the circuit breakers, which can be thrown out from any portion of the building by means of electric buttons.

The condensing system includes two Allis condensers for the small engines built by the Allis-Chalmers Co. and a Bulkley jet condenser for use with the Westinghouse engine.

The capacity of the boiler room has been increased by adding four 500-h. p. horizontal water-tube boilers. Coal is supplied to the power house direct by rail and loaded from cars into overhead hoppers, although the power house is located so that coal can be brought by either water or rail. The boilers are equipped with Greene economizers arranged in the usual manner with by-pass flues for leading the gases direct to the stack, should occasion require. The method employed for the removal of ashes is of particular interest. The overflow from the condensers and pumps is carried through trenches which pass under the ash pits of the boilers. The ashes can be dumped at will into these trenches and are carried off with the overflow to flats or meadows which are being filled and enclosed.

While the new boilers were primarily installed for the purpose of furnishing steam to the Westinghouse engine, the scheme of piping has been carefully arranged so that the boilers may supply steam to any engine. Cylinder oil for the entire station is forced by city water pressure from a tank located in the basement.

The scheme of electrical distribution and auxiliary equipment has been carefully worked out, the details of this as well as the general installation of the additional power equipment has been under the direct supervision of Mr. C. S. Sergeant, vice-president, and Mr. C. F. Baker, superintendent of motive power and machinery for the Boston Elevated Railway Co.

PHOTOGRAPHS OF EXPOSITIONS.

Those who contemplate making exhibits at the St. Louis Fair will be interested in the following letter from a committee of the Chicago Trade Press Association to the Director of Concessions of the Louisiana Purchase Exposition:

"The Chicago Trade Press Association has appointed a committee instructed to ascertain from the Exposition officials what courtesies will be extended to representatives of the trade press during the Exposition, and especially what privileges will be accorded them in the securing of photographs for purposes of illustration.

"In the discussion that led to the appointment of the committee it developed that the members of the association felt that at previous expositions they had been unfairly dealt with, especially in having no better facilities for securing photographs than anyone else having to pay high prices, and even then not owning the negatives for which they had paid. Instances were cited in which photographs taken for them by the official photographers under their special supervision and for which they had paid the high prices demanded for special photographs, were in the hands of the public at nominal rates before they could use them in their respective papers.

"It seems to the association that the technical papers are not only entitled to better treatment than this, but that they should have special privileges in this connection.

"The members feel that they should not be compelled to submit to the exactions of a concessionaire or be forced to await his convenience in the taking of photographs. They believe that they should be privileged to take their own photographers, who are often better experienced in this particular line of work, into the Exposition and take what photographs they require for the purpose of illustration."

ELECTRIC TRACTION IN GREAT BRITAIN.

From mid-April to the Whitsuntide recess, Parliament displayed extraordinary activity in dealing with electric traction undertakings for London.

The Select Committee of the House of Lords, over which Lord Windsor presides, had under consideration the fourteen leading electric railway schemes, while Lord Ribblesdale's Committee presided over the initial fate of another group of ten underground railway bills of comparatively smaller magnitude and which, moreover, are not competitive.

The struggle for the possession of London's electric network of tube railways has been warmly contested from day to day before the two committees by the rival promoters, who fell into two principal groups known as the Yerkes and Morgan combinations. The Lord's Committees have dealt with the bills under recommendations of the Joint Committee of last year and of special reports furnished by the Board of Trade, and have shown that they are bent on evolving a thoroughly practical and efficient network of electric traction.

The line proposed by the Central London Co. from Shepherd's Bush via Hammersmith, Picadilly and Charing Cross to the city at Liverpool St., completing the circuit of the present "twopenny tube," has been rejected, excepting the extension from the Bank to Liverpool St., mainly owing to the opposition of Mr. Balfour Browne on behalf of the Morgan combination, who objected that the scheme would never be realized and was merely promoted as a block to hinder competition; he quoted from the company's prospectus to the effect that its policy was not one of expansion and reminded the chairman that the company had admitted that the shareholders had not been asked to sanction the acquisition of extra capital for the new line. The Picadilly and Charing Cross extension of Mr. Yerkes' Brompton and Picadilly scheme (already sanctioned) is rejected, leaving the other sections for further consideration.

The section of the London United Railways (one of the Morgan group) from Addison Road via Shepherd's Bush to Hammersmith is also rejected. The City & North-East Suburban bill, another Morgan scheme, has been withdrawn in consequence of Lord Windsor having refused to sanction the city end of the line, and the portion of the North-East London from Palmer's Green to Southgate is likewise rejected.

Since Whitsuntide Lord Windsor has given a decision concerning the combined scheme presented by the London United Electric Railways (Morgan group) for the Piccadilly & City Railway and the North-East London Railway, which provides for a tube railway from Hammersmith via Kensington, the Strand and to the city and thence on to Tottenham and Palmer's Green, which has been passed; the Marble Arch, Sloane St. and Clapham Junction railway, passed (Morgan scheme), the Yerkes extension section from Picadilly to Holborn, connecting with the Great Northern and Strand; and the Yerkes deep-level line from Earl's Court to Picadilly, both passed. The King's Road railway, rejected. The Charing Cross, Hammersmith & District Railway rejected. This concludes the labors of the Lords' Committees.

Of the bills before Lord Ribblesdale's Committee, only two have been rejected, as will be seen from the following statement:

Charing Cross, Euston & Hampstead (Yerkes) with extensions to Golder's Green & Hendon.....	Passed.
Edgware & Hampstead.....	Passed.
Islington, King's Cross & Euston (promoted by City & South London Co.).....	Rejected.
City (Cannon St.) & Crystal Palace.....	Rejected.
North-West London.....	Passed.
Great Northern & City.....	Passed.
Great Northern & Strand (Yerkes).....	Passed.
Baker Street & Waterloo (Yerkes).....	Passed.

The last three bills only sought for extension of time to complete the authorized line.

In the sphere of tramways, the London County Council have so far been successful; it has managed to pass the bill for the line along the Victoria Embankment from Waterloo Bridge (the portion eastward to Blackfriars Bridge being disallowed) to Westminster bridge through the second reading in the House of Commons, but the opposition is sure to be renewed at every subsequent stage; the bill is, therefore, by no means out of peril yet. The Council was likewise fortunate in getting the bill for the construction of a sub-

way tramway from the Embankment to Theobald's Road, under the new Strand to Holborn thoroughfare, through the first committee stage with very little difficulty, but was forced to abandon the large general proposal in the subways bill for powers to construct subway tramways in London wherever it chose. The committee has resolved to report the bill to the House for a third reading, subject to the insertion of certain protective clauses for the benefit of the District Railway Co. The ease with which the bill has slipped through the House of Commons shows that the trend of public opinion is in favor of increased facilities for electric transit. The shallow subway tramways, however, must be regarded as serious rivals to the tube railways.

The bill for the Croydon Tramways is now in committee stage and seems likely to pass, and the proposal to electrify the North Metropolitan lines in Middlesex is meeting with but little opposition. The debate in the House of Commons on the obnoxious Standing Order No. 22 has proved a great disappointment. The amendment proposed by Mr. Chaplin to remove the veto of the local authorities on tramway schemes, and to substitute instead an order to the effect that the committee on the bill should be given proof as to whether the consent of the local authority had been obtained or not, and that if unreasonably withheld a report should be made accordingly, was negatived without division. This right of absolute and unreasonable veto given to local authorities is confined to tramway bills; in the case of lines built under the Light Railways Act, a local inquiry is held by the Light Railways Commissioners and the application for the order may be granted in spite of the opposition of the local authority, if this is proved to be unreasonable. The right of veto gives a small local authority the power to block effectually a large scheme for a line which would benefit several districts. The alteration in the law is as urgently needed as the revision of the law of electric lighting, traction and power distribution, and it is to be regretted that the amendment was not presented officially from the Government instead of being brought forward by a private member without sufficiently preparing the ground beforehand.

A new tube railway, connecting London with the lovely county of Surrey, is being projected under the title of the City & Surrey Electric Railway bill. The scheme proposes to use the City & South London Railway from King William St. to the Borough and to carry the new line thence across Lambeth to the Croydon district, including Caterham, Westerham and Redhill.

Two more schemes are under consideration for the construction of monorails on the Behr system; the first from London to Brighton, to run to a large extent over the lines of the London, Brighton & South Coast Railway. Mr. Behr suggests that a monorail should be laid on an elevated track from Victoria and London Bridge to the outskirts of London in order to obviate all land acquisition troubles, and thence alongside the present track. The trains would travel at a speed of 120 miles an hour, accomplishing the journey in 25 minutes. It is claimed that the scheme would work harmoniously with the London, Brighton & South Coast Railway Co., carrying only first-class passengers; it is expected that, if the negotiations on foot between the company and Mr. Behr's syndicate are successfully arranged, the bill will be presented to Parliament next season. The second scheme is announced from Glasgow, where a start has been made with the survey of a route for a monorail, Behr system, between that city and Edinburgh.

The Board of Trade has sanctioned the plans for the Manchester & Liverpool Express Railway and the company is preparing to proceed immediately (during June, it is hoped) with the construction, when a start will be made simultaneously at Warrington and in the suburbs of Liverpool and Manchester.

D. N. D.

THE OSAKA COMMERCIAL MUSEUM.

The rules of the Osaka (Japan) Commercial Museum have been published in book form and the volume contains considerable information of value to merchants in all departments of business. The institution was established for the purpose of stimulating trade and manufactures in Japan by exhibiting the most important domestic and foreign products of manufacture. It collects newspapers, magazines and books that bear upon the above subjects and in this way furnishes information to merchants and manufacturers. It also provides a chemical laboratory for making analytical tests and explains and encourages inquiry into all kinds of industrial problems.

ANNUAL MEETING OF THE CANADIAN ELECTRICAL ASSOCIATION.

The 12th annual convention of the Canadian Electrical Association was held June 11, 12 and 13, 1902, at Quebec, the headquarters being at the Hotel Frontenac. The convention was welcomed by the mayor of Quebec, Hon. S. N. Parent, after which the president's address was given. This was followed by the reading of the minutes, reports of committees and general business. In the afternoon special cars left the Hotel Frontenac, taking the delegates to the substations of the Quebec-Jacques Cartier Electric Co., which arrived at the car house of the latter company at 3:00 o'clock. Here a paper was presented by Mr. A. B. Lamb, of Toronto, Ont., on the "Electrical Equipment of an Ordinary Street Car." At the evening session, which was held at 8.00 o'clock, a paper on "The Development of Arc Lighting Apparatus from 1870 to 1902, With Special Reference to Modern Arc Light Engineering," was read by Mr. W. D'A. Ryan, Lynn, Mass. On Thursday the morning session was devoted to the reading of two papers, one on "Arc Lighting" by Mr. C. M. Greene, Lynn, Mass., and "Lightning Protection and the Static Interrupter" by Mr. Percy H. Thomas, Pittsburg, Pa.

During the afternoon visits were made to the Shrine of St. Anne De Beampre, Montmorency Falls and Kent House. The power house of the Quebec Railway & Power Co. at Montmorency was also visited. In the evening the delegates were entertained at a concert given by the Royal Canadian Artillery Band, and at 9:00 o'clock the annual banquet was held.

Friday morning two papers were read, the first being "The Use of Storage Batteries in Electric Distributing Stations" by Mr. A. A. Dion, of Ottawa, Ont., and the second "Electric Suburban Railways" by Mr. Ed. A. Evans, of Quebec, Que. In the evening by the invitation of Mr. Frederick Nichols, vice-president and general manager of the Canadian General Electric Co., Ltd., the members of the association enjoyed a trip by steamer around the island of Orleans, including a visit to the dock, harbor and site of the new Quebec bridge.

INDIANAPOLIS-CINCINNATI ROUTE TO BE OPENED.

The Indianapolis, Shelbyville & Southeastern Traction Co., which projects the establishment within two years of a direct electric railway route from Indianapolis to Cincinnati, has completed track-laying for its interurban between Indianapolis and Shelbyville, and, if a crossing of the Big Four at Fairland can be effected, this portion of the system will be in full operation between July 15th and August 1st. An extension to Greensburg and Batesville will be completed by December of this year, and it is expected that cars will be running to Cincinnati not later than January 1, 1904. Townsend, Reed & Co., to whom the contract for the construction of the line was given, have located the central power house at Shelbyville, with a view to operating the extension to Greensburg and Batesville from this point. The three-phase, high-tension system has been installed, and the plant will have an initial capacity of 800 h. p., which, however, will be more than doubled by the addition of more generators. Seven 50-ft. motor cars have been received and more will be put in commission when the proposed extension shall be opened. The cars are geared for a speed of 50 miles an hour, the motor equipment consisting of four 50-h. p. motors. They are equipped with air brakes and will be heated by the hot water system.

The new interurban runs through a thickly populated rural district, and the terminals, Shelbyville and Indianapolis, are cities of 8,000 and 100,000 inhabitants, respectively. When the through service between Indianapolis and Cincinnati (110 miles) is opened, a limited service and schedule will be inaugurated, and cars will be run at the rate of 70 miles an hour. A freight and parcel express service will be inaugurated with the opening of the line between Indianapolis and Shelbyville.

The officers of the Indianapolis, Shelbyville & Southeastern Traction Co. are: E. K. Adams, president; Albert de Prez, vice-president; T. E. Goodrich, secretary, and John R. Messick, treasurer. The board of directors includes, in addition to the foregoing, W. N. Harding and Charles M. Cooper, of Indianapolis, and Sherman P. Minear, of Greensburg.

AUGUSTA BENEFIT ASSOCIATION.

The Augusta Railway Athletic and Benefit Association, formed of the employes of the Augusta (Ga.) Railway & Electric Co., is in a flourishing condition. Practically all the employes of the company are now members of the association, and the men take an energetic interest in the welfare of the society, that promises well for its future.

At the last public reception given by the association to its members and friends several hundred people gathered in the association's hall and enjoyed the musical and literary program provided, the features of the evening being whistling solos and choruses by the Baptist Whistling Choir, and music by the mandolin club. Col. D. B. Dyer, president of the railway company, made a happy speech that was much appreciated by the boys and their friends.

In opening the meeting the president of the association explained that the object of the public receptions was to bring the people of Augusta and the street railway, gas and electric light employes into a close and cordial relation, to the end that the service to the public might be constantly improved, and that the public might feel that the company and its servants were always desirous of receiving and acting upon suggestions from its patrons.

After the meeting and reception light refreshments were served. Mr. George Conklin, claim agent for the company, is treasurer of the benefit association. I. H. Woodward, one of the older employes, is president.

NEW RESORT AT OLCOTT BEACH IS A SUCCESS.

The International Traction Co., of Buffalo and vicinity, has established a summer resort at Olcott Beach which thus early in the season is attracting a large proportion of the traffic over the company's lines and promises to become the most popular pleasure ground between New York and Chicago. Olcott Beach has been very appropriately termed the Manhattan Beach of Buffalo.

Until the International company acquired possession of the Lockport & Olcott Ry., Olcott Beach was practically inaccessible from Buffalo, and the natural beauties of its environs were known only to sportsmen and occasional tourists. This season has witnessed a change, and the company's cars now carry many thousands of people daily to the beach. Among the principal improvements is a modern hotel with accommodations in its dining-room for 1,500 persons, and 100 sleeping rooms. A pavilion, amphitheater and concert hall have been erected, and there are numerous smaller attractions including carousals, etc. The bathing and boating facilities are unexcelled, and from the bluffs a view of the Canadian hills 50 miles distant can be obtained.

The Pittsburg Orchestra, under the direction of Victor Herbert, was one of the attractions at Olcott Beach early in the summer, from which it may be judged that all the amusement features offered by the management will be of the best quality. Mr. W. Caryl Ely, president of the Lockport & Olcott Ry., has been active in promoting the establishment of the resort and it is apparent from the extent to which the beach is being patronized that he has met with a high order of success.

ELECTRIC RAILWAYS IN MALAGA.

Consul Ridgely writes from Malaga that the municipal council of that place has authorized the operation of the street railway system by electricity. The mileage of this system at present in operation is comparatively insignificant, being only about 8 miles, but concessions have been granted for various extensions and the system is sure to extend considerably in the near future. The company owning the system is a joint stock company with headquarters in Brussels, Belgium. The corporate name of the company is Tramways of Malaga, and all of the officers reside in Brussels. It is said to be the intention of the company to go to Germany for its entire electrical equipment but it is thought that American agents might overcome this plan if the plant is considered to be of sufficient importance.

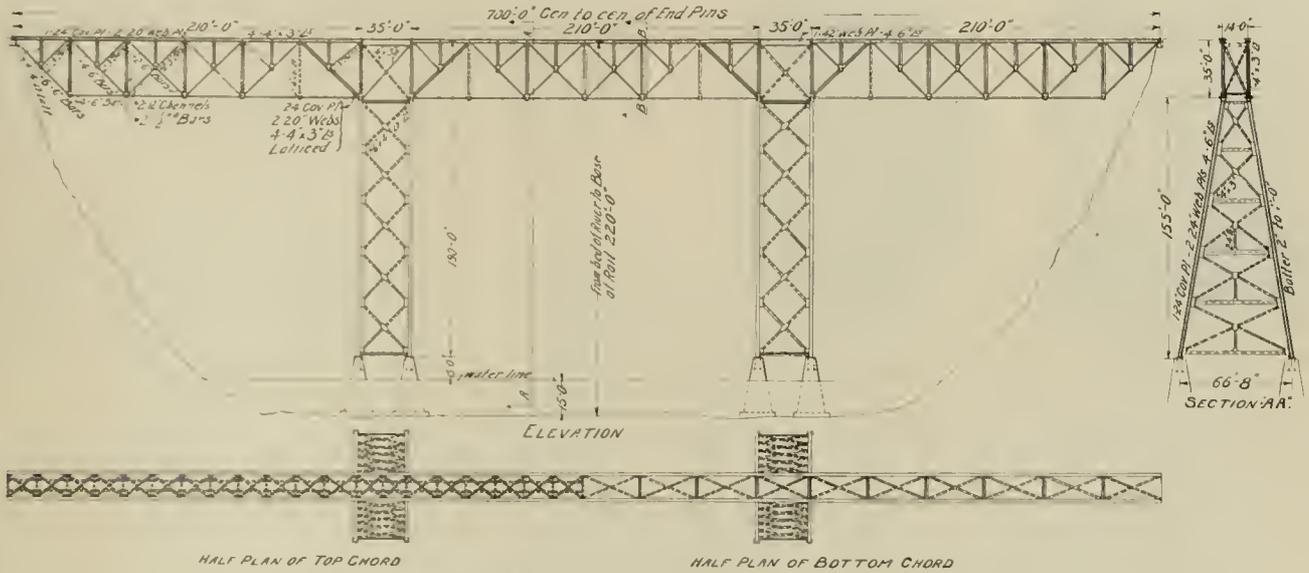
The Binghamton Railway Co. has begun the erection of a new sub-station at Endicott which is to be completed and in operation by July 1st.

NEW BRIDGE FOR THE BUFFALO, SPRINGVILLE & CATTARAUGUS RY.

A route has recently been surveyed for the Buffalo, Springville & Cattaraugus Ry., which passes through a very irregular section of country so diversified with hills and valleys as to make it an extremely difficult matter to locate a line free from impossible grades. The same section of country has been surveyed by several interests with the idea of building both steam and street railways, but here-

building from Buffalo to Syracuse. Since then Mr. Upson has been identified with the organization and building of several lines and for some time has been the general manager of the Buffalo, Hamburg & Aurora Ry., which is now to be extended 38 miles to Cattaraugus. In the prosecution of this work he has overcome obstacles which appeared insurmountable to everyone except himself.

Mr. Locke was born in Cattaraugus County, New York, was reared on a farm and secured his education by attending night school during the winter; he then took a position as teacher in a country



HIGH BRIDGE FOR THE BUFFALO, SPRINGVILLE & CATTARAUGUS RY.

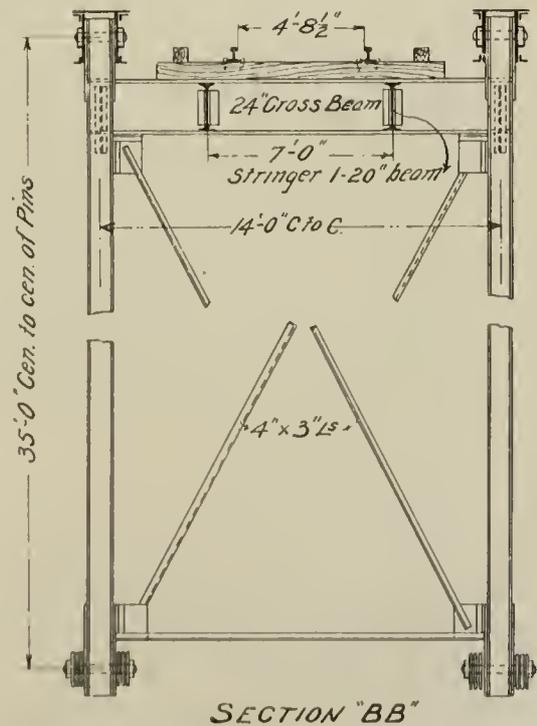
before the difficulties encountered have led to the abandonment of four or five projected lines. The success of the present attempt is due to the perseverance of Mr. U. L. Upson, vice-president and general manager of the Buffalo, Springville & Cattaraugus Railway Co., and to Mr. Charles G. Locke, civil engineer.

The new route involves the building of a bridge which will be the longest and highest trolley bridge in this country, if not in the world. Cattaraugus, as well as several other towns to be connected to Buffalo by this line, have heretofore been almost isolated as far as railway facilities are concerned. The section of the country through which this road will travel is considered to be one of the most fertile regions in the state, and its connection with the markets at Buffalo will stimulate its development to a great extent. The accompanying illustration shows a plan, elevation and section of the new bridge, the total length of which is 700 ft. from center to center of end pins and its height above the water level is 200 ft. The bridge is built of three spans of 210 ft. each, resting upon two towers which are supported on concrete foundations extending to bed rock 15 ft. below the water level. The approach to the bridge on the north side is 400 ft. long and that on the other side 500 ft. long. The construction is of the lattice type with pin connections.

As will be seen from section B B the bridge is designed for a single track road on which 70 lb. rails will be spiked to ordinary cross ties. A wooden guard is used on the outside of each rail. The bridge is designed to carry a dead load of 2,000 lb. per lineal ft. and a live load of 4,400 lb. per lineal ft. The material is to be medium steel.

Mr. Upson is a railway man of many years of practical experience, having worked his way up from water boy on a construction train to organizer and manager of the railroad. He began his business career in 1869 on a construction train working between Hamletville and Southampton as water boy and was advanced successively to the position of time keeper, brakeman and conductor. He was made a conductor before he attained his twentieth birthday. While serving as brakeman he studied telegraphy and in 1873 accepted a position as night operator at Dalton, on the Buffalo division of the Erie road. In 1874 he was transferred to Main St., Buffalo, as freight agent, filling that position until 1882, when he resigned. He then reentered the train service as a construction train conductor on the West Shore Railroad, which was then

school, and in this way earned sufficient money to carry him through the higher schools and enable him to take up the study of civil engineering. For the past 20 years he has been connected with the



SECTION "BB"

railway work in the state of Pennsylvania, where the hills, gulches and ravines make it very difficult to establish a line of survey. In several instances he has, after much difficulty, found a practicable route where others had entirely failed. Mr. Locke has also had

much experience in the oil fields and just preceding his connection with the Buffalo, Springville & Cattaraugus Railway Co. he was engaged for several years in topographical work under the state engineer of New York, and was in charge of some of the most difficult work in the Adirondaek wilderness. In connection with Mr. Upson he established a practicable line for the Buffalo, Springville & Cattaraugus Ry. after spending many weeks of hard work,



U. L. UPSON.



CHAS. G. LOCKE.

but with the determination to secure a line where several others had failed. The route of the new line covers the ground surveyed by several steam railways from 30 to 35 years ago and abandoned because of the heavy grades, sharp curves and other difficulties which seemed to be insurmountable.

WAGES INCREASED AT MILWAUKEE.

June 1, 1900, the Milwaukee Electric Railway & Light Co. voluntarily increased its scale of wages, which was established at 15 cents per hour for the first year and increased at the rate of one cent an hour for each year up to the fifth year, after which 20 cents per hour was the maximum rate. At that time the rate was increased to 17 cents per hour for the first year up to 20 cents per hour for the fifth and succeeding years. On May 29th of this year notice of a further general advance was posted, to take effect June 1st as follows: 18 cents per hour for the first year, 19 cents per hour for the second year, 20 cents per hour for the third year and 21 cents per hour for the fourth year and thereafter. The notice added that the advance was voluntarily made and was in pursuance of the company's policy to do the very best possible for all of its employes. It is also an evidence of the company's appreciation of the honest and loyal service, and it is hoped will prove an incentive for even more careful and enthusiastic service in the future. The notice issued by Mr. John I. Beggs, president and general manager, concludes as follows:

"It may not be amiss to state at this time that our new general office building, central car house and terminal station (the construction of which has just been commenced) will contain the most ample and comprehensive provision for the comfort, instruction and entertainment of our men ever undertaken by any street railway company. When this building is completed I hope to be able to present for the consideration of our employes a plan for the organization of a beneficial society, and likewise a plan for pensioning those who grow old in our service.

"Assuring you of my earnest solicitude for your advancement and welfare and suggesting that you can best serve the company by at all times giving courteous, careful and considerate attention to the safe and comfortable handling of our patrons, and bearing in mind that every act of discourtesy or inattention on the part of a motor-man or conductor is construed by the public as a fault of the management, I beg to remain, etc."

An ordinance was passed in San Francisco, May 19th, providing that the hours during which street railway companies in that city shall receive half fare tickets from pupils going to and returning from school shall be extended to be from 7:30 to 10 a. m.; from 12 m. to 1:30 p. m.; from 2:30 to 4:30 p. m., and from 6:30 to 9:30 p. m. on days during which schools are in session.

IMPROVEMENTS AT LOGANSPORT.

The Logansport local division of the Wabash-Logansport Traction Co., which is under the management of Mr. C. E. Folsom, has been greatly improved during the last three years and is now in fine physical condition. Mr. Folsom who is a thorough electrical engineer and a railroad man of wide experience has put in a new trolley wire on the whole line, thoroughly repaired the tracks, added new cars, motors, trucks, etc. and has also thoroughly overhauled the old equipment. The road is now giving a much better and faster service than formerly and the rates have increased about 25 per cent. This line will soon be connected with an interurban system running to Peru and Wabash. This connection with the extension to the city lines will greatly increase the traveling facilities of the Logansport people and that the changes are greatly appreciated is shown in the very largely increased receipts.

METHOD OF DEPOSITING BILLS IN BANK.

A suggestion is given in the proceedings of the Western Gas Association which might prove of value to street railway companies which are operating electric light and power circuits in connection with the street railway business. Mr. W. A. Bixby, of Decatur, Ill., gives the following method of collecting the bills through the bank. When any consumer complains of its being inconvenient to come to the office to settle his bills or gives any excuse for not paying before the 10th the company asks him to sign a slip as follows:

..... Bank.
Please accept my gas and electric bills from the Decatur Gas & Electric Co. until notified to discontinue same.
..... Consumer.

This slip is deposited with the customer's next bills and all later bills are deposited until the consumer gives the company notice to discontinue. The blank space at the top of the slip is filled in

The Decatur Gas & Electric Co.

.....190.....
.....Bills listed at
.....Bank.

Table with multiple columns and rows, likely a ledger for bill tracking.

with the name of the bank with which the customer deals. The accompanying blank is used by each of the banks and a list of the bills which are deposited is made out on this blank. Only the amount is noted, care being taken to place the bills in the same order as the amounts set down.

The Decatur company collects by this method about \$2,000 per month from about 500 bills and it is constantly adding to the number.

The city council of Kenosha, Wis., on June 2d, by unanimous vote granted the Kenosha Electric Railway Co. a franchise to lay its tracks through the city, thereby removing the last barrier to a direct electric railway route between Chicago and Milwaukee. It is expected to have cars running through from Milwaukee to the southern limits of Kenosha by July 1st, and the work of building the road from Kenosha to Waukegan, which will complete the Chicago-Milwaukee route, will be finished by September 1st.

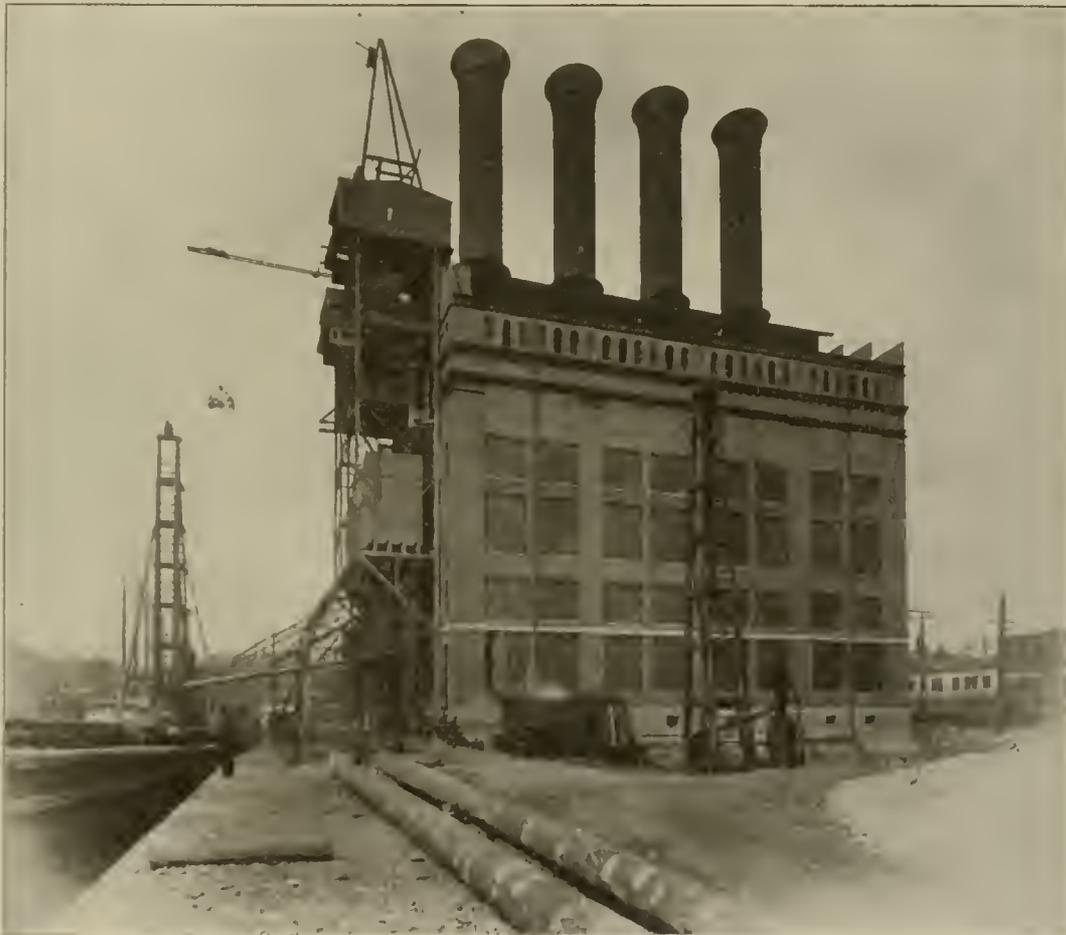
Increased Power Facilities for the United Railways & Electric Co., of Baltimore, Md.

When the United Railways & Electric Co., of Baltimore, came into existence, by the consolidation of several street railway companies, operating in the city of Baltimore and the outlying districts in all directions, it took over with these properties nine different power houses, most of which had been built to fill the needs of the companies when they were in independent operation, and part of them were, therefore, situated at points which make economical distribution somewhat difficult.

The United system, comprising 360 miles of track, has outgrown the capacity of these old stations and about a year ago the company's engineers were called upon to face the problem of rearranging and enlarging the old stations or practically redesigning the entire power system. A factor in the problem was a recent ordi-

stalled in the old power house, and in addition a new boiler house and generating station are being erected adjoining the site of the old power house. In the new station will be installed alternating current apparatus for supplying by high tension distribution the outlying districts. The suburban lines in the northwest and western sections of the city will be furnished with power from this alternating station through two sub-stations.

In enlarging this station, plans have been made for practically one large building. The former building comprising the northerly wing of the completed plant will contain direct current apparatus. Adjoining this on the west is the old boiler house. The southerly wing, which is to contain alternating current machinery, is now being erected, and a new boiler house, which will supply steam



EXTERIOR OF NEW BOILER HOUSE.

nance of the city requiring that all electric wires and cables be put underground in certain portions of the city. The city has constructed a system of municipal subway and conduits in which the wires and feeder cables of the street railway company are to be housed within certain districts.

The Pratt Street station, which is the largest power house owned by the United company, is well located near the theoretical load center of the system and has the further advantage of being situated on tide water from giving an abundance of water for cooling and condensing purposes, without cost, and also permitting the delivery of coal immediately alongside the boiler room. The station is also situated not far from the center of the city where the bulk of the heavy traffic is concentrated.

In consideration of these advantages it was determined to considerably increase the generating capacity at this point, and to do this new direct current machinery in large units has been in-

stalled in the new addition, has been erected between the site of the new annex and the old power house.

In addition to the Pratt Street power house, the Light Street power house, in which are installed four 500-kw. direct current generators, will be operated, and the Falls Road power house, containing five 300 kw. generators, will also be kept in service, it not being deemed advisable to disturb the overhead feeder systems of these stations, there being no municipal regulation requiring the wires to be underground. The Owings Mills power house, which is about 12 miles from the center of the city, will also be maintained. The Owings Mills and Falls Road stations are run condensing, the Light Street station being run non condensing. The old stations nearer the center of the city will be abandoned.

The plan for the alternating generating and distributing scheme call for 2,000-kw. units at the new addition to the Pratt Street station, generating alternating current at 13,000 volts with a fre-

quency of 25 cycles per second. This current will be transmitted at the initial pressure to the two sub stations where it will be changed by the usual converting and transforming apparatus to 345 volts alternating current, and then transformed to 575 volts direct current for transmission to the line circuit.

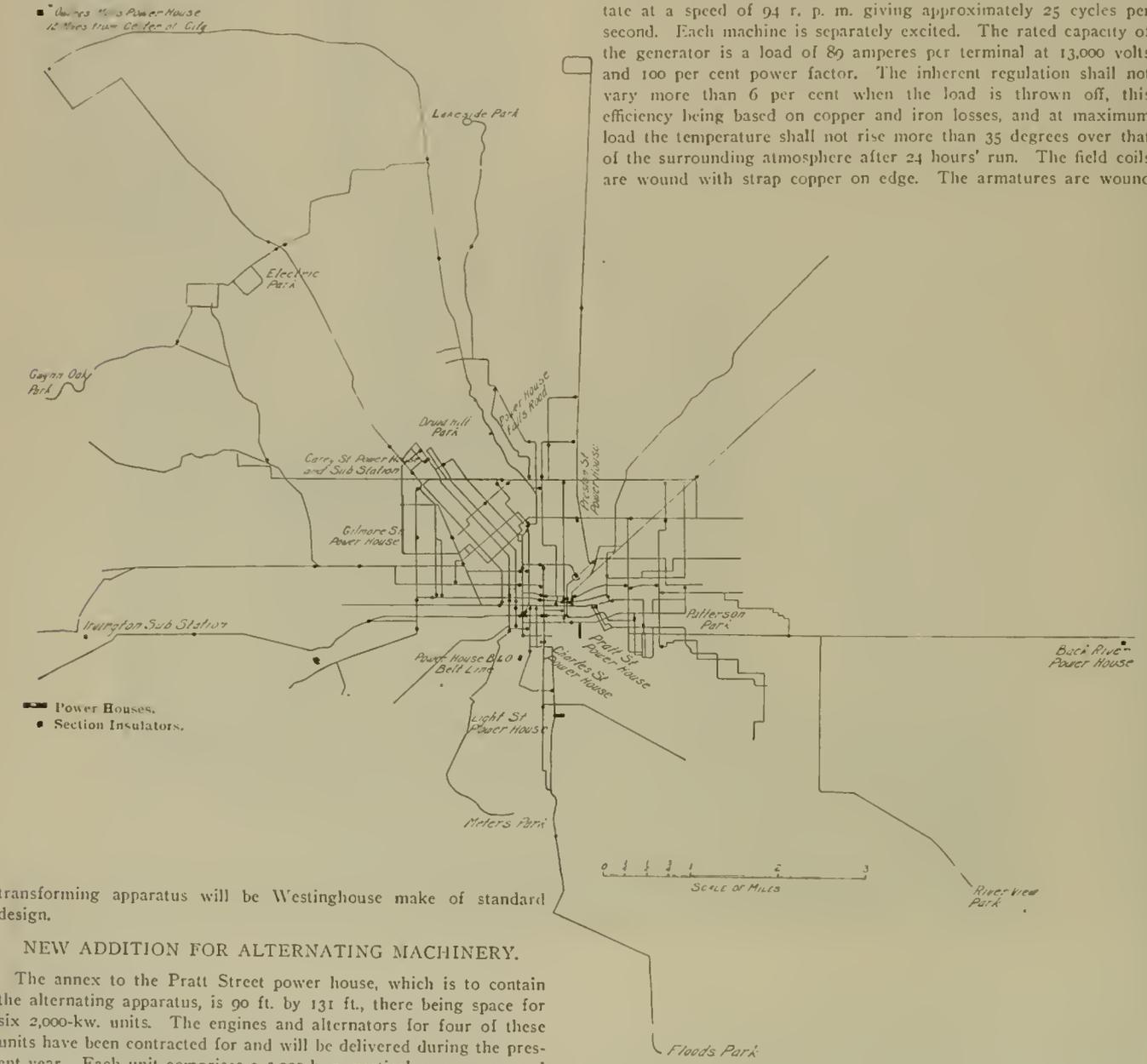
The Irvington sub-station will contain three 500-kw. rotary converters. The Carey Street sub-station will contain four 1,000- and one 500-kw. rotary converters. The transformers for the Irvington plant will consist of three 175-kw. transformers for each rotary. For the larger converters at the Carey Street plant there will be three 350-kw. transformers. All of this converting and

load, (not exceeding rated load) will not exceed 1-72 of the pitch angle between two consecutive poles.

The engines are provided with a speed changing device which is electrically operated, so that the speed of the engines may be raised or lowered four or five revolutions per minute in order to synchronize the generator and also to divide the load between the engines.

The engine bearings have automatic forced lubrication.

The generators are standard Westinghouse construction. The rotating fields are built on a cast iron spider. The exterior frame of the engine is movable in a line parallel to the shaft to allow ready access to the windings. There are 32 poles and the fields rotate at a speed of 94 r. p. m. giving approximately 25 cycles per second. Each machine is separately excited. The rated capacity of the generator is a load of 89 amperes per terminal at 13,000 volts and 100 per cent power factor. The inherent regulation shall not vary more than 6 per cent when the load is thrown off, this efficiency being based on copper and iron losses, and at maximum load the temperature shall not rise more than 35 degrees over that of the surrounding atmosphere after 24 hours' run. The field coils are wound with strap copper on edge. The armatures are wound



transforming apparatus will be Westinghouse make of standard design.

NEW ADDITION FOR ALTERNATING MACHINERY.

The annex to the Pratt Street power house, which is to contain the alternating apparatus, is 90 ft. by 131 ft., there being space for six 2,000-kw. units. The engines and alternators for four of these units have been contracted for and will be delivered during the present year. Each unit comprises a 3,000-h. p. vertical cross compound engine, direct connected to a 2,000-kw. Westinghouse alternator of the fly-wheel engine type with rotary fields. The engines will be supplied by the McIntosh & Seymour Co., of New York.

These engines have cylinders 33 x 68 in., with 56-in. stroke, and take steam at a pressure of 165 lb. The i. h. p. is 2,970 at 26-100 cut off, and 4,220 at 1/2 cut off. The shafts are to be fluid compressed hollow forged open hearth steel forgings, as made by the Bethlehem Steel Co. They are to be 28 in. in diameter.

The engine governors are provided with a patented device so as to have no tendency to cause trouble from surging of generators when run in parallel. The weight of the revolving parts is to be so proportioned that the maximum angular variation from the mean angular velocity while the generator is delivering the constant

for 3-phase generation, the phases to be 120 degrees apart and the wave of e. m. f. to be approximately a sine curve.

The high tension feeders to the sub-stations are 3-conductor paper and lead covered cables with 14-32 in. of insulation between the conductors and the lead sheath. The cables will be supplied by the Standard Underground Cable Co., and there will be two cables to each sub-station. These will be laid in the municipal conduits which are Roy multiple duct vitrified clay conduits.

OLD PRATT STREET STATION.

The older portion of the Pratt Street station which has been remodeled contains the direct current generating apparatus.

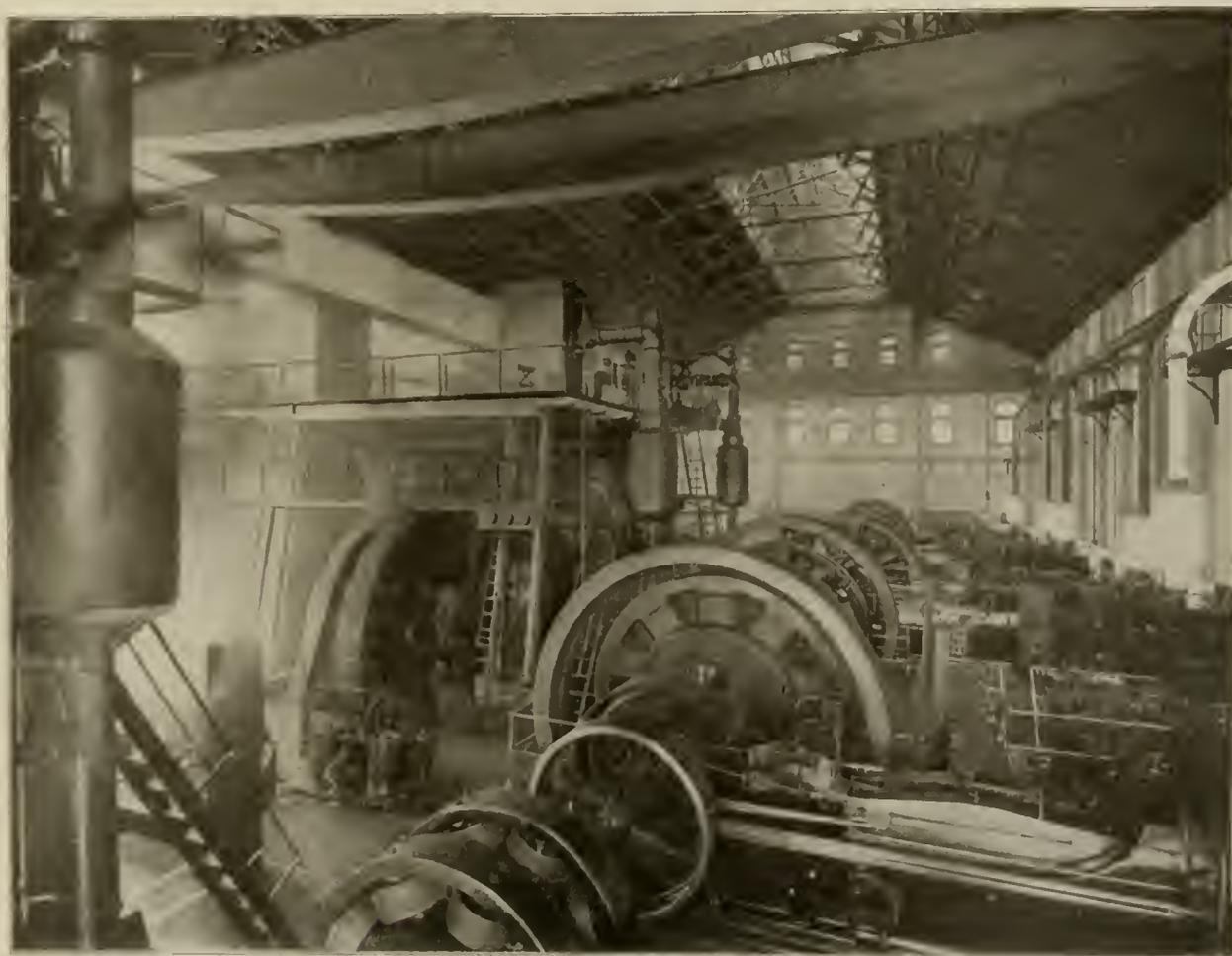
STREET RAILWAYS OF BALTIMORE.

This includes the following: three 2,500-h. p. vertical cross compound engines with cylinders 29 and 60 by 36 in., direct connected to 1,800-kw. General Electric generators of the engine type; two 1,250-h. p. horizontal tandem compound engines with cylinders 24 and 42 by 46 in., direct connected to two 800-kw. General Electric generators; three 800-h. p. tandem compound engines with cylinders 20 and 36 by 36 in., belted to three 500-kw. General Electric generators.

There are also two 800-ampere, 125-volt, steam driven General Electric boosters, and one motor driven booster of 3,000-ampere capacity.

Oil for the engines is forced by compressed air at a pressure of about 70 lb. into manifold tanks, the object of this being merely to avoid the manual labor of carrying oil around the station. From the manifold tanks the oil flows by gravity to the parts on the engine requiring lubrication. The waste oil is caught and is drained back

arrangement has the advantage of greatly simplifying the wiring and connections, and also gives absolute safety, as it is impossible to have a short circuit on the board as the positive and negative leads are over 30 ft. apart. The arrangement is, of course, applicable chiefly to stations of large capacity; it is used in the new stations of the St. Louis Transit Co. The board is in three tiers, mounted on galleries, viz., the generator gallery, the feeder gallery, and the third gallery in the roof where are placed the resistances. The wiring of the board is simple and inexpensive and is made clear in the accompanying diagram. A separate wattmeter is of course provided for each generator, but there is no totalizing wattmeter for the station. It is held that this arrangement permits the wattmeters to work under their best conditions, which is not the case with totalizing wattmeters, especially when running the station at light load in the early hours of the morning. There are two circuit breakers in each generator circuit, one being placed on the



ENGINE AND GENERATOR ROOM, PRESENT PRATT ST. STATION, UNITED RAILWAYS & ELECTRIC CO., BALTIMORE.

to an open tank in which there is a steam coil. There is always considerable water returned with the oil and this water settles to the bottom of the tank leaving the oil at the top. As the steam coils are also located near the top the oil is rapidly heated, thereby reducing its specific gravity and causing all particles of foreign matter to be precipitated to the bottom. The hottest and therefore the cleanest oil is at the top and flows over to another tank from which it is raised by steam pump into the storage tanks.

Air for the oiling system is compressed in a small Westinghouse locomotive compressor which is steam driven. The compressed air is also used for clearing generators and switchboard and for lifting water from an artesian well.

SWITCHBOARD.

The switchboard has but one side of the circuit on it. The positive bus bar is mounted on the switchboard and the negative bar is located near the center of the power house in the sub cellar. This

power house floor near each machine and one on the board. By a system of battery circuits and push buttons on the switchboard the attendant is able while standing on the switchboard gallery to throw the breaker located at any machine.

The switchboard has a steel frame and the gallery floors are of circular concrete and expanded metal. The board comprises 15 feeder panels, with two feeders to each panel; 8 generator panels; 2 booster panels and 1 station panel.

Steam for this division of the plant is taken from the old boiler room which contains ten 350 h. p. Campbell & Zell boilers operated at 135 lb. pressure. There are two 11 ft. stacks 165 ft. high.

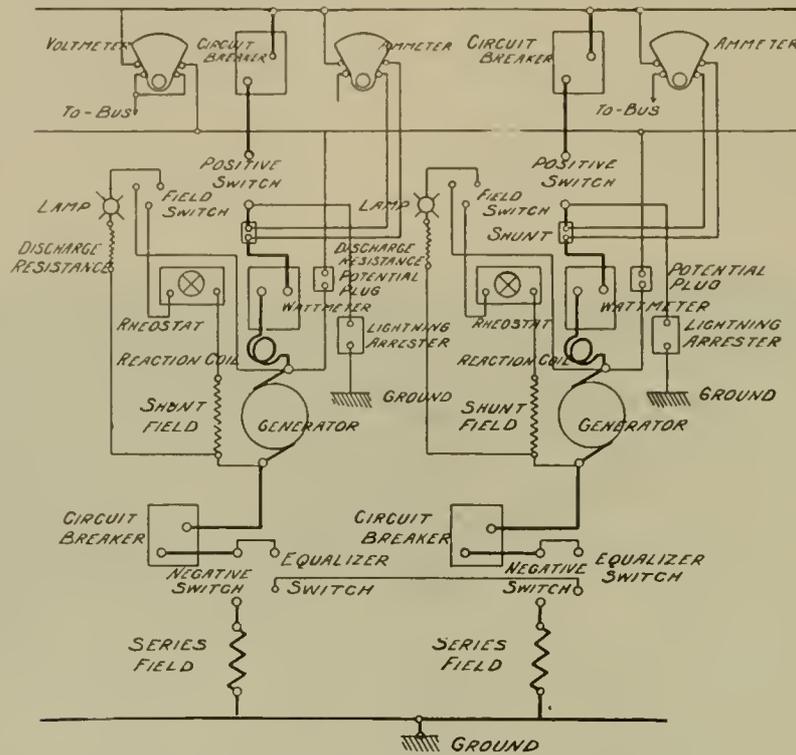
The auxiliary steam apparatus includes Wainwright feed water heaters, Blake vertical air pumps, Blake duplex feed water pumps and Blake jet condensers.

The direct current engine room is provided with a 25 ton crane of 78 ft. span which has two 12 ton hoists.

NEW BOILER HOUSE.

This building, which is of the "steel cage" construction, is 94 by 131½ ft. on the ground line, with brick walls and slate roof. The entire building rests on hard pine piles, spaced 2½ ft. on centers and varying in length from 16 to 20 ft. These are driven to a solid footing of gravel. On top of, and around the piles is laid a founda-

tion bed of concrete which is 7½ ft. thick under the supporting columns and 13½ ft. thick under the four stacks along the center of the building. The boiler room has an ultimate capacity for 16,000 boiler horse power, of which 4,000 h. p. are now in commission and 5,000 h. p. additional are now being installed. The boilers are Babcock & Wilcox make, with wrought steel headers and inside hand hole



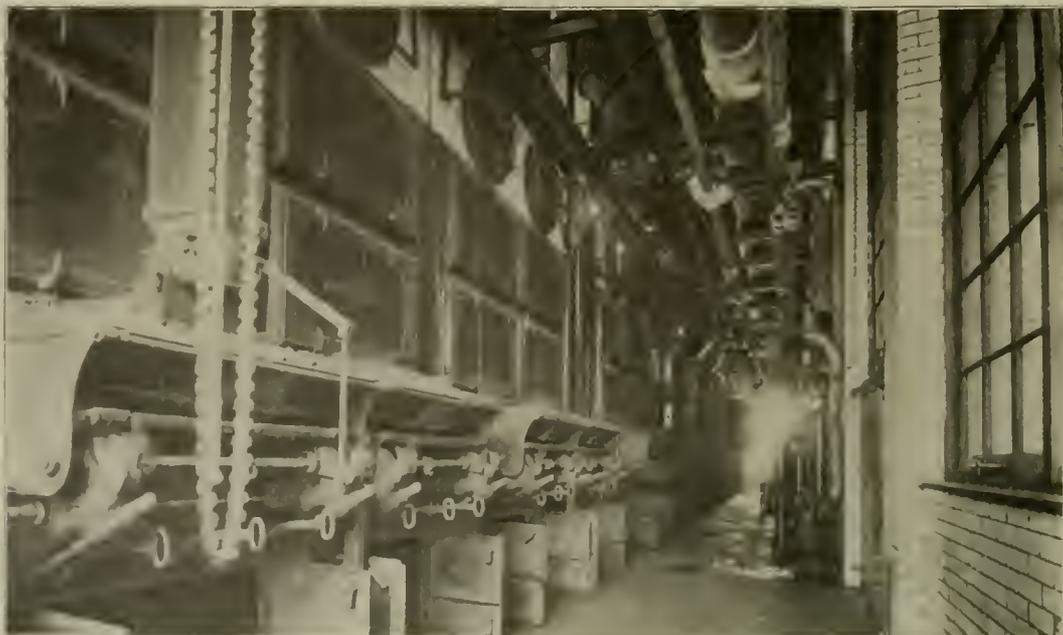
CONNECTION OF GENERATORS EQUALIZING ON NEGATIVE.

tion bed of concrete which is 7½ ft. thick under the supporting columns and 13½ ft. thick under the four stacks along the center of the building.

The boiler room has an ultimate capacity for 16,000 boiler horse power, of which 4,000 h. p. are now in commission and 5,000 h. p. additional are now being installed. The boilers are Babcock & Wilcox make, with wrought steel headers and inside hand hole

200 ft. high and 13½ ft. inside diameter, and are lined throughout with brick to protect the metal.

The piping is extra heavy welded flange pipe with extra heavy fittings. Each of the four main headers are 16 and 20 in. in diameter and all piping is carried overhead on galleries formed of 8-in. I-beams supported from the wall beams and longitudinal trusses, and having open grating floors. The arrangement makes all

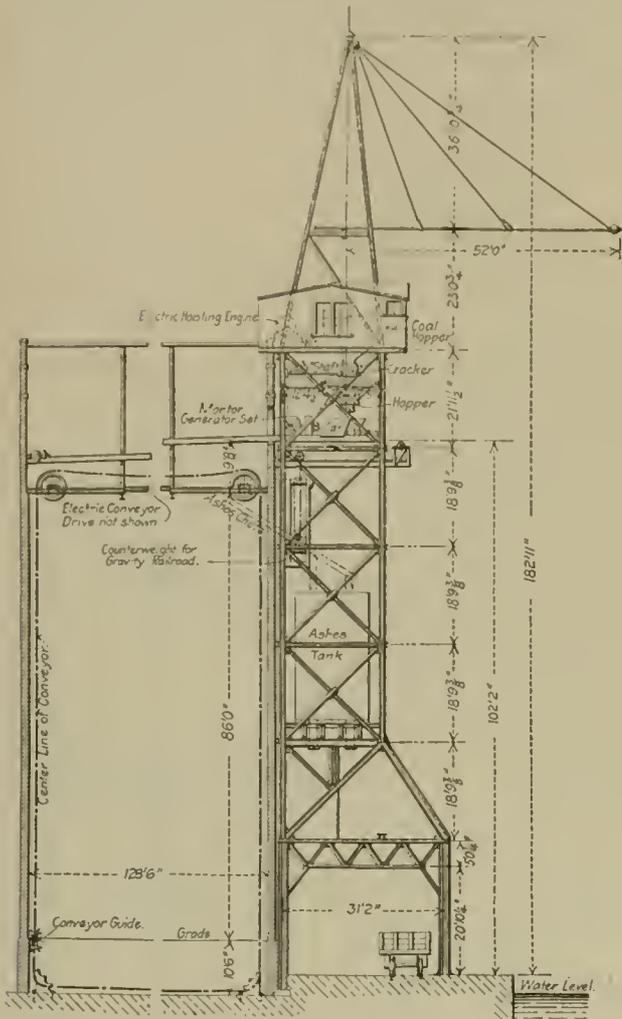


SHOWING ARRANGEMENT OF PIPING AND RONEY MECHANICAL STOKERS.

servng as the lifting rope. The bucket is lowered with the jaws open and deposited on the coal pile. The lifting cable controlling the jaws is then put in motion, causing the jaws to close and the

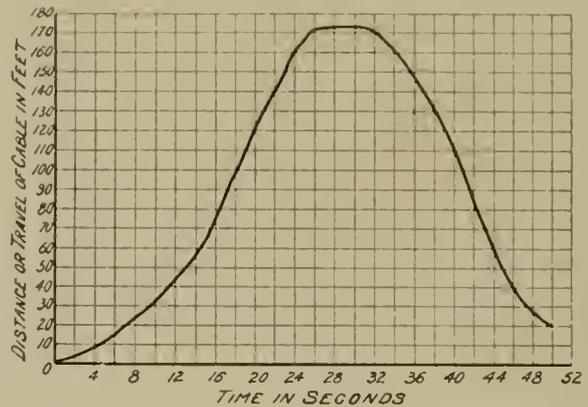
Control of this boom truck and also of the hoisting and lowering apparatus is accomplished entirely by electrical means embodying a number of novel features original with Mr. Keilholtz.

The drums for winding up the ropes attached to the shovel are driven by a plain shunt wound motor which receives power from a generator that is motor-driven. A coil rheostat under the control



COAL HOIST TOWER.

shovel to bury itself in the coal. When the jaws have come together and the scoop is filled it will begin to rise. Dumping, it will be understood, is achieved by slacking on the lifting cable, thus causing the jaws to open and the weight of the shovel is then



DISTANCE-TIME CURVE.

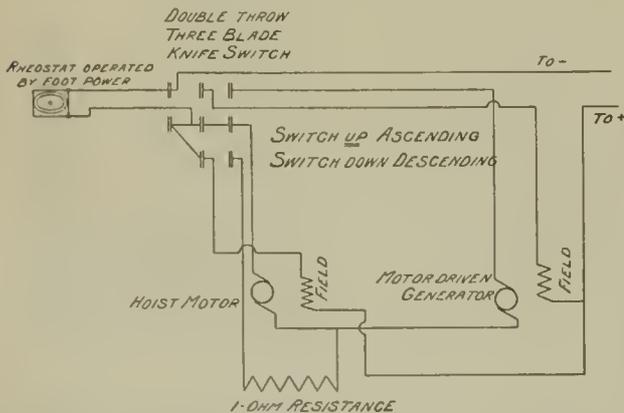
Time required to raise filled bucket from ground to top of hoist, unload and return empty bucket to ground.

of the operator's foot is placed in the field circuit of the generator and as the generator speed is constant its e. m. f. is proportional to the strength of its field, and the attendant is therefore enabled to impress upon the hoist motor any desired e. m. f. and so secure a wide range of speed. By fitting the rheostat with numerous steps in the resistance the acceleration may be very rapid and still perfectly smooth and without shock or jar.

The lowering of the bucket is done entirely by gravity and instead of using a band or other form of brake, the shovel is brought to rest by converting the energy developed in its fall into electrical energy working against resistance. This is accomplished by intro-



A PORTION OF THE NEW BOILER HOUSE.



CONNECTIONS BETWEEN HOIST MOTOR AND GENERATOR MOTOR.

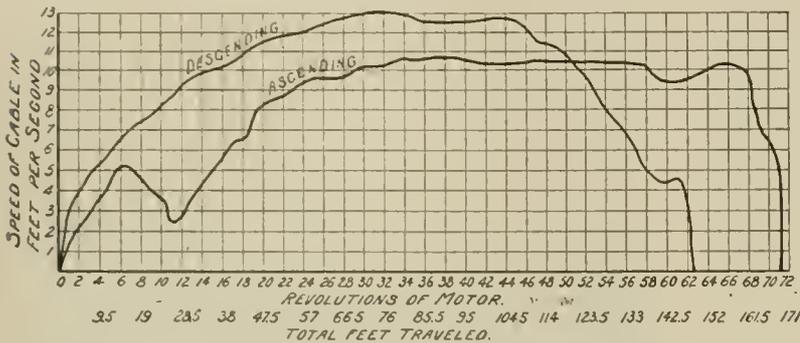
transferred to the other cable. The cables pass over pulleys mounted on a boom truck which runs up and down the boom and may be anchored at any point corresponding to the location from which the hoisting is to be done.

ducing by means of a switch a resistance into the armature circuit of the hoist motor and varying the field strength of the machine by means of the rheostat. It will be understood that as soon as the scoop starts to drop the hoist motor becomes a generator the speed of which is controlled by introducing resistance in its field circuit. This presents a very interesting example of an operation where electrical energy is employed to overcome gravity and gravity is then made to generate electrical energy which is dissipated as heat.

From the curves accompanying this article the rapid acceleration and braking secured will be evident. On this test trip the bucket in descending was allowed to reach a speed of 13 ft. per second, but notwithstanding this the scoop was brought to rest within a fall of less than 30 ft. In one instance the bucket has handled 70 tons of coal per hour, and on a recent test handled for 15 minutes coal

at the rate of 80 tons per hour. In service the current runs from 200 to 500 amperes at from 50 to 270 volts, the current necessary to maintain speed being about 360 amperes at 270 volts.

The coal from the shovel is first weighed and then drops into a crusher from which it passes into a car that runs over an incline railway and automatically distributes the coal to the two 3,000-ton capacity storage bins which are arranged one on either side of the line of stacks. The car holds 4,000 lb. and when filled runs down the incline and strikes a block to which is attached a counter weight. As the loaded car continues on its journey it lifts its weight until a trigger is automatically operated causing the car to dump. When



VELOCITY CURVES—TEST OF COAL HOIST.

Weight of coal in bucket, 2,275 lb. Weight of bucket, 2,900 lb Total weight lifted, 5,175 lb
Volts, 50 to 270. Amperes, 200 to 500. Current to maintain speed, 360 amperes at 270 volts.

this is accomplished the weight drops, giving the empty car an impulse that returns it to the loading platform at the head of the incline. The arrangement may be set to dump at any point.

From the storage bunkers the coal passes to the Roney stokers through movable hoppers running on tracks in front of each line of boilers.

Ashes are raised by a traveling bucket conveyor from beneath the boilers to an ash chute at the top of the boiler room. From the chute they pass by gravity to an ash storage tank on the hoisting tower and are dumped into cars or scows for removal.

The apparatus was built and installed after plans prepared by the railway company's engineers.

This entire plant, including both engine rooms, the new boiler house, the coal handling apparatus, and other features, were designed by and erected under the supervision of Mr. P. O. Keilholtz, Associate Member A. I. E. E., and consulting engineer for the United Railways & Electric Co.

PENSION PLAN IN GERMANY.

A pension fund has recently been inaugurated in the Vulcan Ship-building Yards of Stettin, which is described by Consul J. E. Kehl as follows: "All employes of the 'Vulcan' who receive an annual salary of more than \$375 are eligible to membership. Every member pays an initiation fee equal to one month's salary, but not to exceed \$119, after which he pays an annual premium equal to 3 per cent of his yearly salary. This highest basis upon which an initiation fee or premium can be paid is a yearly salary of \$1,428. The Vulcan company pays into the fund an amount equal to the annual premiums collected. Five years' membership, or the paying of back dues so as to make the amount equal to five annual premiums, entitles a member to a pension. The amount paid to an incapacitated or retired member amounts, after five years' service, to 15 60 of his last year's salary and increases 1 60 every subsequent year of actual service until the limit of 45 60 has been reached. The right to a pension is accorded to those permanently disabled through accident or sickness, or who have a forty year membership, or have reached the age of 65. The widow of a member is entitled to one-half of her husband's pension and every child of the deceased (under 18 years) to 1 20 of the pension; but in no case shall the amount paid to widow and children exceed 15 20 of the amount of pension due the deceased husband and father. All officers of the fund, with the exception of the treasurer, furnish their services gratis.

The old horse car line in Fresno, Cal., is being replaced by the Fresno City Electric Ry.

THE FEEDER INSTALLATION OF THE BOSTON ELEVATED.

Supplementary to the extended description of the system of the Boston Elevated Railway Co., which appeared in the "Review" for March, April and May, 1900, the following description of the feeder requirements and installation of the elevated section of this system, by C. H. Hile, superintendent of wires, which was published in the Wisconsin Engineer, will be of interest:

The elevated structure over which the Boston Elevated Railway Co. began operating its elevated car service June 10, 1901, comprises 15.62 miles of track, lying between the Dudley St. Terminal at the southern part of the city, and the Sullivan Sq. Terminal at the north.

The general plan of the route shows a loop in the heart of the city, using the subway for the western leg and comprising 4.44 miles of double track, while north and south from the loop double tracks extend 1.66 miles to Dudley St. Terminal and 1.71 miles to Sullivan Sq. Terminal.

The running distance between the two terminals is 5.015 miles, via the Subway, or 5.567 miles, via the Atlantic Ave. leg of the loop.

The running time between the two terminals via the subway is 22 minutes, the trains making nine stops.

The Subway is used by the elevated trains for a distance of 2.32 miles, and in thus using the Subway as a part of the "L" route, trains must pass from the level of the elevated structure, at an average of 16 ft. above the street to the Subway level of about 19 ft. below the street surface.

Within the 2.56 miles of the so-called Subway section of the elevated system, trains take grades varying from 3 to 8 per cent for 29 per cent of the total distance run, and pass around curves varying in length of radius from 1,600 ft. to 90 ft. for 54.6 per cent of the distance run.

The maximum train service for the present, and immediate future, is intended to furnish four car trains on two or three minutes headway on the main line, and three car trains on seven minutes headway on the loop, thus giving about 24 trains on the line at one time.

Each car is 46 ft. 10 1/2 in. over all, weighs when fully equipped 29.5 tons. The cars are equipped with two 150-h. p. motors.

The trains are operated on the Sprague multiple-unit system. The average power consumed by each four-car train is 219 kw. at the switchboard, or a current consumption of 368 amperes. The maximum power consumption for one four-car train accelerating on one of the 5 per cent grades is 924 kw. or a current consumption of 1,700 amperes.

With the trains operated under the foregoing conditions the power required to operate the entire elevated system is, on an average, 4,718 kw., or requiring an average current consumption of 7,929 amperes. This includes power for light and heat in the cars.

The power for the system is furnished from three of the company's power stations, all in the vicinity of the structure, one feeding in on the southern section at a point about 1.2 miles from the Dudley St. Terminal, another feeding in on the Atlantic Ave. leg of the loop, and the third feeding in at the northern end of the system or at the Sullivan Sq. Terminal.

The feeder system may be divided under the following heads: Feeder mains, third rail, feeder connections, return system.

FEEDER MAINS.

In calculating the copper required for transmitting the power to the motors, a 2,000,000-c. m. wire was determined upon as a unit in the feeder system.

At the switch board each feeder panel carries one carbon break circuit breaker, having a capacity for carrying 3,000 amperes continuously without overheating, one ammeter measuring up to 6,000 amperes, and one quick break switch having a capacity of 3,000 amperes continuously without overheating.

The power is carried from the station to the elevated structure using 2,000,000-c. m. lead covered rubber insulated cables, which are drawn in conduits built of vitrified clay pipe.

The conductor in each cable is insulated with 5-32 in. of rubber

compound, covered with a tape and protected with a lead covering $\frac{1}{8}$ in. in thickness.

At each end of the cables, where they are carried through the vault of the station to the switchboard and up the posts of the elevated structure to the bare feeders, it was deemed desirable to discontinue the lead covering and splice on from 40 to 60 ft. of rubber insulated triple braided wire. At the structure end the cables are carried from the man holes, which are built about the bottom of the elevated supporting posts, on the inside of the posts, being insulated from the iron by wood supports. The cables terminate in switch boxes placed on the structure, where they terminate on switches, which makes it possible to cut out a cable from the feeding system at any time, for making tests or repairs.

The feeder mains on the structure leading out from the switch boxes are 2,000,000-c. m. bare copper wire, concentric laid and made up of 61 tinned copper strands.

These are carried along the structure in enclosed feeder boxes built between the tracks and having a capacity for six feeders. The feeder boxes run parallel with the tracks throughout and are closed at the sides and top. The top covering is built in sections of planking laid crosswise and tightly fastened together. Each section is about 5 ft. in length and can be easily and quickly removed when it is necessary to get to the feeders. The feeder boxes with their top covering affords a safe and convenient walk along the tracks.

The supports holding the box are placed about every 6 to 8 ft. and inside the box are used to hold the wood pins which carry the insulators, which, in turn, support and protect the feeders.

The wood support on which the boxes are built, the locust pins, and the glass insulating supports, constitute the means by which the bare wires are insulated from the structure.

THIRD RAIL.

The so-called third rail system is used in transmitting the power from the feeder system to the cars. Each car carries four contact shoes, carried outside the forward and rear trucks and hanging at such a distance as to come in contact with the third rail, which is so placed outside the running rails that its contact surface is $19\frac{1}{8}$ in. from the gage of the running rail and, approximately, 6.2 in. above.

An ordinary T-rail 85 lb. to the yard, is used for the third rail. It is supported on specially designed insulators built up of malleable castings with "Aetna" insulation between the upper and lower parts. These chair insulators are placed on the end of every third tie, which is about fifteen inches longer than the regular ties, and are held in place by lag screws.

At each joint the third rail is bonded with the short "Protected" type of rail bond, enough bonds being used to bring the joints up to the same carrying capacity as the rail.

At all special work and cross-overs, where the third rail must be broken, cast iron run-offs are fastened to each end, and the continuity of the rail as a feeder is maintained by running a 1,000,000-c. m. rubber or weatherproof insulated wire underneath the structure and connecting with the ends of the rail by means of terminal or feeder tap bonds.

FEEDER CONNECTIONS.

The feeder taps or connections through which the power is transmitted from the feeder mains to the third rail, are placed throughout the system at such points as the conditions require, and convenient for access; 1,000,000-c. m. and 500,000-c. m. rubber insulated triple braided wire has been used for making the connections, and all connections between the third rail and the feeder mains are carried through switch boxes, so as to make it easily possible to cut out from the feeding system, either a section of the third rail or one of the feeders.

RETURN SYSTEM.

The steel in the elevated structure throughout is used as a part of the return system. In addition to this, one rail in each track constitutes part of the return circuit.

The joints on the rail, which is of the 85-lb. T type, are bonded nearly to the full capacity of the rail itself, and at 500 to 600-ft. intervals, the rail is bonded to the longitudinal girders of the structure.

One rail of each track is used as a part of the signal circuit and is, therefore, not available for the return system.

As the company controls and operates all surface lines paralleling, crossing under and leading into the elevated system it has been found desirable to connect the elevated structure with the surface tracks and return wires at frequent intervals, thus giving a well balanced return system.

The same power stations feed both the elevated and surface lines, but through separate feeder systems.

RAPID TRANSIT IN YUCATAN.

One of the quaintest and most picturesque little railways imaginable is that of the Xcalak & Aguada Railway Co., which is owned and operated by the government of Yucatan, and used for transporting troops and army supplies from the coast of the Caribbean sea to a fresh water lagoon in the interior, seven miles across the peninsula.

The nearest large port of entry being Belize, in British Honduras, 75 miles down the coast, supplies whose destination is the interior



LIGHTER ON THE YUCATAN COAST.

of Yucatan are sent by steamer to a point on the Caribbean sea some distance out from Xcalak, where they are met by flat baggage boats, or "lighters," manned and rowed by native Yucatanians, and by them lighted ashore. One of the illustrations shows one of these lighters with its crew.

Reaching the coast, the baggage is transferred to the tiny flatcars of the little railway; and by them all supplies, troops and officers are carried through the seven miles of tropical undergrowth lying between the coast and the fresh water lagoon, which runs up into the interior for a distance of a hundred miles. Transports plying to and fro on the fresh water lagoons carry passengers and supplies to their ultimate destination.

The equipment of the Xcalak & Aguada Railway consists of some fifteen or twenty cars, open and closed; the motive power in all



STREET RAILWAY TRAVEL IN YUCATAN.

cases being the native long-eared mule—a plucky, sure-footed little creature, resembling an overgrown donkey or burro, an important feature in the economy of the country. These patient, cheerful animals plod back and forth over their seven-mile track, looking plump and well-fed on a diet of chopped straw, and needing only an occasional whistle of encouragement from their drivers to keep them at a steady, even jog-trot through every yard of the entire distance.

THE ELECTRIC RAILWAYS IN VALTELLINA.

The two most notable experiments in electric traction in Italy were made by the two largest Italian railroad companies, namely the Mediterranean company and the Adriatic company. Both of these companies built their electric lines in the neighborhood of Milan. The Mediterranean has constructed a road on the third-rail system running from Milan to Gallarate and thence to Arons, Levano and Porto Cerejio; this is operated by continuous current. The Adriatic company built its lines from Lecco to Colico, Sondrio and Chiavenna, a distance of 106 km., which is operated on the three-phase system at a high potential, and the overhead trolley is used. The road belongs to the state but is operated by a department of the Adriatic company which was formed for the special purpose of carrying on this experiment. The capital interested is principally Italian.

Water power is used to operate this road, and it is obtained through difference of level between the Ponte di Desco and the Ponte di Ganda near Morbegno. The head of water between these bridges is ordinarily about 36 m. and the quantity of water in the Adda passing at this place is about 25 cu. m. per second. If we assume, therefore, an available head of 30 m. this volume of water will give 10,000 nominal horse power, and at an efficiency of 75 per cent there will be 7,500 effective horse power. The canal gate is placed at about 250 m. above the Ponte di Desco, and in front of the gate there is a screen for the purpose of diverting sediment or other matter brought there by floods into the right branch of the Adda. This screen also prevents the passage of gravel into the gate. The gate is placed at 1.1 m. below the summit of the dyke, is slightly inclined, and is 3 m. in height. Immediately beyond the screen there are eight gates, each of 3.2 m. in width and 1.1 m. in height. Each of these is divided into two openings of 1.6 m. by means of a central I-beam and two lateral channel bars in which the bulkheads slide; the gates are supported by pillars 1.2 m. wide and 3 m. in height. The channel is 4,800 m. long and runs partly in tunnels and partly in open cuts. There are 15 sections that run in the tunnels, having an aggregate length of 2,900 m., of which 1,650 m. are natural tunnels and the remainder constructed of masonry. The longest gallery is 770 m. in length and commences immediately beyond the canal gate. There are 14 sections of open cuts, with a total length of 1,900 m. The total section of the canal is 10 sq. m. in area and its grade is 1 per cent. At a distance of about 900 meters from the gate there is a settling basin 100 m. long and 100 m. wide. A second settling basin is placed just beyond the gate at the lower extremity of the channel; this is 80 m. in length and is divided into two equal parts, with a gate placed between them. The head reservoir is 25 m. long, 7 m. wide and 5 m. deep. At a little distance from this bay there is a division forming two channels, each 4½ m. in width and 3 m. in depth. These channels lead to two iron pipes 2½ m. in diameter and 68 m. long, which stand at an angle of 45 deg. These pipes are again divided into two, each of which are 1.2 m. in diameter, so that four pipes are led into the generating station. The dynamo room of the generating system contains four turbines, each direct-connected to a dynamo. Three of these turbines have a capacity of 2,000 h. p. and the fourth 3,000 h. p. Only the first three have been installed up to the present time. These were furnished by Messrs. Ganz & Co., of Budapest, and are designed on the Francis reaction system. They operate at a speed of 150 r. p. m. and each turbine is independent. The generator for this station were supplied by Shukert & Co., Nuremberg, and are three phase machines with fixed armatures and revolving field magnets. They have a frequency of 19 periods per second, and an output of 1,050 kw. at a potential of 20,000 volts. The switchboard was constructed by Shukert & Co., and contains the instrument for the four unit and for two feeder circuits. The measuring instruments of the switchboard are all on low tension circuits, each being operated through a transformer in order to avoid danger to the employes of the station. Each feeder is provided with a voltmeter, an ammeter, a rheostat and a single pole switch. Each alternator is provided with an ammeter, two voltmeters, one for the pressure and the other for the phase indicator, and two three pole circuit breakers. There are three fuses for the protection of the alternator in each of their circuits. Each of the feeder lines has three ammeters, one for each conductor, and a wattmeter, a voltmeter and a three-pole switch. The lightning arresters are of the horned type. The high tension lines are run with bare copper con-

ductors, and these as well as the secondary circuits are carried on poles.

Where the road passes through tunnels the high tension wires are carried outside of the tunnels owing to the danger because of their very high voltage. The terminals of the high pressure systems are at Abbadia, 7 km. from Lecco, and at Castione, 5 km. from Chiavenna. These lines measure about 90 km. Two of the wires for the low pressure system have a section of 50 mm. These are suspended above the rails which form the third conductor of the three-phase system and are at a height of about 6 m. from the ground. In the tunnels this distance is reduced to 4.8 m. The pressure of the low tension service lines is 3,000 volts. These wires are supported upon wooden poles with brackets while in some places span construction is used. A special safety device is used to prevent harm to passers-by in case one of these wires should break; by means of this arrangement the wire is grounded before it falls to the earth and thus becomes harmless.

The rails are bonded at each joint by copper bonds made of wire of 6 km. in diameter and the tracks are cross bonded at every 500 meters. The trolley wires are fed at nine points from the transformers of the sub-stations. There are five sub-stations in all and the machinery in all of them is similar, each containing a transformer of 450 kw. capacity. Four of these sub-stations contain only single units while the one at Abbadia contains two units of the size mentioned. The sub-stations are all divided into two rooms, one containing the transformer and lightning arrester and the other the switches for the primary and secondary circuits and a fan for cooling the transformers.

The rolling stock of this line consists of five cars for first class passengers, five composite cars for first and second class passengers and two baggage cars. The passenger cars are all similar except in regard to their outside finish. The trolleys consist of two bronze rollers each 600 mm. long which are supported on rods made of Mannesmann's tubes. At first only two trolleys were used on the cars, one for each direction, but the company is now equipping each car with four trolleys, two of which will be used at once in order to avoid sparking. The trolleys which act together when running in one direction are at a distance of 19 mm. apart. The trolleys are raised and lowered by means of compressed air, and the cables carrying the current are connected at the trolley wheels. These cables are encased in a metallic tube which is kept in good electrical contact with the rails so that in case of any imperfect insulation of the cables no harm can be done to anyone on board the car.

The cars have two speeds, one being with the two car motor armatures in series and the second with the armatures in parallel. The armature shafts are hollow with a diameter of 300 mm. Through this hollow shaft another axle of 110 mm. in diameter passes which serves as a bearing for the hollow shaft. All the high potential circuits on the car have metallic casings which are securely grounded to the rails as a precaution against accident. The cars are each provided with two motormen's cabs, one at each end. These cabs are similarly equipped and contain a hand and a relay switch, a controller, a reverser, a hand brake, a Westinghouse brake, a valve for raising and lowering the trolley by compressed air and an air whistle.

In case the air in the reservoir should be insufficient the trolley could not be operated and to avoid this difficulty a hand pump is carried in the cab. The cab also contains a voltmeter and a manometer for indicating the air pressure in the reservoir. Just outside of the cabs is an air pump which is operated by means of a three-phase motor, which is automatically cut in and out of the circuit, according to the pressure of air in the reservoir. This pressure is normally maintained at 6 atmospheres. Water rheostats are used for starting the motors and are placed on the cars. The amount of liquid employed is regulated by means of air pressure. The liquid is a solution of carbonate of soda.

The maximum velocity of the car is 60 km. and the second speed 30 km. per hour. The operation of starting the cars is easily accomplished. A main circuit breaker is used to break the high potential current coming from the trolley wires to the motors. This acts automatically and opens the circuit when the limit of 90 amperes is reached. The cars are lighted by means of a battery of accumulators and also by three phase lamps of 110 volts which are supplied with current by means of an 8-kw. transformer. This transformer also supplies current for the Westinghouse brake pump

and is placed inside the car. It also supplies current for the electric heaters. The battery is charged at Lecco, Sondrio and Chiavenna.

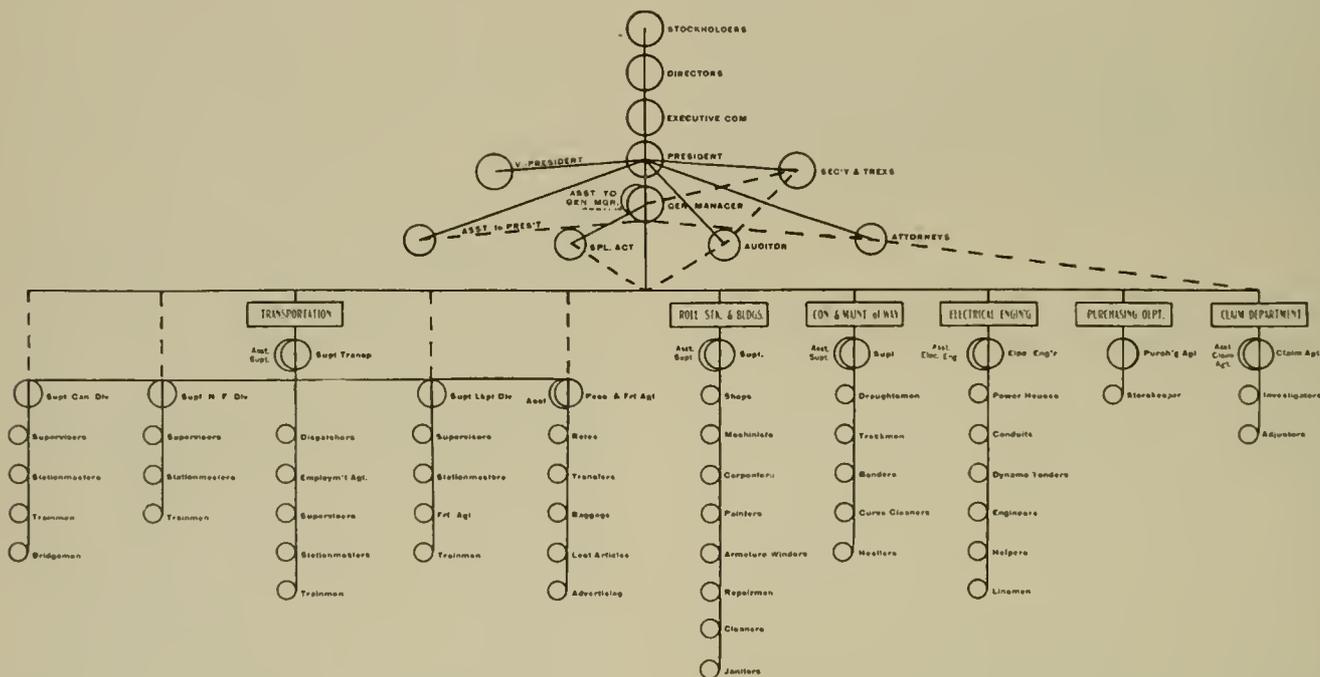
The cars use double trucks, which are placed at a distance of 11½ m. apart. The total length of the car is 19 m. and the height 3.9 m. Each truck has four wheels 1.16 m. in diameter and the axles are 2½ m. between centers. Each truck is equipped with two motors. The first class cars are used only for express trains and the composite cars for the local trains. The first class cars have both smoking and baggage compartments, and ventilation is secured by means of electric fans. The heating is procured by means of electric heaters. They have a seating capacity of 24 passengers, a total capacity of 35 passengers, and they weigh 50 tons each. The composite class cars have a first class compartment at one end and a second class compartment at the other end, with a compartment between them for baggage. They have a capacity for 24 first class passengers and 32 second class, and are heated and lighted in the same way as the first class cars and weigh 53 tons each.

ORGANIZATION OF THE INTERNATIONAL TRACTION CO.

The accompanying diagram, for which we are indebted to Mr. T. E. Mitten, general manager of the International Traction Co.,

pushed the controller handle this way and that, while the two passengers rendered their aid and sympathy by giving good advice and jumping up and down on the platform and finally getting off and pushing, but all in vain. Finally Mr. Sprague determined to get out of the curve at any hazard, and with the expectation of wrecking the whole machine he jammed the controller handle on to full speed at once. To the amazement of Messrs. Burt and Greene, the car gave a lurch forward, cleared the curve and sped up the line beyond. With the halt there had collected quite a crowd of spectators, whose numbers had steadily augmented until about 3,000 people surrounded the stalled car. When the fresh start was made some of the derisive ones who had gathered on the track in front of the car were almost bowled over but happily escaped, and the whole procession commenced a mad race after the flying car.

Some distance beyond this there was a steep hill, at the foot of which Mr. Sprague brought the car to a standstill. Mr. Sprague prophesied the car could never mount the hill, but Manager Burt, whose enthusiasm had been fired by the recent burst of speed, declared they could certainly make it and gave the signal to "let her go." This and several other hills were mastered until the car finally reached the steepest grade in the city. Here Mr. Sprague knew too well the end of the ride was reached. Everything underneath the car was in bad shape, and as a last chance he stopped the car in the hopes that the motors might cool down. To his intense relief



of Buffalo, shows the scheme of organization recently put in effect there. The diagram is self-explanatory when it is noted that the solid lines indicates the direct line of report and the dotted lines indirect lines of report which may be necessary when emergencies arise. Where a department head has an assistant the latter office is indicated by a portion of a circle attached to the circle representing the principal officer.

INCIDENTS AT THE OPENING OF THE FIRST TROLLEY ROAD.

In a serial article on the captains of industry who attended a dinner given in honor of Prince Henry, the Saturday Evening Post gives an interesting description of Mr. Frank J. Sprague when starting his first trolley road in Richmond, Va. While the story of the Richmond road has been very frequently told, some of the minor incidents of it are not so well known. The first trolley car on this road was run about nine o'clock at night, with Mr. Sprague as the motorman. With him were the late S. Dana Greene and Mr. Burt, manager of the railway company. The car moved out of the shops at a wobbly pace but started off in a satisfactory way until it reached the middle of a sharp curve, where it stuck. The inventor

the crowd overtook the car again and were received with much enthusiasm by Mr. Sprague, as he knew they would want to inspect this new marvel of engineering and this would give the car motors an opportunity to cool off. After waiting as long as possible and welcoming all comers the time came when the start had to be made, and instantly he then found that his worst fears were realized and the armature had burned out. To confess failure here might have imperiled the success of the entire undertaking, so in a loud aside Mr. Sprague told Mr. Greene he had better go back and get the "instruments," as there was probably some slight trouble with the circuit. Then the inventor turned out the lights and stretched himself on the car seats, hoping the crowd would melt away. It was an hour later when Greene returned, bringing the "instruments" with him, the latter being four of the most powerful mules in the city of Richmond. The "instruments" dragged the car back to the shed. It had been demonstrated, however, that a self-propelled car could round the shortest curves and climb the steepest hills, and the completion of the road was only a matter of detail.

It is generally anticipated that the report of the Metropolitan West Side Elevated Railway Co., Chicago, when published, will show an average of about 105,000 passengers carried per day.

CARRYING EXPRESS AND FREIGHT MATTER BY ELECTRIC CARS AT PROVIDENCE.

About a year ago the several street railway properties controlled by the United Traction & Electric Co. of Providence, R. I., instituted an express and freight carrying service which at first required two special express cars. This business has now grown to an extent where four 41-ft. double truck cars and two single truck cars and one trailer are devoted exclusively to handling packages, merchandise, groceries and other goods presented for transportation.

Perhaps the most interesting feature in connection with the express service as given on these roads is that distributing stations are not maintained and the whole business is carried on from one central station in the city. All records of every kind incident to the details of the business are made and kept at this one depot, making it practically a distributing as well as a receiving station. The company maintains no collection or delivery wagons and all goods for transit on these cars must be delivered at its central



EXPRESS CAR IN PROVIDENCE.

depot. Exception to this rule is made in a few instances where cars pass warehouses, breweries, etc., and any goods these establishments may have are delivered at the car door by their employes. This is permitted only in places where there will be no chance of interfering with the regular passenger cars.

Steam railroad freight methods have been adopted so far as possible. Rates are based on the official classification of the Interstate Commerce Commission with certain minimum charges for small packages and parcels. The employe receiving the goods gives the consignee a receipt similar in form to the receipt used by the steam railroads of New York and other Eastern States. On the back are printed the usual conditions under which the goods are accepted, and the rules defining the liability of the company. The way-bill is also similar to Eastern steam road practice. It is made out in triplicate, one copy remaining in the book for office record, one being sent to the auditor, and the third is taken by a collector who starts out every morning to collect the charges on goods delivered the previous day. Of course if the company had regular distributing agents at outlying points one copy of this way-bill would accompany the goods. But inasmuch as distributing depots are not maintained and it is the desire of the company to give the quickest possible service the way-bill does not accompany the shipment. To serve the same purpose the agent at the central station gives the messenger in charge of each car on every trip a sheet enumerating all the articles on his car. This sheet merely gives the date and designation of each article and the consignee's name and address. It also has a space for the consignee's signature. Deliveries are made in various ways, but shipments are never accepted for delivery away from the line of the road, although goods may be shipped in care of some merchant or store keeper located on the street railway line. In the case of goods or small packages consigned to home addresses along the road the messenger jumps off the car, delivers the package at the house and obtains the consignee's signa-

ture on his shipping sheet as receipt. It is found that this can be done without delaying the regular cars. The messenger on the express car does not very often accept payment for the express charges although he is authorized to do so if the consignee prefers to settle that way. Most of the collections, however, unless charges are prepaid, are made by a special collector who starts out each morning with the way-bills of all goods shipped the previous day. This practice of course introduces greater chances of loss through inability to collect bad accounts inasmuch as the consignee already has the goods, but thus far no serious difficulty from this source has arisen. In fact there have been but one or two instances in the year where there was trouble in collecting the amount.

The system covered comprises about 275 miles of track and all cars make two round trips a day. The same territory is covered to a very large extent by the New York, New Haven & Hartford R. R., but the electric road is in a position to give better service, and in fact can give an express service at freight rates. The advantages are particularly evident on certain classes of goods, such as for instance meat and green goods. The butcher in Providence having a shipment of meat for a suburban town takes it from his ice house early in the morning and delivers it by truck at the central electric express depot. The meat is immediately placed in the electric railway express car, which by the way is very much better ventilated than are the ordinary steam railroad freight cars and the meat is delivered at a point 20 miles away within two hours. If the butcher had relied upon the steam road his meat would have stood in the freight car for a length of time varying from half a day to a day and a half waiting for a full carload to the particular point of distribution. Usually these freight cars stand in the yards where they are exposed to the sun and weather, so that the conditions are all unfavorable to the preservation of perishable goods. The street railway company has a particularly large business in the carrying of vegetables, berries, etc., from the Providence markets to merchants and consumers in the suburbs.

Thus far most of the stuff handled is outgoing freight, very little effort having been made for business coming into Providence. As soon as outlying collecting and distributing stations have been established the volume of incoming freight will undoubtedly increase.

ELECTRICITY IN CANADA.

The use of electricity in Canada is stated in a recent consular report to be largely on the increase and most of the electrical supplies come from the United States. These supplies are admitted to be of better quality than can be obtained from any other country and they can be ordered and received within a few days. In the annual summary of the use of electricity in Canada compiled by Mr. George Johnson, the Dominion statistician, the number of lighting companies represented has increased from 257 in 1898 to 306 in 1901. The arc lights in use increased from 10,389 to 12,800, and the incandescent lamps from 463,615 to 815,676. The increase in the use of electricity for lighting purposes is 60 per cent.

The legislature has been asked to pass a large number of railway bills this year, and should the charters desired be granted it would add 1,046 miles to the electric railway mileage of the province of Ontario. Twelve companies have made applications for roads extending between Cornwall and Windsor, and the projected lines, if built, will cover this distance with the exception of a short stretch between Glencoe and Tecumseh. Another system is projected which will reach from London to Owen Sound, skirting the shore of Lake Huron. Many of these projected lines tap territory not at present served by railways, and it is stated that American capital is behind the lines projected to radiate from Hamilton to Toronto, Guelph and Waterloo. In the province of Quebec a number of electric railway companies have been chartered by the provincial legislature, and it is expected that 50 miles of electric railroad will be constructed in this province during the coming summer.

The Georgia Railway & Electric Co. has put a new wage scale into effect on the Atlanta lines, considerably increasing the salaries of employes. Motormen and conductors in the company's employ will appear in new uniform on May 18th, and it is stated that a daily inspection of the appearance of the men will be instituted and cleanliness and order insisted upon.

NEW TRANSFER SYSTEM FOR HAMILTON & LINDENWALD ELECTRIC TRANSIT CO.

By C. E. WARWICK, DIVISION SUPERINTENDENT

For some time past the Hamilton & Lindenwald Electric Transit Co., of Hamilton, O., has had in use with great success a new transfer system, which has been so very advantageous under the conditions existing on this road that a description of the same may prove of benefit to the managers of other lines similarly situated.

This company has 10 miles of track, with one route running east and west, another north and south, crossing each other at the center of the city, and three short branches all so arranged, with the exception of one or two points, that it is not possible for passengers to belt the lines, making round trip for one fare, or riding continuously as long as they desire for one fare. Instead of having transfers of one color on all lines as was formerly the case, a different and distinct color is used on each line and when a transfer is issued by the conductor, it is good on any route excepting the one from which it was issued, the color alone accurately designating which line issued the transfer, and consequently which lines are

DO NOT FOLD THIS TICKET

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Good only in a continuous direction on next connecting car from point of transfer after time punched.
 Any person who shall transfer or fraudulently use, or attempt so to use any such transfer check, is liable to a fine of \$5.00 and costs. Passenger will see that time and date are correctly punched; otherwise it is void.

DATE OF PUNCHING POINT

HAMILTON CITY SYSTEM.

15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
6	7	8	9	10	11	12	1	2							
45 am	45 pm														
3	4	5	6	7	8	9	10	11							
45	30	45	30	45	30	45	30	45	30	45	30	45	30	45	30

N. E. S. W.
EMERGENCY

No. 271

entitled to receive it. As one color is good on any route except its own, the receiving conductor will readily see when a wrong transfer is offered by certain passengers who make a practice of evading payment of a proper fare by attempting to work an improper transfer on the conductor. At a point where a passenger is apt to make a round trip for one fare the issuing conductor simply punches the direction in which his car is going as the case may be, and the receiving conductor when taking up a transfer of this kind will understand at once where his passenger started from. In case of derailed cars or any other accident, passengers can be transferred from car to car by punching out the word "Emergency," making the ticket good on its own route.

With this transfer ticket the issuing conductor is required to punch out the month, day of month and time of day, making only three punchings for the issuing conductor and three verifications for the receiving conductor, thus reducing the chances for error and collusion between the passenger and conductor to a minimum.

A special feature of this transfer ticket is the time table which explains itself, having half-inch blocks for the hour separated by heavy lines; these blocks are divided into quarter-inch blocks for the minutes, thus requiring but one punch mark for the time of day and allowing an abundance of space for the punch mark, giving the conductor no excuse for punching the wrong time.

Also when hauling large crowds, the conductor can date several transfers in advance and with the punch used can punch the time on from twelve to fifteen tickets at once and transfer a large load of passengers with great alacrity.

Another good feature with the color system is that it eliminates the work of the accounting department in counting and dissecting transfers and checking conductors' reports.

These tickets are put up in pads of 100 each consecutively numbered.

The Elgin, Aurora & Southern Traction Co. has increased the wages of employes on the Elgin division from 16½ cents to 18 cents per hour.

UNLUCKY THIRTEEN.

An item in a St. Joseph (Mo.) paper states that the negroes in that place are so superstitious that the street railway company there recently found it necessary to take off car No. 13 from one of its lines. The car with this number was put into service on the route which traverses the most populous negro quarter of the city. Ordinarily the cars in this quarter run heavily loaded, but invariably No. 13 ran through the section with scarcely a passenger. The protests against this car became so general that the company feared to disregard them any longer and car No. 13 was transferred to another part of the town.

NEW IDEA IN SCHEDULE MAKING FOR SMALL ROADS.

What is believed to be a novel arrangement of schedules has been put into effect by Mr. F. J. Duffy, assistant superintendent of the Richmond (Va.) Traction Co. The usual practice in assigning runs is to so arrange the trips that each man will work a certain number of hours and then have a certain time of relief in which to eat his meal, after which he returns to work and finishes his day's run. The time for relief necessarily varies with local requirements but most companies now endeavor to give the men 10 hours' work to be performed within 12 consecutive hours. Mr. Duffy pays his men for practically 9½ hours' work a day and this work is all performed within 9½ hours. In other words, the work is continuous and when a man has been on duty 9½ hours he is through for the day. The time for meals is partly gained by quickening the schedule running time for all cars at the meal hours, allowing longer layovers at the terminal for meals. A 5-minute headway is maintained on the main lines all day and to fill the gap between cars resulting from the increased layover time extra cars are put out on the meal trips, so that the schedule is not disarranged.

In this way the men are given varying from 9 to 15 minutes in which to eat the meals that come during their days' work. The early-run men eat breakfast and lunch, and the others eat lunch and supper while on duty, although if a man prefers to eat just before he goes on duty he will have to eat but one meal a day at the layover periods. The meals are not eaten on the cars but a special room is fitted up for this purpose at each terminal where the meal layovers occur.

The scheme seems to work to the satisfaction of all concerned. The men like it because it gives them more time to themselves. For instance, a man who goes on duty at 5:45 in the morning is through with his day's work at about 2:45 in the afternoon. It is of course impossible to arrange the runs to give every man exactly 9½ hours, but that is about the result secured. The assignments are shifted every week so that the men on the early runs one week take the late runs on the alternate weeks and vice versa. The conductors and motormen make arrangements with their families or boarding house keepers to send their meals to the terminal at the proper time or else have the pail or basket at some convenient point on the line where the men can get them on the meal trip.

The extra cars that fill out the meal trip are run by volunteers from the men not on duty, requests and assignments for the meal trips being posted one day in advance.

The proposed electric line between Ephrata, Pa., and Adamstown, for which contracts have been awarded, will afford connections with lines running to Reading and thus give a direct route between Lancaster and Reading.

The new car house of the Hartford (Conn.) Street Railway Co. will be of brick and steel, with a frontage of 245 ft. and a depth of 140 ft. The office section in front will be two stories in height, and the wings on either side will be four stories high. The site of the new building is now occupied by the old barns of the Hartford & Wethersfield Horse Railroad Co., which will be razed to make place for the more spacious and commodious structure.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

TURNING BACK OF PEDESTRIAN ATTEMPTING TO CROSS IN FRONT OF CAR NOT TO BE ANTICIPATED — CARE REQUIRED IN CROSSING STREET IN MIDDLE OF BLOCK.

Lawson v. Metropolitan Street Railway Co. (N. Y. Sup.), 74 N. Y. Supp. 885, Dec., 1901.

A motorman seeing a woman attempting to cross ahead of him, in the middle of the block, the appellate term of the supreme court of New York holds, was not called upon to anticipate that she would turn around and retrace her steps. Pedestrians attempting to cross a street upon which a line of cars run, especially in the middle of a block, are bound to exercise a reasonable degree of care not to place themselves in a position of danger.

RIGHT OF PEDESTRIAN TO STAND ON CROSSING WHEN STOPPED BY BLOCKADE OF VEHICLES—FAILURE TO SOUND GONG.

Hernandez v. Metropolitan Street Railway Co. (N. Y. Sup.), 74 N. Y. Supp. 898, Oct., 1901.

A pedestrian attempting to cross a street where it would seem there were two different tracks was compelled by a blockade of wagons and carriages to stand between the two tracks, as he testified, over a foot from the inside one, when he was struck by a car, which, but for a curve, he would probably have seen and saved himself from injury by. The appellate term of the supreme court of New York holds that he was not guilty of contributory negligence, as a matter of law, as he had a legal right to go upon the track at the crossing, and stand at the place where he was injured. And failure to sound a gong or to give some notice of the approach of the car, under the circumstances, even though the car was moving at ordinary speed, it holds, would have been negligence, and the question whether notice of the approach of the car was given was properly submitted to the jury.

RIGHT OF CONDUCTORS TO REGULATE MOVEMENTS OF THEIR CARS—DUTY TO PERSONS ATTEMPTING TO BOARD SLOWLY MOVING CARS.

Metropolitan Street Railway Co. v. Hudson (U. S. C. C. A.), 113 Fed. Rep. 449, Jan. 14, 1902.

Unless a car has reached one of its regular stopping places, or its speed has been slowed to permit an intending passenger to board it, or some invitation, express or implied, to board it, has been given by those in charge, the conductor, the United States circuit court of appeals, second circuit, holds, is under no obligation to anticipate that any person will attempt to board; and if, in ignorance of such an attempt, he causes the motorman suddenly to put on speed, he does not violate any duty towards an intending passenger. Conductors of street cars are at liberty to regulate the movement of their cars as they see fit so long as they do not violate their duties to others. If, however, while a car is proceeding slowly, the conductor is made aware that an intending passenger is attempting to board it, although it may not be his duty to stop the car, common prudence certainly forbids that he start it suddenly forward. No man is at liberty to do an act unnecessarily which he knows or ought to know is likely to imperil the person of another.

STANDING ON PLATFORM OR RIDING ON SIDE STEP OF AN OPEN SUMMER CAR.

Woodroffe v. Roxborough, Chestnut Hill & Norristown Railway Co. (Pa.), 51 Atl. Rep. 324, Feb. 24, 1902.

A passenger who stands on the platform of an electric car, when there are vacant seats inside the car, the supreme court of Pennsylvania holds, assumes the ordinary risks of the road, but all the risk incident to that position. The side steps of an open summer car, it likewise says, are not intended for the use of the passenger, except in getting in and out of the car. When a passenger rides on the side steps with the knowledge and consent of the conductor, and from necessity, from the want of room to sit or stand

inside the car, he is entitled to the same degree of diligence as other passengers to protect him from known and avoidable dangers. But a passenger who rides on a side step, when it is reasonably practicable for him to sit or stand inside the car, takes upon himself the risk of his position, from any cause.

In this case, a passenger, while riding on the side steps of an open car, was killed by contact with a pole which supported the electric wire. It was overwhelmingly established by the testimony that his conduct was disorderly and reckless, that he disregarded repeated warnings of his danger, and that when injured he was holding the upright hand rail, with his arms extended, and his body and head thrown back from the car. These facts, the court holds, should have prevented a recovery of damages with the jury. Moreover, every witness for the party suing admitted that there was standing room in the car, and the court holds that this one fact was conclusive against her right to recover, and should have been so declared by the court. There was then, it says, no legal ground for recovery.

CHANGING SYSTEM OF SANDING TRACKS—CONDUCTOR AND MAN SANDING TRACKS FELLOW SERVANTS.

Smith v. Philadelphia Traction Co. (Pa.), 51 Atl. Rep. 345, Feb. 24, 1902.

A conductor standing on the rear platform of his car was injured by the collision therewith of an electric car on an intersecting street of descending grade. The negligence charged to the company was its failure to have on the latter car the proper appliance for sanding the track. It appeared that about two weeks before the accident the system of sand boxes on the cars had been abolished by the company, because the wheels of the cars had been flattened by that method of sanding the tracks, and another was substituted for it. By the substituted system sand was placed on the streets. A man put it on the tracks wherever needed, and one had charge of sanding them where the collision occurred. The supreme court of Pennsylvania holds that the substitution of this new system of sanding the rails was in itself no evidence of negligence by the company. It says that it could be fairly presumed that the traction company, in adopting what it conceived to be a better system of sanding its tracks, relinquished none of the care it was bound to observe in the operation of its lines. It continued to guard against danger resulting from slippery tracks by continuing to sand them, and, without proof that the change in the mode of doing was improper, the jury ought not to have been allowed to guess that it was. The burden was upon the party suing to prove the negligence complained of,—failure to use proper means for sanding the tracks. No proof of such negligence appeared. Other means may have been used that made the slippery tracks safe, but the mere adoption of new ones, in the utter absence of proof, or even an offer to prove, that they were not efficient, or that their use was accompanied with danger, was no evidence of carelessness by the employer towards its employe. It might be that the rails were not properly sanded by the man whose duty it was to sand them, but that would be evidence only of his negligence,—a fellow servant of the injured man,—and not that the system itself was faulty or unsafe.

NO INTEREST IN SOIL OF HIGHWAY FOR TAXATION AS REAL ESTATE—FRANCHISE TAXABLE.

Mayor, Etc., of City of Newark v. State Board of Taxation (N. J.), 51 Atl. Rep. 67, Jan. 27, 1902.

That there is an inherent value in the property of a street railway company over and above the costs of reproducing its rails, stringers, poles, wires, power house, etc., the court of errors and appeals of New Jersey, reversing a decision of the supreme court, says, needs no demonstration. That value, however, springs not out of any ownership by the company of an interest in the soil of the highways over which its road passes, but out of its ownership of the franchise to maintain and operate its road over those highways, and to collect tolls from all persons traveling upon it. This franchise is property, and taxable as such. But under present legislation

the right to tax it has been reserved by the state to itself, through its board of assessors, and not delegated to the several municipalities through which the company's road passes.

ASSIGNABILITY OF CONTRACT WITH STREET RAILWAY COMPANY FOR CONSTRUCTION AND OPERATION OF ROAD.

Lakeview Land Co. v. San Antonio Traction Co. (Tex.), 66 S. W. Rep. 706. Feb. 24, 1902

A contract of a street railway company with a land company by which the former, for a valuable consideration, bound itself to construct and operate a line of street railway out to and through an "addition" owned by the latter, the supreme court of Texas holds, was assignable within the terms of a statute providing that "the obligee or assignee of any written instrument not negotiable by the law merchant may transfer to another by assignment all the interest he may have in the same," there being nothing in this contract to indicate that it was limited to the parties making it either by its terms or by the subject-matter of the contract, the character of the thing to be done, nor any other fact that would go to show that the parties intended it should not be assigned. It sees no reason why the obligations of this contract could not be as well performed to any other owner of the lands referred to as to the original land company. And it is of the opinion that the assignment would be effective under the general rule, independent of the statute. Wherefore the court holds that the purchase of this contract, together with the lands, invested the purchaser with all the rights which the original obligee (land company) would have had under the same circumstances. Nor does it consider that this was rendered otherwise by the fact that the purchase was made by a foreign corporation, before it had procured a permit to do business in Texas.

RISK OF JERK ASSUMED BY PASSENGER PREPARING DURING STOPPING OF CAR TO ALIGHT—USE OF APPROVED PATTERN OR STEP.

Phillips v. St. Charles Street Railroad Co. (La.), 31 So. Rep. 135. Dec. 16, 1901. Rehearing denied January 20, 1902.

Where the motoneer of a street car, in answer to a signal, is slowing down his car in order to stop it with the rear platform over the proper crossing, and a passenger has taken his position on the lower step of the platform, preparatory to getting off, the supreme court of Louisiana holds that the fact that the passenger loses his balance, and falls to the ground, it being claimed that such a fall resulted from the sudden jerking of the car and from the passenger catching his shoe in a defective step, will not justify the conclusion that such fall should be attributed to the negligence of the carrier, when it appears that the irregularity of motion complained of was not greater than is usual in the stopping of street cars, and that the step was of an approved pattern, and without discoverable defects. It may be, the court further says, with reference to this case, that the motoneer had slightly miscalculated, and that it became necessary just then to accelerate the motion of the car in order that the rear platform might be exactly over the crossing when the car should stop, and that the passenger resting, possibly, on one foot, was taken by surprise by the forward movement, and lost his balance. But slight irregularities of movement are common incidents in the starting and stopping of street cars, and those who prepare to alight and who do alight whilst the cars are in motion assume the risks resulting from such irregularities.

RISK ASSUMED BY PASSENGER IN ATTEMPTING TO BOARD CAR AT TERMINUS BEFORE IT IS READY.

Clark v. Metropolitan Street Railway Co. (N. Y. Sup.), 74 N. Y. Supp. 267. Jan. 17, 1902

At the end of a line to which a passenger held a transfer ticket he attempted, upon its arrival, to board an open car on the side where the bar had been raised but the step had not been lowered, and was injured by being struck on the knee by the step, as the conductor lowered it. There was nothing to show that the conductor, while attending to his duty in lowering this step and raising the bar on one side of the car, saw that the passenger was in a position in which he could be injured by the lowering of the step.

The evidence was that the whole occurrence—the arrival of the car, the change in the side bars and steps, the rush of the passengers to board the car—all took but a very few moments; and the first appellate division of the supreme court of New York says that this would seem to be a case in which the accident was caused by the act of the passenger in attempting to board the car before it was in such a condition that passengers could safely board it. Continuing, it says that he took the risk of an injury incident to the condition of the car when he attempted to board it. He acted upon the assumption that the step was down without making any investigation as to its actual condition, and without waiting for an investigation from the conductor, with knowledge of the fact that this change in the fixtures of the car was necessary before the car could proceed on its return trip. The fact that other passengers rushed to board the car was not sufficient to justify him in assuming that the car was in a condition that would enable him to board it in safety. And the court does not think that it would be justified in holding the company liable for an injury which resulted from the passenger's attempting to board the car before the necessary changes had been made which he knew had to be made, when an inspection would have disclosed the fact that the car was not ready for passengers to enter from the side from which he attempted to enter it.

ADMISSIBILITY IN EVIDENCE OF CONDUCTOR'S TRIP REPORT.

Callihan v. Washington Water Power Co. (Wash.), 67 Pac. Rep. 697. Jan. 4, 1902.

It being in dispute whether a party had been a passenger on a certain car or not, she claiming that she had been and that her fare had been paid with a transfer slip, the conductor was called as a witness and testified, as a matter of independent recollection, that he had eight passengers for the trip all of whom paid cash fares, and that no transfers were taken, excluding by his identification of the passengers the party referred to. He then further testified that at the end of the line he made a written report, showing the number of passengers carried, and the fares paid—whether cash or transfer—and that this report was, in regular course, and as was his custom, turned into the company. This report was then offered in evidence. The instrument purported to show the number of passengers carried by the conductor on his respective trips on the date in question, and the medium in which their fares were paid, and that on the particular trip in question he had eight passengers, all of whom paid cash fares. The introduction of the report was objected to. It was conceded that the conductor in this instance would have had a right to have examined the report for the purpose of refreshing his memory, but it was contended that, having testified independently of the memorandum, the introduction of the memorandum was equivalent to the admission of declarations previously made, which would be self-serving in their nature. But, after an extensive examination of the law involved, the supreme court of Washington holds that no error was committed in admitting the report in evidence. It does not consider that under the circumstances it could be self-serving. Moreover, it says that so pertinent and convincing was this character of testimony in this particular case, that, if it had not been offered, the company might have felt that it was in danger of being subjected to a telling criticism before the jury for omitting to produce for its consideration convincing evidence resting peculiarly within its own knowledge, the omission of which would raise the presumption, or at least a strong suspicion, that such evidence, if adduced, would operate to its prejudice.

RIGHT TO USE STREET'S AND TO CROSS STEAM RAILWAY TRACKS—STEAM RAILWAY CANNOT ENJOIN CROSSING OR QUESTION VALIDITY OF ORDINANCE.

Atchison, Topeka & Santa Fe Railway Co. v. General Electric Railway Co. (U. S. C. C. A.), 112 Fed. Rep. 689. Jan. 7, 1902.

The doctrine is firmly established in the state of Illinois, in accordance with the general weight of authority, the United States circuit court of appeals, seventh circuit, says, that by the construction and use of street railway tracks no additional burden is imposed upon the easement, as such use falls within the purposes for which streets are dedicated or acquired; but that the use for steam railway purposes is beyond the general public easement, or right of

use, and imposes an additional servitude. It is equally well settled by the uniform line of decisions in Illinois that the use of a street by a steam railway is legitimate when duly authorized, but that no exclusive use is conferred by the permit, and it can only be enjoyed in common with the use of the street by the public as an ordinary highway, and without materially impairing its usefulness as such.

With the rights of a steam railway in a street crossing thus defined, the court holds that they are in subordination to the use for street purposes, which includes use for a street railway. The right is held in common, is "joint and mutual, not exclusive;" and the primary object of the street is for ordinary passage and travel, of which the public and individuals cannot rightfully be deprived. The proposed use in this case of a street in such a crossing for a street railway, the court goes on to say, was within the public purposes of the street, and imposed only the burden to which the steam railway crossing was subjected by the permit. For such crossing of the steam railway tracks at grade by a street railway damages were not allowable for increased delay or danger in crossing. Furthermore, the court pronounces it plain that a bill could not be maintained on behalf of the steam railway company to enjoin the construction and use to that end. The adjudications in Illinois, it says, are conclusive that the question whether the ordinance was either fraudulently obtained or invalid could not be raised by the steam railway company.

SLOWING DOWN SPEED.

Rapid Transit Railway Co. v. Lusk (Tex. Civ. App.), 66 S. W. Rep. 799. Jan. 25, 1902

This was an action for personal injuries received by a passenger who testified that, in attempting to step from a trolley car to the side step, with a view of alighting, he was, by reason of a sudden jerk of the car, thrown therefrom, and he contended that the speed of the car was being slowed down to enable him to alight at the place where he attempted to alight. On the other hand, there was evidence tending to show that by the rules of the company the cars only stopped at the far side of cross streets, and the company contended that the slowing down of the speed of the car was for the purpose of bringing it under control so that it could be stopped at the usual stopping place, the far side of a cross street. There was evidence tending to support each of these contentions, and the court of civil appeals of Texas holds that it was reversible error to assume, in charging the jury, that the object of slowing down the car was to enable the passenger to alight.

If it was the custom and rule of the company, the court holds, to stop its cars only at the far side of the cross streets for the purpose of taking on and letting off passengers, and such custom was generally known and observed by the company's agents and employes in operating the cars, and the purpose of checking the speed of the car was to bring the car under control so that the same could be stopped at the usual stopping place; and if the agents and employes of the company did not know that the passenger was attempting to alight from the car, or ought not to have reasonably anticipated that he or some other passenger might be in the act of getting off the car, and be injured as the result of a sudden movement of the car, then the company was not negligent in so slowing down the speed of the car. If, however, the slowing down the speed of the car was done in response to this passenger's notice that he desired to alight, and to enable him to alight, and in doing so the company did not use the proper care—that is, such care as a prudent and cautious person would have exercised under such circumstances—then it was guilty of negligence; and, if such negligence was the cause of the injury to this passenger, the company would be liable, unless the passenger himself was negligent, and his negligence contributed to the injury. These were questions of fact, which should have been settled by the jury under a proper charge.

INJURY OF PEDESTRIAN ON FALLEN FENDER ON REAR OF CAR.

Levison v. Metropolitan Street Railway Co. (N. Y. Sup.), 74 N. Y. Sup. 882. Oct., 1901.

A pedestrian walking east on a cross street at about 7 o'clock in the evening of a February day, when it was quite dark, in under-taking to pass immediately behind a car which had stopped just north of the north crossing stumbled and fell into the fender at-

tached to the rear of the car, which in some way, not explained by the evidence, had fallen down. Instead of extricating himself, he was dragged some distance before the car was again stopped. When the accident happened the conductor was inside the car collecting fares. He consequently did not see the man fall into the fender, and did not know that he had so fallen when he gave the signal to start the car. The cross street was 125th street. The car had started from 106th street, and the fender was then folded up. At 116th street, nine blocks from the scene of the accident, the conductor had noticed that it was still folded up. The car was crowded, and from 116th street to 125th street the conductor was inside the car collecting fares. He therefore did not observe the fender between those streets, and did not know that it had fallen.

Upon these facts, the appellate term of the supreme court of New York holds, the party had no cause of action against the company. He was not a passenger, but a traveler upon the highway, and the company's obligation to him must be measured by that circumstance. The company had a right to stop its car at the crosswalk, and it was not contended that it was so stopped at an improper place. The fender was not inherently a dangerous appliance, but, on the contrary, was a device carried for the protection of travelers. It did not appear that it was improperly constructed, or that its fastenings were, under usual conditions, defective or insufficient. The company was not chargeable with notice that it had fallen down, for no employe had seen it after it had fallen, and the evidence was that only a short time before it had been folded up. The mere fact that it projected behind the vehicle did not necessarily impute negligence to the company, in the absence of actual or constructive notice of it. Upon the party's own evidence judgment was properly rendered in favor of the company.

CONTRIBUTORY NEGLIGENCE IN CROSSING ELECTRIC RAILWAYS IN OPEN COUNTRY—ELECTRIC COMPARED WITH STEAM RAILWAYS—MOTORMAN NOT TO EXPECT PERSON TO LEAVE PLACE OF SAFETY.

McNab v. United Railways & Electric Co. of Baltimore City (Md.), 51 Atl. Rep., 421. Mar. 6, 1902.

At a place in the open country where the tracks of a street railway were built like those of a steam railway, a T-rail being spiked to cross-ties and the roadbed ballasted with broken stone, on which cars ran at a speed of from 20 to 25 miles an hour, a woman driving a horse slowed down as she approached the tracks from a cross street, but, seeing no car on the track nearest to her and hearing no gong sounded, drove forward, when, as the horse got in the space between the two tracks, she saw a car approaching at a high rate of speed on the farther track, not more than 40 feet away, and, instead of stopping or turning the head of the horse aside, she gave the horse a stroke with the whip and attempted to cross the track in front of the car, which struck the rear wheels of the carriage. This, the court of appeals of Maryland says, was sheer recklessness. No matter how negligent the company's servants may have been in failing to give signals or warnings of the approach of the car to the crossing, the woman, after she saw the danger of leaving a place of safety and of attempting to cross directly in front of the rapidly moving car, was, when she drove forward, equally guilty of negligence, which immediately contributed to the infliction of the injury which she sustained; and that contributory negligence was a bar to a recovery of damages on her part.

But it was suggested that, however this might be had the collision occurred at the intersection of a steam railroad track and a public highway, it could not be the law of this case, because, the injury was inflicted by an electric railway car. The reply of the court is that it is not because of a difference in motive power employed upon a steam and an electric railway, but because of other circumstances, that acts which would be regarded as acts of contributory negligence in the one instance would not be so treated in the other. It is far more dangerous to attempt to cross in advance of a car moving at a high rate of speed, whether propelled by steam or electricity, than to make a like attempt when the car is moving along the streets of a city at a very moderate rate of speed. The difference in the method of the construction of the tracks in the country from that in the city, the very marked difference in the speed attained in the one locality from that tolerated in the other, the adaptation of city streets to the use of pedestrians and vehicles of all kinds as well as to the cars, are all circumstances, wholly apart from what the

motive power propelling the cars may be, which must be considered in determining whether a given act is or is not an act of contributory negligence. Thus to drive across a street car track at the intersection of two streets in a city, where the rails are flat and offer no resistance, might not be an act of contributory negligence, even though an approaching car going at the rate of six miles an hour, but required to stop or slow up on the near side of the intersected street, were but 40 feet distant; but to make the same attempt in the country, where T-rails themselves interpose obstructions, and where the car is running at the same high rate of speed which cars propelled by steam attain, would be just as clearly an act of contributory negligence as it would be were the car being moved by steam power instead of by electricity. A car making 6 miles an hour can be slowed or stopped much more promptly than when making 25 miles an hour, and this circumstance is of considerable importance in determining whether an attempt to cross in front of it is an act of contributory negligence. It is the relation which the act done bears to the final result in the light of all the attendant circumstances that determines whether the act done is or is not one of negligence or contributory negligence. The conditions as to construction, location and speed and the danger incident to crossing the tracks being precisely the same in this instance as they would have been had the motive power been steam, the legal principles defining contributory negligence could not be different merely because the motive power was electricity.

Furthermore, the court holds that when the motorman saw (and it says that it may be presumed that he did see, because he could have seen) that the woman was in a place of safety, he was under no obligation to assume that she would deliberately leave that place and drive into the jaws of danger.

MAY REFUSE TO ACCEPT DETACHED COUPONS—PAS-
SENGER GETS NO RIGHTS FROM RINGING UP OF
UNPAID FARE—OBLIGATION TO PAY FARE—DE-
MAND OF FARE NECESSARY BEFORE EXPUL-
SION—SECOND DEMAND OF FARE NOT
REQUIRED.

United Railways & Electric Co. v. Hardesty (Md.), 51 Atl. Rep., 406. Mar. 6, 1902.

A wife purchased in her own name a 20-trip coupon book, which was issued at a reduced rate, the purchaser agreeing in consideration thereof to comply with the reasonable regulations of the company. The book declared that each undetached coupon would entitle the owner, naming her, a householder, or member of her immediate family, or a servant therein, to ride, between certain points, and in accordance with the conditions of the contract in the back of the book. It was further stipulated on the coupons that they would not be "good unless detached by the conductor." The woman and her husband used this coupon book going one way, after which he tore out coupons for a return trip and handed the book to her, and later, on the same day, but not in company with her, he boarded a car going to his home. He testified that the conductor took one of the detached coupons, rang up the fare, and said that the book would have to be shown, which he was told could not be shown.

It is clear and undisputable, the court of appeals of Maryland thinks, that the husband had no right whatever to ride on the detached coupon. It says that it was not an ordinary railway ticket. Under the specific terms of the contract embodied in the ticket, a detached coupon was wholly void. That was a regulation which the company had the power to make, and one to which the purchaser of the ticket agreed. As a token of the holder's right to ride on the car, the detached coupon was of no more value than a slip of blank paper would have been. The holder of the coupon was bound to know this, and he was equally bound to know that the tender of a detached coupon, even if taken up by the conductor, was no more a payment of the car fare than the tender and acceptance of a counterfeit coin would have been. As the detached coupon was void by the very terms of the contract, it was no ticket; and as the holder had, therefore, presented no ticket at all, he obviously had no right to ride on the car unless he paid his fare. The fact that the conductor had rung up the void coupon, as though it had been a valid coupon, did not make it what it was not, and clearly did not give the passenger a right to be transported, when his right to be carried on the car depended altogether on his complying with the rules by paying his fare, and did not depend on the fact that the conductor had

rung up the fare, as paid, when it had not in reality been paid. He was not, therefore, entitled to be carried as a passenger.

Then, the question was whether, having once demanded the passenger's fare, and having received a worthless ticket instead of the fare, the conductor was legally bound to make a second demand before removing the passenger from the car. The court holds that he was not. It says that it is a matter of common knowledge, of which the court will take judicial notice, and of which the public is bound to take notice, that railroad passenger trains are operated to carry passengers for hire. There were but two ways in which the passenger could pay—either by ticket or in cash. When he tendered the one, and was informed that it was insufficient because detached, he knew just as well as the conductor that his right to remain on the car depended on his doing the only other thing he could do, viz., paying his fare in cash. If he knew this—and he was bound to know it, and therefore must be held to have known it—what possible reason could be assigned for holding, as matter of law, that the company, through its conductor, was legally bound to ask the passenger to do precisely what the latter knew he was obliged to do? And how could the failure of the conductor to ask the passenger to pay a fare, which the passenger was well aware he was required to pay if he wished to remain on the car after he had refused to exhibit the book, relieve the passenger from the obligation to voluntarily pay the fare?

The right of a carrier of persons to collect fares and to receive them, the court continues, does not depend on the fact that the conductor or other servant demands the fare. The right to collect and receive fare arises out of the circumstance that the passenger enters the conveyance for the purpose of being carried therein. By entering the conveyance for that purpose he agrees to pay the fare, and the duty to pay it is thereby imposed. Morally and legally he is as much bound to pay the fare when not demanded as he is when it is demanded of him, because the duty to pay has not its origin in the demand for payment; and a failure to demand it cannot, consequently, be treated as giving him a right to be transported gratuitously. This being so, the primary and continuing obligation is obviously on the passenger to pay the fare. The demand for it by the carrier is made with a twofold view, viz.: First, for the convenience of the passenger, to save him the annoyance of himself seeking the conductor to deliver the ticket or fare to the latter; and, secondly, for the protection of the company against individuals who would not scruple to ride without paying if they could evade making payment. But neither of these considerations can be converted into or treated as a requirement that when a demand has been once made for a fare, and has not been complied with, or, what is the same thing, has been complied with by the delivery of a worthless ticket, which the holder was bound to know was worthless, the conductor must make a new demand before the passenger can be expelled.

While the duty to pay fare does not originate in or rest upon the demand for it, there can be no expulsion of a traveler for not paying until he has refused to pay, and there cannot be a refusal until there has been a demand of some kind. In this case, there was a demand; but there was no second demand, which, as before stated, the court holds was not necessary to be made before the expulsion of the passenger. A railroad company, the court says, may eject from its accommodations all persons who refuse compliance with its reasonable regulations. This has been so often announced by the courts that it may be said to have become axiomatic law. A condition printed on a reduced rate ticket to the effect that a coupon affixed thereto shall be invalid unless detached by the conductor is undoubtedly a reasonable regulation. An attempt to use a previously detached coupon, and a refusal to exhibit the book from which it had been taken, clearly forfeit the right of the holder to proceed farther on the car. If his right to remain on the car is thus forfeited by his own act, it was lawful to eject him, and he could avoid expulsion only by paying or offering to pay his fare. Therefore, if he wished to remain in the car, the duty was on him to tender his fare to the conductor, in the absence of any rule of the company requiring the conductor to demand the fare. Again, the court says that the passenger had ample opportunity to pay the fare, which it was his duty to pay when he declined to show the coupon book. His attempt to ride on a worthless ticket did not impose upon the conductor an obligation to make a second demand for the fare, but did require the holder of the ticket, if he wished to avoid being ejected, to himself make tender of payment. As he was in the wrong throughout, he had no cause of action against the company, and the case should have been withdrawn from the jury.

CAR DISPATCHING.

In view of the general interest in the matter of controlling movements of cars on high speed, single track electric roads we have taken occasion during the past few months to secure personal interviews with a number of managers of interurban roads in the hope of collecting information of value on this subject. Practically without exception, those who have had experience along this line, agree that if a mechanical block signal, satisfactory in all respects, could be devised, the ideal arrangement would be to divide the road into absolute or permissive blocks with a telephone instrument at each turnout from which a car crew when off schedule could call the main office for instructions. In the absence of a block signal

orders for each car at every turnout; and the Toledo, Fremont & Norwalk Ry., where the dispatcher gives orders only when cars are off schedule.

As adding to the general fund of information on the subject we give at this time an outline of the methods employed on the Washington, Alexandria & Mt. Vernon Ry. Dispatching on this road is done entirely by telegraph and the rules from which we quote are the same as those adopted by the Pennsylvania R. R., with such modifications in terminology and details as are necessary to meet the needs of an electric railroad.

The Washington, Alexandria & Mt. Vernon Ry., with its branches, is about 26 miles long, most of which is single track with turnouts. It is the practice here to run trains comprising one 40-ft. motor car

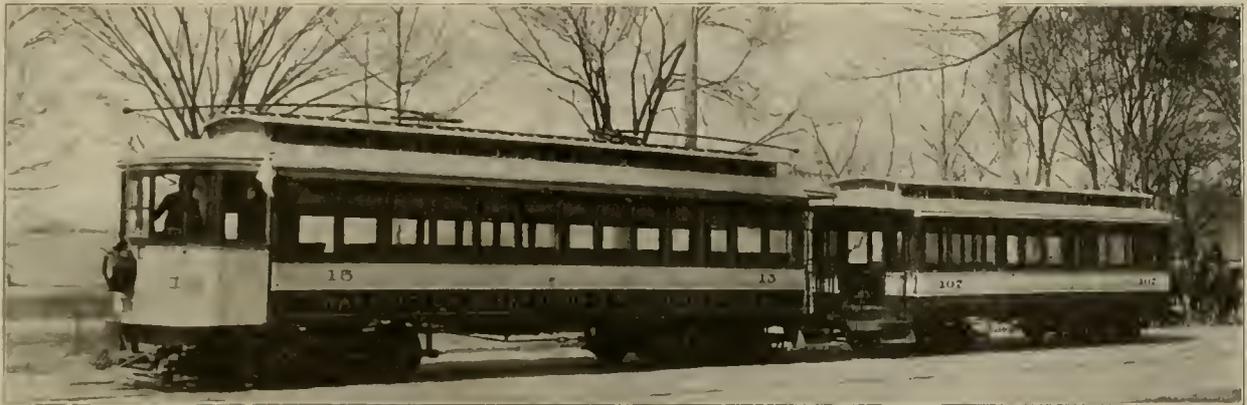


FIG. 1 TRAIN ON THE WASHINGTON, ALEXANDRIA & MT. VERNON RY.

satisfactory to all, opinion appears to be divided as regards the relative merits of the telephone and the telegraph for dispatching purposes. Where telephones have been installed it is pointed out that the dispatcher is brought into much closer touch with the train crews; his orders are given verbally directly to the men who are to execute them; questions can be asked and explanations given more readily by telephone than by telegraph; and the telephone system once installed can be maintained at less expense, and it does not require operators at each instrument. In favor of the telegraph it is urged that written records of every message, or order, are more easily secured at at least two points on the line for reference, comparison or checking; the telegraph line and instruments are less susceptible to derangement than the telephone system; and as far as expense is concerned it is pointed out that the telegraph operators may also be employed to good advantage for selling tickets, taking charge of suburban stations, and filling other necessary duties not conflicting with their duties as operators. On the score of accuracy in the transmitting of messages the advocates of both systems claim the advantage. It is argued that there is greater chance for the train crews to misunderstand the orders over the telephone through carelessness, indistinctness in the telephone instrument or other causes, than there is for trained telegraph operators to make errors in the receiving and transcribing of orders. It is also argued that a telephone system installed for street railway service with wires strung on the trolley poles and instruments more or less exposed to the weather is not working under advantageous conditions and line and instruments are apt to get out of order resulting in indistinct messages if not total interruption of service. This is denied by the advocates of the telephone, who claim that the verbal message is always more reliable than the written telegraphic order.

equipped either with two G. E. 1,000 motors or four G. E. 57's, drawing one 38 or 40-ft. trailer. About 40 trains each way are run on ordinary days.

For a part of the distance near the terminal at Pennsylvania Ave. and 13½ St. N. W., Washington, D. C., the company uses the tracks of the Pennsylvania R. R. On this section the electric trains are sandwiched in between regular steam trains and run subject to orders of the Pennsylvania Railroad Co.

The dispatcher for the Washington, Alexandria & Mt. Vernon Ry. is located at the Washington terminal, and telegraph stations



FIG. 2 CAR USED BY PRINCE HENRY.

There are good authorities on both sides of the question. The Union Traction Co., of Anderson, Ind., the Toledo, Fremont & Norwalk Ry., in Ohio, and others use the telephone exclusively.

The Buffalo & Lockport, the Washington, Alexandria & Mt. Vernon Ry., the electric branches of the New York, New Haven & Hartford Ry., and others, employ the telegraph.

We have described in previous issues of the "Review" several schemes of dispatching cars by telephone. Special reference is made to the "Review" for Aug. 15, 1901, page 479, where will be found extended description of the methods in vogue on the Union Traction system of Anderson, where the dispatcher issues special

are located at the principal passing points. The telegraph operators act as ticket agents and perform other duties around their stations and also receive public telegraph messages for transmission. The railway company pays the wages of the operators and the Western Union Telegraph Co. allows a commission on all public messages received for transmission at the railway stations.

As long as trains are on schedule time their movements are regulated absolutely by the time table without orders from the dispatcher. The time table is defined as the "general law governing

the arriving and leaving time of all regular trains at all stations." The time table intended for the information and government of employes is printed on a large sheet 15x41 in. which however can be folded to convenient size for reference. Every employe having anything to do with the movement of trains is required to keep a copy of the table about his person when on duty.

A section of the time table is reproduced with this article. The designation "train" means either a single motor car or a car with trailer.

Trains are operated under train numbers and their class is indicated on the table.

Regular meeting or passing points are indicated by figures in bold-faced type.

Both the arriving and leaving time of a train are in bold-faced

ly giving first his own station number, then the number of the train and the time of leaving, as for example: 11—No. 201—5 55. He must also keep a record of the time at which trains pass his office. This report is sent out on the line without calling and the operators at the station in the rear and also at the one next in advance are required to receive it and record it immediately on daily report blanks provided for the purpose, giving a prompt O. K. and office call. The dispatcher also of course receives the message and enters the information on his dispatching sheet.

At each telegraph station there are signal stands. Red indicates that the block is not clear and means stop. White indicates that the block is clear and is permission to proceed. Green indicates that there are one or more trains on the block and is permission to proceed with this knowledge. The signal always displays red

Washington, Arlington and Mt. Vernon Divisions.

Time-Table No. 10. In Effect 1.00 A. M., Friday, November 1, 1901.

Diet. from Washington.												STATIONS AND SIDINGS.	Diet. from Mt. Vernon.											
1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.		1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.	1st Cl.		
ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly		ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly	ArDly		
exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun		exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun	exSun		
A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.		A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.	A. M.		
9 25	8 59	8 29	8 00	7 30	7 04					0 30		15.8	8 25	8 54	7 25	7 45	8 11	8 20	8 41	9 00	9 30	10 00		
9 30	9 04	8 34	8 05	7 35	7 09					0 35		14.9	8 20	8 49	7 20	7 40	8 06	8 25	8 36	8 55	9 25	9 55		
9 31	9 06	8 36	8 07	7 36	7 10					0 36		14.4	8 19	8 48	7 19	7 39	8 05	8 24	8 35	8 54	9 24	9 54		
9 33	9 08	8 38	8 09	7 38	7 11					0 37		18.9	8 18	8 47	7 18	7 38	8 03	8 22	8 33	8 52	9 22	9 52		
9 34	9 09	8 39	8 09	7 39	7 12					0 38		13.5	8 18	8 47	7 17	7 37	8 02	8 21	8 32	8 51	9 21	9 51		
9 35	9 10	8 40	8 10	7 40	7 13					0 40		18.1	8 14	8 44	7 16	7 35	8 01	8 20	8 31	8 50	9 20	9 50		
9 36	9 11	8 41	8 11	7 41	7 15					0 42		12.8	8 13	8 42	7 15	7 33	7 59	8 10	8 30	8 49	9 19	9 49		
9 38	9 13	8 43	8 13	7 43	7 17					0 43		12.2	8 11	8 40	7 13	7 32	7 57	8 17	8 29	8 47	9 17	9 47		
9 40	9 15	8 45	8 15	7 45	7 18					0 44		11.7	9 10	8 39	7 10	7 31	7 56	8 15	8 28	8 45	9 15	9 45		
9 43	9 17	8 46	8 16	7 45	7 20					0 45		11.1	8 08	8 37	7 08	7 30	7 54	8 14	8 27	8 43	9 13	9 43		
9 44	9 18	8 48	8 18	7 47	7 22					0 47		10.7	8 07	8 35	7 07	7 29	7 53	8 12	8 25	8 42	9 12	9 42		
9 45	9 19	8 49	8 19	7 48	7 23					0 49		10.2	8 05	8 34	7 05	7 28	7 51	8 10	8 23	8 41	9 11	9 41		
9 46	9 20	8 50	8 21	7 50	7 24					0 50		9.8	8 03	8 32	7 03	7 27	7 50	8 08	8 24	8 40	9 08	9 38		
9 48	9 22	8 52	8 23	7 52	7 26					0 52		9.1	8 02	8 31	7 02	7 26	7 48	8 07	8 23	8 38	9 07	9 37		
9 50	9 24	8 55	8 25	7 55	7 29					0 54		8.7	8 00	8 29	7 00	7 24	7 46	8 05	8 21	8 35	9 05	9 35		
9 53	9 27	8 58	8 28	7 58	7 32					0 57		8.3	8 57	8 26	8 57	7 21	7 43	8 02	8 18	8 32	9 02	9 32		
9 55	9 29	9 00	8 30	8 00	7 34					0 59		8.1	8 55	8 24	8 55	7 19	7 41	8 00	8 16	8 30	9 00	9 30		
										1 00		7.5				7 13				8 09				
										1 01		7.2				7 12				8 08				
										1 02		6.4				7 09				8 05				
										1 03		6.2				7 06				8 02				
										1 04		4.5				7 03				7 59				
										1 05		3.7				7 01				7 55				
										1 06		3.3				6 59				7 53				
										1 07		3.0				6 57				7 52				
										1 08		2.1				6 54				7 47				
										1 09		1.8				6 51				7 45				
										1 10		1.9				6 48				7 44				
										1 11		1.9				6 44				7 40				

FIG. 3 SECTION OF TIME TABLE, WASHINGTON, ALEXANDRIA & MT. VERNON RY.

type when both are meeting or passing times or when one or more other trains are to meet or pass it between those times.

The numbers of trains that are to meet or pass are shown in small type adjoining the bold-faced type.

"s" signifies regular stop.

"f" signifies flag station where stops are made on signal only.

It is the duty of the station master to have a train with a competent crew in readiness to leave the terminals for the first runs as called for by the schedule. A few minutes before leaving time these trains are "reported in" to the dispatcher who enters on the dispatcher's sheet (also shown herewith) the number of the train, the car number of the motor car, and the names of the conductor and motorman in charge of the train. The trains leave according to their schedule time without further orders from the dispatcher. It is the duty of each telegraph operator to "report in" each train as it passes his station and the time it leaves. This report is made

except when changed to white or green to permit a train to pass. As soon as the train has passed the signal must be returned to red, and while displaying white or green the signal must be held by the hand and not fastened.

As soon as notice is received that a train is running behind schedule the dispatcher must immediately issue orders to all trains whose passing points will be affected by the delay. He records the incident in the column on his sheet headed "Remarks," giving the designation of the train, the time delayed and the cause, thus, "No. 250 delayed 10 minutes at Four Mile Run by reason of hot bearing."

It then becomes his duty to handle his trains with the view of getting them all back onto schedule at the earliest possible moment consistent with safety.

If the delay is likely to prove serious he orders out another train to take the place of the one that is disabled.

Crews of regular trains of the first class run their trains under the broad assumption that unless they are intercepted by written orders to the contrary they have the right of way and will meet their opposing trains at the scheduled passing points.

All extra trains, including passenger extras and work trains, run only on special written orders, except in the case of trains run

Washington, Arlington & Mt. Vernon Divisions.

WASHINGTON PASSENGER STATION.

RD			NORTHWARD.	
AINS.			PASSENGER TRAINS.	
STATIONS.				
	Motor		Motor	
	Conductor		Conductor	
	L.	Washington, A	W. A	
		Fourteenth Street, B. G.		
		Causeway, C. Y.		
		S. E. Long Bridge, N. D.		
	A	Arlington Junction, L	J. A.	
	L.	Arlington Junction, A		
		Arlington, A. R.		
	A	Roslyn, R. N.		
		Four Mile Run, F. R.		
		St. Asaph, S. D.		
		Spring Park, S. K.		
	A	Alexandria, L.	F. D.	
	I	Alexandria, A.	F. D.	
		Dyke, D. K.		
		Riverside, R. S.		
	A	Mt. Vernon, L.	M. V.	

FIG. 4 SECTION OF DISPATCHER'S TRAIN SHEET.

as additional sections of a regularly scheduled train, in which case the regular train and all the additional sections must carry designating flags. Two green flags by day and two green lights by night displayed in the place provided for that purpose on the front of the motor denote that the train is followed by another train, running on the same schedule and entitled to the same time-table rights as the train carrying the signals. Two white flags by day and two

The register of trains is kept by the dispatcher on a blank 32 in. long by 19 in. deep. The upper half of this blank is ruled as shown in Fig. 4, which is a section out of the middle of this portion showing station list headings. Of the lower half a space 6½ in. wide the left end is occupied by a ruling for entering descriptions of trains; the ruling and column heads are indicated in Fig. 5. The rest of the lower half of the register sheet is for remarks. At the top of the sheet are places for entering the date, state of the weather, and the dispatchers' names.

The following are the rules governing the dispatching of trains by telegraph:

MOVEMENT OF TRAINS BY TELEGRAPHIC ORDERS.

Special orders, directing movements varying from, or additional to, the time-table, will be issued by the authority and over the signature of the superintendent. They are not to be used for movements that can be provided for by rule or time-table. They must not contain information or instructions not essentially a part of them.

They must be brief and clear, and the prescribed forms must be used when applicable; and there must be no erasures, alterations, or interlineations.

Each order must be given in the same words to all persons or trains directly affected by it, so that each shall have a duplicate of what is given to the others. Preferably an order should include but one specified movement.

Orders will be numbered consecutively for each day as issued, beginning with No. 1 at midnight.

Orders must be addressed to those who are to execute them, naming the place at which each is to receive his copy. Those for a train must be addressed to the conductor and motorman, and also to a person acting as pilot. A copy for each person addressed must be supplied by the operator.

Each order must be written in full in a book provided for the purpose at the superintendent's office; and with it must be recorded the names of trainmen and others who have signed for the order, the time and signals, showing when and from what offices the order and responses were transmitted, and the train dispatcher's initials. These records must be made at once on the original copy, and not afterward from memory or memoranda.

The terms "superior right" and "inferior right" in the rules, refer to the rights of trains under the time-table and train rules and not to rights under special orders.

When an order is to be transmitted, the signal "31," or the signal "19," meaning "train order," will be given to each office addressed, followed by the word "copy," and a figure indicating the number of copies to be made, if more or less than three—thus, "31 copy 5," or "19 copy 5."

An order, to be sent to two or more offices, must be transmitted simultaneously to as many as practicable. The several addresses must be in the order of superiority of rights of trains, and each office will take only its proper address. When not sent simultaneously to all, the order must be sent first for the train having the superior right of track.

Operators receiving orders must write them out in manifold during transmission, and make the requisite number of copies at one writing, or trace others from one of the copies first made.

When an order has been transmitted, preceded by the signal "31," operators receiving it must, unless otherwise directed, repeat it back at once from the manifold copy, and in the succession in which their several offices have been addressed. Each operator repeating must observe whether the others repeat correctly. After the order has been repeated correctly by the operators required at the time to repeat it, the response "O. K.," authorized by the train dispatcher, will be sent, simultaneously, to as many as practicable, naming each office. Each operator must write this on the order, with the time, and then reply "I O. K.," with his signal.

Those to whom the order is addressed must then sign their names to the copy of the order to be retained by the operator, and he will send their signatures to the superintendent. The response "complete," with the superintendent's initials, will then be given, when authorized by the train dispatcher. Each operator receiving this response will then write on each copy the word "complete," the time, and his last name in full; and will then deliver a copy to each person included in the address, and each must read his copy aloud to the operator.

For an order preceded by the signal "31," "complete" must not be given to the order for delivery to a train of inferior right, until "O

SOUTHWARD		Motor	Coaches,	Comb'd	Extra Cars	Total	Pass'rs.	NORTHWARD.		Motor	Coaches,	Comb'd	Extra Cars	Total	Pass'rs.
Train No.	hrs.							Train No.	hrs.						
..						
..						
..						

FIG. 5 DESCRIPTION OF TRAINS (FROM TRAIN SHEET.)

white lights by night displayed on the front of the motor denote that the train is an extra.

A train of inferior class, which includes all extra trains, must in all cases keep out of the way of a train of superior class. When running on single track northbound trains have absolute right of track over southbound trains of the same or inferior class. A scheduled train becoming one hour late loses all its rights and can proceed only on special orders.

K" has been given to and acknowledged by the operator who receives the order for the train of superior right. Whenever practicable, the signatures of the conductor, motorman and pilot of the train of superior right must be taken to the order and "complete" given, before the train of inferior right is allowed to act on it.

After "O. K." has been given and acknowledged, and before "complete" has been given, the order must be treated as a holding order for the train addressed, but must not be otherwise acted on until "complete" has been given.

If the telegraph fails before an office has received and acknowledged "O. K." to an order preceded by the signal "31," the order at that office is of no effect, and must be there treated as if it had not been sent.

The specifications for train order form and books for operators for "31" orders are as follows. Form as here shown. Blank space for order 4 in. with no lines. The mode of filling the blanks as indicated by small type. Form 6 1/2 x 9 1/2 in. below perforated line. Book 6 3/4 x 10 1/2 in. 300 leaves. Stitched. Bound at top. Paper cover on face and top. Very stiff back on lower side. Paper opaque, white, sized, and of such thickness as to admit of making seven good copies with No. 1 Faber pencil. To be used with carbon paper, 6 3/4 x 9 in. and a stiff tin, same size, corners rounded.

When an order has been transmitted, preceded by the signal "19," operators receiving it must, unless otherwise directed, repeat it back at once from the manifold copy, and in the succession in which the several offices have been addressed. Each operator repeating must observe whether the others repeat correctly. After the order has been repeated correctly, the response "complete," with the superintendent's initials, will be given, when authorized by the train dispatcher. Each operator receiving this response must write on each copy the word "complete," the time, and his last name in full, and reply "I complete" with his signal, and will personally deliver the order to the persons addressed without taking their signatures.

For an order preceded by the signal "19," "complete" must be given and acknowledged for the train of superior right before it is given for the train of inferior right.

If the telegraph fails before an office has received and acknowledged

when trains are late, they must be delivered in the same way as to conductors of trains.

An order to be delivered to a train at a point not a telegraph station, or while the office is closed must be addressed to "C. and M., No. — (at —) or (between — and —), care of —."

and forwarded and delivered by the conductor or other person in whose care it is addressed. "Complete" will be given upon the signature of the person by whom the order is to be delivered, who must be supplied with copies for the conductor and motorman addressed, and a copy upon which he shall take their signatures. This copy he must deliver to the first operator accessible, who must at once advise the train dispatcher of its having been received, and forward it immediately to the superintendent.

Orders so delivered to a train must be compared, by those receiving them, with the copy held by the person delivering, and acted on as if "complete" had been given in the ordinary way.

Orders must not be sent in the manner herein provided, to trains the rights of which are thereby restricted.

When a train is named in an order, all its sections are included unless particular sections are specified, and each section included must have copies addressed and delivered to it.

Meeting orders must not be sent for delivery to trains at the meeting point, if it can be avoided. When it cannot be avoided, special

BOUND HERE.

PERFORATED LINE.

Washington, Alexandria & Mt. Vernon Railway Company.

TELEGRAPHIC TRAIN ORDER No.

Superintendent's Office, Washington, June 1, 1896.

FORM 19 To C. & M. of No. 13. at Alexandria 19 FORM

Conductor and Motorman must each have a copy of this order.

Rec'd 2.15 P. M. Made Complete at 2.16 P. M. Rec'd by Jones Op'r.

FIG. 6 ORDER FORM "19."

BOUND HERE.

PERFORATED LINE.

Washington, Alexandria & Mt. Vernon Railway Company.

TELEGRAPHIC TRAIN ORDER No. 10

Superintendent's Office, Washington, June 1, 1896.

FORM 31 To C. & M. of No. 13. at Alexandria 31 FORM

Conductor and Motorman must each have a copy of this order.

Time received 2.15 A. M. O. K. given at 2.16 A. M.

Conductor.	Motorman.	Train	Made	At	Received by
Jones.	Brown.	13	Complete.	2.20	Harrison.

FIG. 7 ORDER FORM "31."

the "complete" to an order preceded by the signal "19," the order at that office is of no effect, and must be treated as if it had not been sent.

The order, the "O K" and the "complete" must each, in transmitting, be preceded by "31" or "19" as the case may be, and the number of the order, thus, "31, No. 10," or "19, No. 10." In transmitting the signatures they must be preceded by "31," the number of the order, and the train number, thus, "31, No. 10, Train No. 5." After each transmission and response the sending operator must give his signal.

The specifications for train order form and books for operators for "19" orders are as follows: Form as here shown. Blank space for order 4 in. with no lines. The mode of filling the blanks is indicated by small type. Form 6 1/2 x 6 in. below perforated line. Books 6 3/4 x 7 1/2 in. 300 leaves. Stitched. Bound at top. Paper cover on face and top. Very stiff back on lower side. Paper opaque, green, sized, and of such thickness as to admit of making seven good copies with No. 4 Faber pencil. To be used with carbon paper 6 3/4 x 7 in. and a stiff tin, same size, corners rounded.

The operator who receives and delivers an order must preserve the lowest copy. On this must appear the signatures of those who sign for the order; and on it he must record the time when he receives it, the responses, the time when they are received, his own name, the date, and the train number, in the places provided in the blanks. These copies must be sent to the superintendent.

Orders used by conductors must be sent by them daily to the superintendent.

Motormen will place their orders in the clip before them until executed.

For orders delivered at the superintendent's office the requirement as to record and delivery will be the same as at other points.

When necessary to give orders to persons in charge of work requiring the use of track in yards or at other points, authorizing such use

precautions must be taken by the train dispatchers and operators to insure safety.

There should be, if possible, at least one telegraph office between those at which opposing trains receive meeting orders.

Orders should not be sent an unnecessarily long time before delivery, nor to points unnecessarily distant from where they are to be executed. No orders, except those affecting the train at that point, should be delivered to a freight train at a station where it has much work, until after the work is done.

A train, or any section of a train, must be governed strictly by the terms of orders addressed to it, and must not assume rights not conferred by such orders. In all other respects it must be governed by the train rules and time-table.

Orders once in effect continue so until fulfilled, superseded or annulled. Orders held by, or issued for, a regular train, are to be considered as annulled when the train has lost its rights, and other trains will be governed accordingly.

The Brooklyn Rapid Transit Co. has obtained an order directing that the courts shall decide to whom the company shall pay the \$25,000 reward which was offered in the latter part of 1900 for information leading to the arrest and conviction of persons who had circulated false reports with the intention of depreciating the stock of the corporation. This recent action on the part of the company was rendered necessary by the number of spurious claims made for the reward.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

POWER HOUSE NOTES.

BY ARTHUR B. WEEKS.

There are times when repairs to a generator armature are rendered necessary amid the rattling of machinery and in a constant draught. In such an instance, the use of canvas, as shown in the illustration, will afford temporary protection, retaining commutator heat and preventing the cooling of soldering irons. Where the draught is unusually violent, the work can be wholly enclosed.

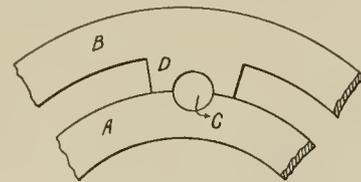
Should it become necessary to remove the collector rings of a rotary converter armature, as herewith illustrated, remove the connections of the rings to the armature conductors. It will be observed that there are twice as many of these connections to the armature as there are pole pieces on the rotary. The rotary converter armature here shown belongs to a 350-kw. Westinghouse machine for street railway service.

After taking off the starting motor armature, insert threaded rods into tapped holes in the collector casting provided for that purpose, and place a heavy strap of iron across the end of the shaft. Tighten up the nuts on the rods which pass through holes in this strap of iron. The collector rings of a General Electric rotary are removed in the same way. It may prove a difficult undertaking, for after years of running, it will have rusted fast; yet after persistent work it can be removed, though one may break several rods and double up the straps of iron, until material is secured which will stand the strain. Collector rings of the raised pattern give far better satisfaction than those whose surface is $\frac{1}{2}$ to 1 in. below the insulating material separating the rings. Raised rings may be put on in the following manner:

Turn off each ring, and fit over each a ring like that shown in the illustration. The inside ring, A, is a portion of the original ring, and B, a portion of the new one with a lug, D; this allows a ventilating space between the surfaces. The outside ring is fastened with a dowel pin, C, driven into a hole drilled at the intersection of the

bration of floor and machine when the armature is in motion. By all means, let it be corrected as soon as possible. The armatures are, as a rule, bar wound, and connected to copper strips extending up radially from the commutator, in line with the armature coils. An idea prevails that there is something very mysterious about a rotary converter; but one soon becomes familiar with its operation and peculiarities.

Synchronizing, or paralleling rotaries, is an operation which to some men seems very difficult. It may take a great deal of practice, but they will master it in time. The writer recalls an instance where



RAISED COLLECTOR RING.

an engineer found his steam plant replaced by a modern light and power station, equipped with motor generators and rotary converters. It was a question of either learning to run the new apparatus or looking for a new position. He determined to do the former, and surprised himself by the ease with which he grasped the new conditions.

One's record, or ability to properly care for the rotaries, depends largely upon the skill and knowledge of his informant. Incorrect information may cling tenaciously for years, and is a hard thing to overcome. Of course, more things are liable to go wrong with a rotary converter and its alternating current equipment than when a direct current generator of the same capacity is used. If the transformers are oil and water cooled the oil must be maintained at the right height and the water kept in circulation. It is easy to forget to turn on the water again after a shut-down. Should the water occasionally become muddy, it may cut off the circulation to a dangerous degree if not closely watched.

If air blast transformers are used, do not forget to start the motors for the fan. Sometimes such apparatus is placed in subways or poorly lighted places; be the more particular to inspect machinery so located. Take the air supply from outdoors where possible, especially in summer. The writer remembers a transformer room in which there were a number of air blast transformers supplied with air by two fan blowers driven by induction motors, with an air shaft opening on to a side street where a large sand-pile for plasterers was located. To the disgust of everybody the greater portion of the sand disappeared into the transformer room. Burnt out transformers for rotary converters generally cause consternation, but if properly installed, the fuses or circuit breakers, as the case may be, will take care of the machinery.

General Electric rotaries are usually started by a motor generator consisting of an induction motor driving a direct current motor sufficiently large to propel the converter as a shunt motor under no load. At the end of the armature shaft at the direct current end is an electro-magnet connected to a Lincoln oscillator, which periodically produces end thrust of the armature, giving a hard glaze to the commutator, and which also prevents the wearing of grooves in the alternating current rings.

Where there are Westinghouse rotaries in operation also, the General Electric machine is started with current from the direct current bus-bars. There is no difficulty in starting. The Westinghouse converters, as is generally known, may be started either with alternating or direct current.



CANVAS SCREEN FOR REPAIR WORK.

two surfaces. There are three such lugs and dowel pins for each ring. After being replaced on the armature shaft, they should be turned again if they do not run true with the shaft.

The armature may need balancing after fitting these rings. If it has been rewound, this will undoubtedly be necessary. To accomplish it, two nicely planed surfaces are required; portions of an iron girder, each about 3 ft. long, are excellent for the purpose. These should be accurately leveled. Whatever weight is needed to balance the armature is slipped over one or more bolts on the front of the commutator head; replace the nuts and draw up tightly.

Should the armature be out of balance, it is indicated by the vi-

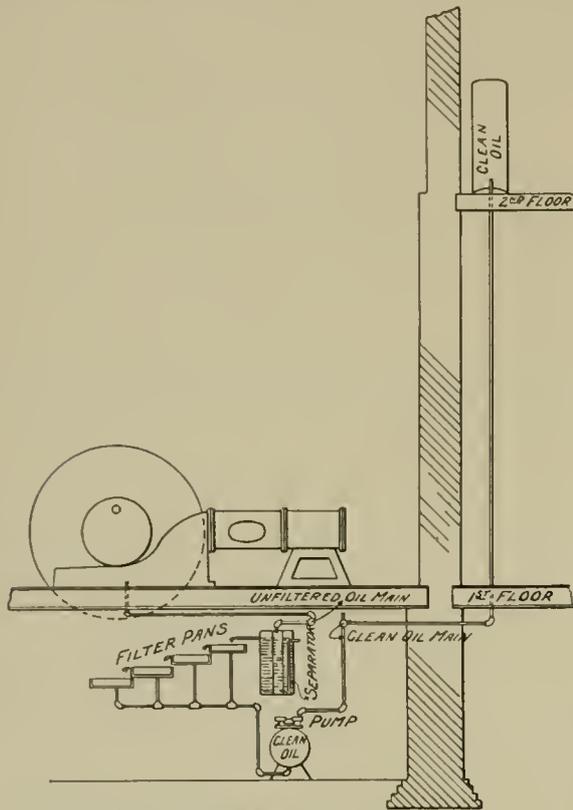
POWER STATION HELPS.

BY **FREDERICK L. RAY.**

Power station economies cannot be based on any one part of the station, nor altogether on the larger items of the make-up of a power station. The auxiliaries come in for a large share of the waste or the saving. The method explained and illustrated in this article is in use in one of the railway and lighting stations of the west, where nothing is too good if it will save a dollar.

In the engine room, no oil is handled except through a system of piping; there are no oilers to spill oil on machinery and floor. The engine room force is reduced to the engineers and wipers, and a hot bearing is as unknown as a snow storm in summer. With a stream of clean, filtered oil running to every bearing, the engineer can devote his time to the careful watching of the records.

The engine oiling system as shown in the diagram is a gravity system. The fresh oil from the barrel is dumped into the system, so that oil must go through the separator and filter and then to the



SECTION SHOWING OILING SYSTEM.

pure oil reservoir. This takes out all splinters, etc., that may come from the barrel. All oil used on the engine which is not consumed in lubrication is piped to the separator, where all water, dirt and heavy matter is separated; then it passes to the filter, which consists of a series of pans. These pans are set one above the other, so that if one will not filter all the oil coming over, the next one will, and so on down to the last one. The pans are watched, and if oil begins to travel to the last pan for filtering, then the filtering material, which consists of white waste and outing flannel, is changed. A layer of flannel is put in the pan extending up the sides to the top, with a wire rack in the bottom to keep the cloth off the pan. Afterward the pan is filled with waste. The filtered oil is piped to a pure oil reservoir. From here it is pumped by a small Marsh pump to a second reservoir, which is on the second floor of the boiler room. From this it flows by gravity to the manifold oiler on the engine, and the process of filtering is repeated over and over until all is lost. No loose oil is brought into the engine room, as a pipe extends outside to the oil house, where oil is supplied to the system.

Cylinder Oil.

The handling of the cylinder oil is accomplished by a gravity system, aided by compressed air. A system of piping is arranged so

that oil flows to a hand pump and automatic lubricator, so that all the attendants have to do is to open a valve and fill the cups. The oil is raised to the reservoir by compressed air. Another reservoir is placed in the basement of the engine room, into which the oil is piped from the oil house, in the same way as the engine oil. A barrel of oil is let in, the valves are closed, and an air pressure of 50 lb. applied on top of the oil. By this method the oil is forced up to the reservoir on the second floor ready for use. This forcing of oil into the reservoir compresses the air there and gives an air pressure to drive the oil out, which is advantageous, especially in cold weather.

Condensation.

The saving of condensation, priming, etc., from all sources is of no little importance. At this plant, the amount saved is about 15 per cent of the total consumption. A system of piping is arranged so that all water from live steam mains, separators, etc., is led to a tank in the basement, and from this tank it is returned to the boiler by a return trap.

The water from the exhaust mains is not so easily handled because of the cylinder oil there is in it. All this water is caught in a tank and then pumped by a small Marsh pump up to the top of the water softening apparatus. It is put through this machine and treated with soda ash; the oil is precipitated and the water comes out as clear as crystal, and we have so much clean, soft water for the boilers.

Water Softening.

We have practically soft water for our boilers. This is accomplished by a continuous operating system installed by the Industrial Water Co., of New York City, which treats the water cold with lime and crystal carbonate of soda. The water as it continually passes through the system has added to it certain proportions of lime and soda, by which the scale-forming matter is precipitated to the bottom of the tank, where it is blown off to the sewer. No scale forms in the boilers, and the great trouble we once experienced with tubes bursting is now entirely eliminated.

One of the most expensive auxiliaries about a station is the ordinary boiler feed pump, consuming all the way from 150 lb. to 250 lb. of steam per h. p. hour. This method has been displaced by the more modern idea of a motor-driven pump. This is fitted with a regulating or by-pass valve, and runs constantly; the regulating valve being set at 25 lb. above boiler pressure and the feed valves to the boiler "pinched" down to admit the necessary water to the boiler. In this way the expense is only for the actual cost of generating the current for motor; it would not be fair to charge the motor with the selling price of the current any more than it would be to charge the selling price for current used on the motor-driven exciter.

Motor-Driven Exciter.

Instead of the usual method of exciting the field of an alternating current generator by an exciter by a belt from the main machine, it is a great improvement to use a motor-driven direct-connected exciter, independent of all other machines. Of course where you have the motor-driven exciter you should have a duplicate exciter driven by a steam engine, so that if the whole plant is shut down you can get started again. This motor can be a type to use the same voltage as the generator, not needing any transformer interposed.

Recording Meters and Gages.

Recording meters and gages are a wonderful stimulus to correct manipulation of the machinery of a power station. A recording meter on the bus bars of a switchboard is a splendid thing, giving the correct voltage for the whole day. It is well also to have several of them on the pressure wires leading out on the main circuits to the center of distribution, with a Stillwell regulator interposed, so that you can take care of the drop in the lines, and in this way give splendid service at farthest point from the station.

One of these instruments on steam mains to give a record of boiler pressure has a great influence toward keeping the fireman up to his duties and turning his attention to the steam gage. How few people know what kind of steam they are using: whether it is wet or dry. If you will put a recording temperature gage on your steam main, you will be able to know just what your steam is, and if you have boilers that give superheated steam, you will be able to tell just how high that superheat is, and if you are trying to get your steam as highly superheated as possible and keep it there, you will

be able to tell at a moment when your boiler is getting foul or the superheat begins to come down and continues to come down on the boiler until it is cleaned. Some water tube boilers easily give 100 deg. F. of superheat, while others give very wet steam.

Heating System.

If you have an exhaust steam heating system connected to your engines, put one of these recording gages on that too; then when a customer complains about pressure, just point to your chart, and he will hunt some place else for trouble. Adopt a graduated scale of pressure for the heating system, depending on the temperature of the water, then get a recording thermometer to give you the weather conditions, and you can give perfect service to your heating customers at the least possible back pressure on the engine.

Air Compressors.

A motor-driven air compressor is another handy station auxiliary. Air is a splendid thing to clean switchboards, dynamo, etc., to run air drills on boiler work instead of the ratchet drills, for the handling of oil, and many other uses.

Station Records.

The more records kept the better. The old commandment of "Know thyself" is equaled by another, "Know what you are doing." How much coal are you burning? What per cent is ash? How much water do you evaporate? What is steam consumption for auxiliaries? What is steam consumption for engines? Where is the rest of the steam going? What is the cylinder oil consumption per engine-hour? How many pounds of water per pound of coal? How many pounds of coal per kw. h. All these questions and many more the wide-awake chief engineer of to-day must be prepared to answer.

MOVING STAIRWAY FOR CHICAGO ELEVATED

The Metropolitan West Side Elevated Railway Co., of Chicago, has installed at its new Marshall Boulevard station a moving stairway for taking passengers to the station platform. Moving stairways have been used experimentally by the Manhattan Elevated Ry., of New York, and their successful operation in that city has influenced the Metropolitan Company in deciding to test the device in Chicago with the end in view of ultimately equipping all its prominent stations with some form of lifting stairway or elevator. The apparatus installed in the Marshall Boulevard station is, strictly speaking, not a stairway but an elevated inclined plane having corrugations on its surface to prevent passengers from slipping. The apparatus is made by the Reno Inclined Elevated Railway Co., of New York City, and is very similar to the inclined elevator that has been in use for several months at the Third Ave. and 59th St. station of the Manhattan road in New York.

As installed at the Marshall Boulevard station the elevator is in two sections giving a total lift of about 35 ft., the lower section being 15 ft. in length and the upper section about 20 ft. There is a short landing platform between the two sections.

The moving belt or plane is about 2 ft. wide and moves at a speed a little faster than the average persons would walk upstairs. A hand rail at the side moves in conjunction with the belt and affords passengers a means of steadying themselves during the ascent. The belt is made of a composition metal and travels on small rollers placed at very frequent intervals.

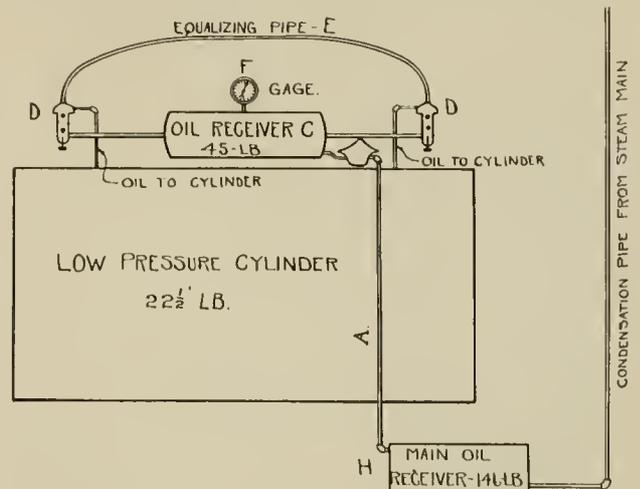
One section of the elevator is driven by a 7-h. p. motor and one by a 5-h. p. motor. Both of these machines take direct current from the line circuit at about 500 volts. They are both controlled by rheostats placed in the ticket booth where they are under the immediate control of the ticket agent. The expense of operation is stated to be merely nominal.

The Marshall Boulevard station is a new depot just established on the new Douglas Park extension of the elevated and will afford an excellent place for testing the elevator, as the station platform is about 40 ft. above the ground, and the station is one that will be used largely by women and children coming from the park. At this point the elevated crosses the C., B. & Q. railroad and the depot is destined to be a very important one.

CORRESPONDENCE.

THE LUBRICATION OF COMPOUND ENGINE CYLINDERS.

Editor "Review": Having had more or less trouble with the usual "hydrostatic" systems of lubrication for compound cylinders, I venture to send you a sketch of a simple device that I have found will often prevent stoppage of the oil flow. The low pressure cylinder is of course the difficult one to lubricate by the hydrostatic method. In common practice the oiling system is connected to both ends of the cylinder, and sometimes a water column is used in connection with the lubricator. In either case, the steam connections are such as to permit condensation to take place in the sight feed glass, and by making a water column connection to either system, in addition to the steam pressure, the oil is forced through the water in the sight feed glass into the steam chest or cylinder. We all know what frequently occurs with this system in service. The number of drops of oil per minute gradually de-



METHOD OF CYLINDER LUBRICATION.

creases, and if not given attention, the flow of oil will finally stop. Very often this is not due to insufficient pressure, nor is it due to the valves becoming clogged. The stoppage of oil is caused by the low temperature of the steam or by the condensation water in the sight feed glass becoming cool. As a consequence the metal connected with the lubricating system is chilled, causing the oil to thicken and finally stop feeding. By a glance at the accompanying working sketch it can readily be seen how this trouble may be prevented. The oil is under boiler pressure plus the water column in tank II, or about 146 lb. pressure. From this tank or receiver, the oil is delivered through a reducing valve B, to the receiver C, at 45 lb. pressure. It then goes to the sight feed glasses (D), and finally to the steam chest and cylinder. In the ordinary lubricating arrangements the circulation of steam stops at the sight feed glass of the low pressure cylinder and the water or condensation becomes cool. This is remedied by the addition of the steam loop or circulating pipe E. This pipe is connected to the highest point of each sight feed glass, allowing a circulation of steam from one end of the steam cylinder or chest to the other. The steam which condenses at the extreme height of the steam loop will flow to the sight feed glasses, and keep the water hot, causing the oil to remain at the same temperature as the water. While the steam is circulating in pipe E, all connections to the lubricator will remain at a high temperature and keep the oil in the same condition. Yours truly,

Herman Van Ormer,
Ch. Engr. Hartford (Conn.) Street Railway Co.

The North Texas Traction Co.'s interurban between Dallas and Fort Worth will be put in operation before July 1st. The power house at Handley is completed, and will supply power for the Fort Worth lines as well as for the interurban road.

WINDING ARMATURES.

Editor "Review": I changed the winding on our Westinghouse No. 3 armatures about 18 months ago and have reduced our armature troubles in this motor about 40 per cent over the old style winding with form wound coils. I have noticed in winding this type of armature with the form wound coils sometimes the insulation would be injured in putting them in place, as it is impossible to put them on without using a hammer, and when the armature was put under heavy load it was liable to ground and burn out. With our new method I have not seen this happen in a single case. I use one sheet of micanite and two sheets of brown paper in lining the slots of the core, making the insulation $\frac{5}{8}$ -in. longer than the core of the armature. The winding is the same as with the old style coils from slot 1 to 25. When the section is started put the left hand lead in slot 26 until the section is finished in 1 and 25. Then put a piece of lead cover on both leads the length of the core so as to make a good insulation between the sections. This is done so as to bring both leads out on top of the section. On the ends of the armature one thickness of muslin or linen is enough under each section. It takes a little longer to wind an armature in this way but I have found it to be much cheaper in the end. The commutator connections are the same as with the other winding. The ends of the armature are much smaller with this winding.

A. F. REKROTH,
Foreman Repair Shops,
Harrisburg (Pa.) Traction Co.

INDICATING INSTRUMENTS.

Editor "Review:":

In the handling of stations, whether for power and lighting or for street railway work, nothing is so essential as a sufficient number of indicating instruments. While I was with the Detroit Citizens' Street Railway Co. I devised a scheme for indicating to the firemen in the boiler room the amount of the load being carried by the station. A Weston illuminated dial ammeter was placed on the wall in front of the boilers. The shunt circuit was run from the switchboard to the ammeter and the ammeter carefully calibrated to read the total amperes output of the station. The shunt resistance for the ammeter was made by replacing some short copper connecting strips in the main bus bar by iron strips of the same size. This scheme proved very helpful in regulating the steam pressure according to the load, and saved much signalling back and forth from the engine room. I believe this ammeter is still in use there but I have never seen it applied in any other station.

O. A. Honnold,
Salt Lake City, Utah. Utah Light & Power Co.

NATIONAL ELECTRIC LIGHT ASSOCIATION AT WORLD'S FAIR.

At the Cincinnati convention of the National Electric Light Association great interest was manifested in the importance of the association meeting in St. Louis in 1904 during the World's Fair. It was unanimously resolved that the association would lend its best efforts to contribute to the achievement of an electrical exhibit such as the exposition management and the industry demands. Prominent members of the association expressed themselves as being highly desirous of showing the industrial application of electricity at the World's Fair, on a very large scale, and their willingness to cooperate in securing this end. It is expected that this exhibit will have the effect of opening up for business a large territory which is now undeveloped electrically.

It is probable that the association will have an exhibit of its own which will demonstrate the method of selling and measuring electrical energy whether for light or power. The action was taken this year to hold the 1904 meeting at St. Louis for the reason that the association believes that much better working exhibits will be forthcoming if the electrical manufacturers understand that the central station men are thoroughly interested in having all electrical apparatus exploited on a large scale.

The Kansas City-Leavenworth Railroad Co. headed the list of donations for the Memorial Day celebration at Leavenworth with a cash subscription for \$50.

KEEPING GOOD TIME.

A detail of operation that has always been given careful attention by steam railroad managements but is sometimes neglected by street railways is the necessity for making sure that all employes having to do with the movement of cars are provided with reliable watches which should be regulated every morning.

The following precautions in this direction are in force on the Washington, Alexandria & Mt. Vernon Ry. The rules are formulated from those adopted by the Pennsylvania R. R., and are as follows:

Observatory standard time is the only recognized standard, and will be transmitted from the National Observatory to the main office.

The standard time will be signalled to all points on the system from the main office at 12:00 noon, daily.

Certain clocks will be designated on each division as standard clocks.

Where station clocks are provided, those in charge of stations must see that the clocks show correct time, but employes must not take time from such clocks unless they are also designated as standard clocks.

Each conductor and motorman must provide himself with a reliable watch, which must be examined and approved on a prescribed form by a watch inspector appointed by the company, and must file this certificate at the manager's office before he will be allowed to take charge of a car. Watches must be examined and certificates renewed every six months.

Each conductor and motorman must regulate his watch by a designated standard clock before starting on each daily trip or run, and register his name and the time at which he regulates his watch on a form provided for that purpose.

Conductors and motormen whose duties prevent them from having access to a standard clock must compare daily with, and regulate their watches by, those of conductors or motormen who have standard time and have registered their names in accordance with these rules.

The forms referred to are merely standard blanks with space for the foregoing information to insure uniformity in the making of reports.

All the cars of the Washington city systems have a small attachment on the front dash for holding the motorman's watch where it will be in constant view. The motormen are required to become familiar with the time at which they should pass certain prominent points and by having the watch before them at all times they are better able to regulate their speed in order to keep up to the requirements of the schedule.

POST CHECK CURRENCY.

The "Post Check" currency plan now before Congress contemplates the issue of one, two and five dollar bills which will have the dual properties of money and transferable checks by providing blank lines for assigning such bills to a named payee if desired. An issue of fractional currency of a similar form in denominations of five to fifty cents is also contemplated which would provide for sending small amounts of money by mail. The object of this currency is to provide an entirely safe method of sending money through the mails, as when a bill is endorsed it can only be paid to the payee named upon it upon identification at the post office stated. This makes it as safe for transmission as any bank check.

Post check currency has been widely advocated by leading newspapers and business houses in all parts of the country and it appeals especially to publishers as it provides a ready means for paying subscriptions and avoids the use of postage stamps or silver in sending small amounts by mail. There seems to be no possible objection to this kind of currency while the advantages it offers are many, both to the sender and receiver. It avoids the trouble of going to the post office to procure money orders and it also overcomes the difficulty of handling and disposing of a large number of stamps which can generally only be converted into money at a loss. While publishers are greatly benefited by such a currency, there are a vast number of other interests to which it would appeal with equal force.

The Union Traction Co., of Philadelphia, has inaugurated a through service between Frankford and Willow Grove.

MECHANICAL DEPARTMENT

SYSTEM IN REPAIR SHOPS.

BY H. ARNOLD FRENCH, MASTER PAINTER, UNION RAILROAD CO., PROVIDENCE, R. I.

There is but one way to success in any undertaking, and that is to so arrange your task, whatever it might be, so that the end may always be in sight. No engineer would for a minute think of setting his men to work on a job before he made a complete layout of the whole, the end being of as much importance to his as the beginning. The writer has had occasion in a practical way of seeing this fact demonstrated to its full extent.

We will take for instance the regular work of the shops, such as a general renovation of the whole equipment, which should be done over once in twelve months at least. We have seen it done in a great many shops in a sort of haphazard way without any system or method, simply taking the cars in, and when they are done, sending them out, whenever it has pleased the men to accomplish the work. Whether it is done in a week or a month matters not to them so long as they get their pay for it, and we cannot blame them any more than we could a regiment of soldiers after a repulse in a mismanaged charge on the enemy. Such being the case, let us try to reason out a remedy, if possible.

Never losing sight of the end that I first mentioned, let us start in a methodical, business-like way. No manager wants his open cars in the shops in the summer or his closed cars there in the winter. The reason is obvious. Enough equipment has to stand all day in the car houses to do the extra work at night and morning, without having more of it in the shops just for the want of a little energy on the part of the shop management to push it out.

The first of May should see all of the open cars ready for business. The season is liable to open any minute and they will be wanted. Now, the first application of the remedy leads up to the question, How many open cars are there on the list? Say, 200. Figure back from the first of May the number of working days we have to do them in, doing one, two or more a day, as the whole number might require. Then so arrange your work that each man will have a certain amount to do in a day, being particular to be just both to the company and to the men, which, by the way, is a mighty fine line to work by, but which can be accomplished by a little reasonable thought.

Just fancy stepping into your shop in the morning and when the signal to proceed to work is sounded, seeing each man step to his post without a word from the foreman, and begin that same work which is allotted to him every day, with the understanding that he is to finish his particular part at the end of the day. By this method of working each individual man becomes a most proficient workman, and having the end in view, he so regulates his work that at any hour of the day he is never behind. In reality (to use a shop phrase) he keeps tab on himself.

I can hear the practical, unsystematic man, even now as he reads these lines, raise many objections. The condition he has to work under will never allow such a scheme to exist. My answer is this: Just push your handle up one more notch and get away from that "resistance" that is holding you back so much that it certainly amounts to a disease, and you will be surprised to find how easy it is to manage a shop, if you have some system whereby the end is always in view. Now mark the result of systematic work. You see coming from the car houses into the shops every day one, two, or three, or as many cars at your method will accommodate, and a like number going out, all finished and ready to be put into service. Thereby repair work is made as systematic as manufacturing, and it becomes a simple mathematical problem for you to solve when you are asked by the manager the exact time he can have his cars.

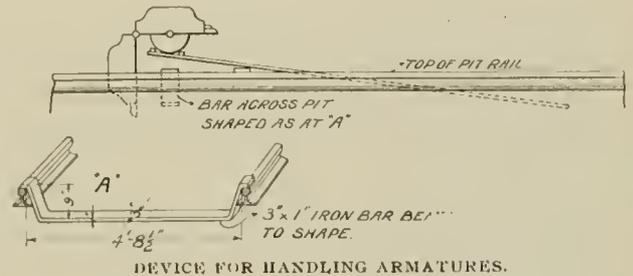
The same methods of doing the open cars can of course be applied to the closed cars, having them all done in the summer months, ready in the fall at any given time.

Now, in conclusion let me impress on the mind of the reader that there is more than one way of working. It is not necessary to work this man's way or that man's way; it may not be practicable that you should; your conditions may not allow it. But you can search out some method whereby without taking observations you can always know what part of your little ocean you are sailing on and can always tell to a day when you are due in port.

FOR REMOVING OR REPLACING ARMATURES.

A number of schemes for removing and replacing armatures under cars have been described in recent issues of the "Review." Mr. J. C. Sherrill, barn electrician for the Charleston (S. C.) Consolidated Railway Gas & Electric Co., suggests a scheme for accomplishing the same results for roads that do not own a pit jack, or for use at times when the jack is not available.

The essential features of the arrangement are a plank 2x12 in. and 20 ft. long to act as the lever; a smaller piece of board to go across



the top of the pit as the fulcrum; and a 1x3-in. iron bar bent as at A in the sketch and designed to be placed across the pit to support the end of the long plank when the armature has been lowered.

To remove an armature from under a car the lower half of the motor case is swung down. One end of the lever board to which are fastened two cleats to prevent the armature from rolling off is then brought to bear against the lower side of the armature. One man at the other end of the lever supports the weight of the armature while a second man unscrews the bolts that hold the bearings together. The armature is then lowered until the board rests upon the iron strap placed across the pit. The small board which acted as the fulcrum is then moved back along the top of the rails until it supports the power end of the lever. In this way the lever is made to form an incline plane up which the armature may be rolled and so placed on the car barn floor.

Mr. Sherrill states this makeshift fills the requirements as well as an elaborate pit jack would do, though it is not so convenient.

The Interborough Rapid Transit Co., of New York City, which was recently incorporated, has issued stock to the amount of \$25,000,000. The company's system will comprise 7 miles of 4-track and 14 miles of double track and one large power house equipped with eight 7,500 h. p. engines furnished by the Allis-Chalmers Co., and 48 Babcock & Wilcox boilers of 600 h. p. The officers of the Interborough company are: August Belmont, president; E. P. Bryan, vice president and general manager; Frederick Evans, secretary, and J. F. Buck, treasurer. John B. McDonald is the general contractor and George Gibbs, consulting engineer.

TIME REQUIRED TO REPAIR AND PAINT CARS.

Through the courtesy of Mr. H. A. Davis, superintendent, and Mr. E. W. Hiller, master mechanic of the New Orleans & Carrollton Railroad, Light & Power Co., we are permitted to publish the following data regarding the time required to repair and paint cars at the shops of this company. The figures are averages secured under working conditions and are valuable as showing what may be expected from average men working in a well regulated shop. They enable the master mechanic to estimate the time necessary to put a given number of cars through the shops with a given force of employes.

These data will be especially valuable to any company having in mind the establishing of a piece work system of paying employes. In this connection reference is made to the "Review" for last April, page 223, where will be found data regarding advantages of the piece system and also the complete schedule of prices paid for piece work at the shops of the North Jersey Street Ry.

TIME REQUIRED FOR ONE MAN TO DO SPECIFIED WORK AT REPAIR SHOPS OF THE NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO.

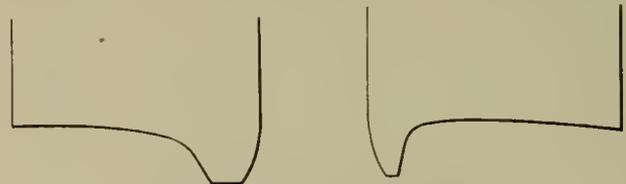
	HOURS.
Carpenter Shop.	
Strip car for general repairs.....	18
Trim car for general repairs.....	38
Strip car for varnishing only.....	11
Trim car after varnishing only.....	15
Work on Roof.	
To remove canvas, top deck.....	12.5
To remove running board only.....	2.5
To remove 5-16 in. x 2½ in. sheathing.....	11
To remove head linings.....	8
To remove one end.....	2
To remove moldings.....	3
Work on Platform. (Including time to remove old material.)	
To fit and fasten one new dash.....	3.5
To remove sub-sill.....	4
To remove floor.....	4
To remove buffer timber.....	5
To remove platform knee.....	3
To remove step board.....	2
To remove foot guard.....	1
Hoods. (Including removal of old parts.)	
To build hood complete with canvas.....	16
To renew canvas only.....	2
To renew one rib.....	3
To renew one half rib.....	2
To renew one rim.....	6
To renew one half rim.....	4
To remove and replace.....	3.5
To renew sheathing.....	1
Panels, Sills, Etc.	
To remove panels one side of car.....	10
To remove panels one end of car.....	9
To strip in order to renew one section panel.....	1
To renew one section side panel.....	4
To renew guard rail.....	7
To renew guard and belt.....	19
To renew one side post.....	22
To renew two side posts.....	27
To renew one side post including renewing of side panels, belt guards, etc., and painting (\$60).....	300
To renew upper end plates.....	8
To renew upper end panel.....	3
To renew upper deck corner mullion.....	3
To renew end sill.....	28
To renew sub sill.....	4
To renew floor.....	12
To renew trap doors.....	4
Labor to Paint One Car.	
Burnng off.....	15
Sanding.....	5

Rough stuffing.....	20
Rubbing down to surface.....	50
Sand papering.....	2
Coating color 8 hours, 3 coats.....	24
Ornamenting.....	40
Varnishing 5 hours, 3 coats.....	15
Scrubbing trimmings.....	30
Scrubbing seats.....	8
Scrubbing inside of car.....	4
Varnishing trimmings (1 coat 15 hours, 2 coats 24 hours).....	24
Coating seats.....	12
Painting floor (1 coat 5 hours, 2 coats 8 hours).....	8
Painting deck.....	4
Painting floor and platform.....	2
Painting trucks 2 hours, inside dash, etc.....	2

In further explanation it may be added that these figures are for work performed on the standard cars of the New Orleans & Carrollton Company. These cars are 20 ft.-body, closed cars, 30 ft. 8 in. over all, having seven cane cross seats on each side of the center aisle. They were built by the American Car Co., of St. Louis.

WHAT CAUSED THESE FLATTENED FLANGES?

Mr. S. M. Coffin, master mechanic of the Mobile (Ala.) Light & Railroad Co., has called our attention to a curious wheel trouble which is giving him considerable annoyance. He finds that after the car wheels have made in the neighborhood of 25,000 miles many of them have to be removed owing to the flanges wearing flat on the edges. This wear seems to take place uniformly around the entire circumference and is well illustrated by the sections repro-



VIEW OF FLATTENED FLANGES.

duced on this page which are from actual templets taken from a sample pair of wheels removed for this cause. This particular pair of wheels made 25,000 miles. The standard used on the road is a 400-lb. chilled iron wheel with 2½-in. tread and ¾-in. flange.

The curious part of the matter is that the wheels shown ran entirely on 45-lb. T-rail and were never used on girder or grooved rail and the trouble cannot therefore be due to the wheel running on the flange. It has been suggested that the flattening might be due to too shallow special work, but Mr. Coffin explains that all special work on the road is of the built-up type and is at least 1-in. in depth even in the pieces that have been down some time and are partly worn. It was also suggested that the wear might be caused by improperly adjusted brake-shoes or by the type of shoe used but this can hardly be possible as several different makes of shoes have been tried without relief. It might be added that the brake shoes themselves wear in conformity with the wear of the wheel and section though discarded shoes show the same flattened flanges.

Mr. Coffin is now inclined to believe the trouble is caused by sand drifting in close to the head of the rail, as a large portion of the road is built entirely in sand. He thinks the edge of the flange might be ground flat by constant running in this sand.

We would appreciate receiving suggestions from anyone as to the probable cause of this peculiar trouble and would like to hear especially from companies who may have had similar experiences with flattened flanges.

The Dayton, Covington & Piqua Traction Co., of West Milton, O., expects to open its 34-mile interurban electric line this month. Ten passenger and two freight cars will be operated, and the installation at the power house will comprise two Buckeye engines of 450-h. p. capacity and two 300-kw. generators made by the General Electric Co. The officers of the operating company are: Denis Dwyer, president; W. E. Geer, vice-president; M. J. Randolph, secretary, and Edward C. Spring, general manager and superintendent. R. D. Colburn is chief electrician.

COMPRESSED AIR CARS IN SEVERE SERVICE.

Our readers are already familiar with the good record made by the compressed air cars used in the all-night service on the Clark St. line of the Chicago Union Traction Co., and also with the result of the operation of air cars on the Metropolitan Street Ry. of New York. The cars in service in Chicago were illustrated in the "Review" for October, 1900, page 729; some interesting data on the New York installation were given in our issue for October, 1900, page 613, and the latest types of the compressed air storage



FIG. 1 COMPRESSED AIR CAR WITH SNOW PLOW.

tanks and motors were shown in the "Review" for Sept. 15, 1901, page 594.

We reproduce here two engravings which show the results obtained with compressed air street cars under adverse conditions. Fig. 2 is from a photograph taken during the recent flood at Rome, N. Y., and shows the cars running at high speed through a depth of water that would put an underground electric line or a steam locomotive out of business and that would give the ordinary overhead trolley car serious trouble. In Fig. 1 the compressed air car is at work in deep snow.

The advantages offered by an independent motor for car service under exceptional conditions are well known and it is also appreciated that there are various applications for air as an auxiliary in many cases where the overhead trolley is the most economical and desirable for regular service. The mechanism of an air motor being similar to that of the steam engine is quite as reliable and has the same range of speed and power.

The Compressed Air Co., of New York, has extended its field of operations and is preparing to build mining locomotives; its later designs of street car motors have the running parts made heavier than in the earlier types.

TO EXPEDITE TRAFFIC.

A communication to the London Daily Mail suggests that foreign street railways have troubles of their own as well as those in many American cities. A coronation visitor staying in London described a trip by the electric street car that runs westward from Hammer-smith. Throughout the trip the car was constantly impeded by farm wagons which were loaded roof high and on which the drivers appeared to be asleep, as it took four or five rings of the alarm bell before they appeared to even notice it. When the drivers thought they would like to let the car pass they turned out of the track at such a small angle that it carried their wagons some 100 yards ahead before the rear wheels were clear of the line. The writer suggested that what it wanted on that line for about a week is an armored train. The cars should be given one alarm bell and if there is no response, then shoot.

STORAGE BATTERY CARS PROHIBITED IN GERMANY.

The Zeitschrift für Kleinbahnen for May states that a few months ago the authorities in Berlin and Hagen, Germany, forbade the use of accumulators in street cars. On April 7th the police department of Hanover followed with a decree peremptorily ordering the Hanover Street Railway Co. to remove storage batteries from the street cars of Hanover and Linden within a year from the date of the order. The decree declares accumulators are unsafe and dangerous for this service on account of containing materials which threaten the health and lives of passengers with explosions and conflagration. The alleged dangerous character of the accumulators has not yet led to any serious disasters, but the authorities apparently consider it their duty to forestall any such trouble. The street railway service in Hanover was often unsatisfactory in bad weather and accidents of a minor nature occurred frequently. The Hanover company has been given four weeks to come to an understanding with the municipal authorities about a new way of applying electricity as a motive power for the cars. If it is decided to use an overhead system then the necessary construction work must be completed within a year, and if it is found impossible to reach any agreement with the municipal authorities within four weeks the matter must be at once referred to the courts and the term of one year will date from the time of the court decision. In case any legal action should become necessary against owners of property to which electric wires are to be attached the limit of one year will be extended so as to make up for the time required for such action. Press reports state that there is little prospect for an amicable agreement with the municipal authorities and it is predicted that the courts will be called upon to settle the matter. The decree practically ends the use of storage batteries in Germany. In Prus-



FIG. 2 COMPRESSED CAR IN FLOODED STREET.

sia there is but one company that is still permitted to retain them and in this case their use is partially restricted.

OUTINGS IN CLEVELAND.

The outing department of the Cleveland Electric Railway, which is operated under the management of Mr. J. W. Butler, has issued an artistic pamphlet descriptive of the many beautiful neighborhoods which are passed on the various routes of this company. The work is copiously illustrated with views in the principal business and residence districts as well as rustic scenes in the parks and suburbs which are reached by these lines and the several suburban roads with which they connect. The company has 131 miles of track, which reaches all points of interest in Cleveland, and the transfer system is very liberal, permitting passengers to reach almost any destination in the city for a single fare. The company makes a business of special trolley car service and of booking picnics and societies, etc., for the pleasure resorts and public parks in and about Cleveland.

THE REQUIREMENTS FOR THE PARALLELING OF ALTERNATORS AS VIEWED BY THE ENGINE BUILDERS.*

BY HENRY E. LONGWELL.

The parallel operation of alternating current generators direct connected to reciprocating engines, has, during the past five years, been the subject of many learned discourses, by many learned electricians. Awed by the formidable array of mathematics, Greek letters and scientific terms, we engine builders have sat humbly at the feet of the masters hoping vainly that there might be let fall some crumb of knowledge that we could assimilate and thereby progress—be it ever so little—towards a reasonable comprehension of the matter.

What the problem needs for its complete and final solution is the advent of another Admirable Crichton, in whom the highest knowledge of electrical and mechanical science will be combined. Failing this, the solution must be the joint work of two or more individuals, with different training and different ways of thinking, and consequently the problem of paralleling alternators is now, and doubtless will be for years to come, complicated with the additional and perhaps equally difficult problem of paralleling brains.

It is not the intent of this paper to advance any unailing recipe for making alternators run in parallel, but rather to call attention to the fact that there are certain things which the electricians have not told us that would be helpful to us if we knew them, and that some of the things they have told us are wrong, and further, to suggest that there is a broader line of investigation than has been generally followed, which will include the action of the generator on the engine, as well as the action of the engine on the generator.

The electrician starts out with the assertion that no electrical question is involved. The stereotyped formula is that "if the alternators are run at uniform speed, and at the same frequency, the paralleling will take care of itself." This we concede without argument, for the reason that it does not have anything to do with the practical case and consequently it makes no particular difference whether it is true or not.

If the prime mover is to be a reciprocating engine, the speed will not be absolutely uniform. It will vary during a single revolution, owing to the irregularity of the tangential effort on the crank pin, and it will vary from revolution to revolution because automatic governing is only a series of approximations above and below the mean speed. This is the actual condition we have to meet, and it is time wasted to discuss ideal and impossible conditions. Admitting that these irregularities, which must exist to a greater or less degree, create certain electrical disturbances in the generators, it must be conceded that these electrical disturbances are communicated from one generator to another, and that there is a resultant reaction back on the engine. It is not enough for the engine designer to merely consider the action of his engine as an independent unit; it is equally necessary that he should have knowledge of the character of the reaction from the generator.

To put the problem of parallel operation before us in kindergarten form so that it could be readily grasped by the purely mechanical mind, we have been told that the whole thing is analogous to, and quite as simple, as running two or more independent engines connected by gears to a common line shaft. It undoubtedly is—almost.

There are to-day quite a considerable number of installations which by dint of strenuous effort blindly applied, and more or less good luck have been made to operate in parallel quite satisfactorily, but as to the reasons for success or failure, opinions have differed so widely that it may be safely said that there is no theory that is not open to attack from some points or other. Some authorities will tell you that dash pots on the governors did the business. Others that the turning moment of the engines was improved; still others will say that the use of copper pole tips or dampers on the generators is what turns failure into success.

I have in mind a certain large installation in which the early attempts to parallel the alternators were far from successful. Shortly afterward the plant was operating in parallel regularly and satisfactorily. I made special inquiry as to what had been done to bring about the result, and my informant said: "Nothing so far as the

apparatus is concerned; we have just learned how to do it,—that is all."

It is perhaps worth while to consider whether or not the expertness of the operator may be a more potent factor than we have hitherto believed.

In a great many instances the difficulties experienced in paralleling alternators have been more or less completely overcome by tinkering with the governing mechanism on the engine, and consequently it has become fashionable to say that the troubles originate in hunting, oscillating, or otherwise faulty governors. This, however, is an unfair statement. Coincidence and cause are two entirely different things. The interaction between the generators is not necessarily caused by the hunting or oscillating of the governors, even though both phenomena are co-existent, and even though the latter tends to aggravate the former.

A more fair statement of the case is, that the parallel operation of alternators imposes a duty on the governing mechanism of the engine, which is abnormal and which is directly opposed to its natural function.

The natural function of a governor is to regulate the supply of motive fluid in proportion to the load. If we have two engines driving alternators in parallel, and, by reason of small speed variations, which we might as well frankly admit are unavoidable, one generator advances ever so little ahead of the other, it takes more load. To restore equilibrium we ought to be able to reduce the steam supply to the engine that is leading and to increase the supply to the engine that is lagging behind. Now the natural tendency of the governor is just the opposite; i. e., to increase the steam supply to the heavily loaded engine and make it capable of taking more load, and to decrease the steam supply to the underloaded engine and make it less capable of taking its share of load. Furthermore, the nearer perfect the governor is as regards the performance of its natural duty, the more promptly and vigorously it does the right things at the wrong time.

Obviously a governor unless endowed with intelligence, cannot assist parallel operation, and the best we can hope to do is to hobble it in such a way as to make it offer as little opposition as possible. In other words, we must sacrifice as far as is safe, all the qualities that have hitherto been regarded as synonymous with excellence, and make the governor so that it will not act quickly under any circumstances, and will not respond at all to moderate changes in load or speed. Hence, dash pots, friction brakes, etc., not because the governor is faulty, but because we must needs make it so to prevent its resisting the contradictory demands of the electrical part of the plant.

No properly designed governor on an engine in any service other than that of running alternators in parallel requires any of these retarding devices, and their presence ordinarily would be an open confession of faulty design.

As regards the required degree of uniformity of angular speed, a common specification issued by one of the leading manufacturers of electrical machinery reads as follows:

" * * * Variations of the rotating part of the generator through the revolution at any constant load not exceeding 25 per cent overload should not exceed one-sixtieth of the pitch angle between two consecutive poles from the position it would have if the motion were absolutely uniform at the same mean velocity. * * * The maximum allowable variation is the amount the rotating part forges ahead plus the amount which it lags behind, the position of uniform rotation is therefore one-thirtieth of the pitch angle between two poles. Generally this is obtained by the use of a heavy fly-wheel."

Another manufacturer makes these limits one-seventysecond and one-thirtysixth respectively.

This requirement presents no particular difficulty, except in the case of slow-moving engines coupled to generators of high frequency where the fly-wheel weights assume proportions that are fearful to contemplate.

The mathematical processes whereby the requisite fly-wheel weights are determined have been so frequently and so ably set forth by various writers in recent years that it would be superfluous to interpolate them here.

In certain instances we have made the angular variation within the specified limit, and even with the governor made as faulty as is safe, the paralleling has been unsatisfactory. Our electrical associate does not say that perhaps his specification was faulty, but

*A paper read before the Engine Builders' Association of the United States, at the annual meeting held in Pittsburg, Pa., May 22 and 23, 1902.

insists that the variation is not within the required limits. Then there is a dead lock. We have had nothing to submit but calculations, and the electrical engineer holds that figures do not weigh at all, as against the observed electrical phenomena. We are now, however—thanks to Mr. P. O. Keilholtz, of Baltimore—on a firmer footing. Mr. Keilholtz has perfected a method of actually measuring the angular variation throughout the revolution, which method seems to give satisfactory and conclusive evidence of what actually occurs, and it is gratifying to note that the measured departures agree very closely in time and extent with the calculations.

This matter is set forth in a complete and interesting manner in a paper read by Mr. Keilholtz at the 157th meeting of the American Institute of Electrical Engineers in New York City, October 25th, 1901.

Knowing that the specified departure from uniform rotation does not always insure success, we are led to make inquiries as to just what is the object of this specification and to wonder whether it may not be faulty or incomplete, and whether it may or may not be subject to modification on account of varying electrical characteristics in different generators.

In a paper read before the meeting of the American Institute of Electrical Engineers above referred to it is stated in substance that the object of the specification is to limit the amount of cross current that can flow between the generators. With a displacement of one-seventysecond of the pitch angle between two poles, ahead or behind the position corresponding to uniform mean speed, two generators might be coupled together in parallel at the instant when the relative positions of the cranks of the two engines would be such that one generator would be the maximum distance in advance, and the other generator the maximum distance behind the position corresponding to uniform rotation. In this event, the two generators might have a maximum relative displacement of one-thirtieth of the pitch angle between two consecutive poles. With this displacement it is stated that the cross current will be 10-15 per cent of full load current, provided the electrical characteristics of the alternators are such that the short circuit current is $2\frac{1}{2}$ times full load current.

Now we find that for various reasons—constructional or otherwise—alternators are actually built giving short circuit currents as low as $2\frac{1}{2}$ times full load current, while others are known to give as much as six times full load current on short circuit, and all of these are supposed to come within the limits of standard representative practice.

If between the generators giving $2\frac{1}{2}$ times full load current on short circuit when displaced one-thirtieth of the pitch angle between two poles, the cross current is 11 per cent of the full load current, then the cross current between the generators giving six times full load current on short circuit when the phase displacement is one-thirtieth of the pitch angle between two poles—which displacement is allowable under the more liberal specification—would be a little over 31 per cent of the full load current—a ratio of nearly three to one.

If the amount of cross current allowable is a very important matter, it does not seem reasonable that the manufacturer of alternators should put out an invariable specification to cover the requirements of generators which differ so widely.

If 31 per cent cross current is allowable, why should the engine builder be burdened with the expense of making a fly-wheel to give a displacement which will cause only 11 per cent cross current? If, on the other hand, 11 per cent cross current is near the allowable limit, why should the engine builder be blamed when the generator builder furnishes machines that will give 31 per cent cross current with the specified displacement?

We are next led to inquire what is the effect of the cross current and we learn that it represents "synchronizing force" or the tendency of the generators to pull each other into step if the phases are displaced. We also learn that the force is such a percentage of the full load torque of one machine, as the cross current is of the full load current.

For example, in a generator having a full load capacity of 750 kw. which is approximately 1,000 electrical horse power—running at 100 revolutions per minute, the full load torque, or the resistance offered by the load would be approximately 10,000 lb. applied at a radius of 5 ft. 3 in.

With two such units in parallel, if the phase displacement is such that the cross current is 20 per cent of the full load current of one

machine, then the force tending to pull the machines into synchronism is equivalent to that of a spring tensioned to 2,000 lb., and connecting the two generators at radial points 5 ft. 3 in. from their respective centers.

If the total load of the two generators is 2,000 h. p., we may consider that with this amount of cross current flowing one generator is carrying 1,100 h. p. and the other only 900 h. p.; or that the resistance at 5 ft. 3 in. radius is reduced to 9,000 lb. in one generator and increased to 11,000 lb. in the other.

If the two generators are running in parallel without outside load, then with the same displacement we may consider that there is an actual magnetic attraction between the two machines equal to a force of 2,000 lb. applied at the radius mentioned.

We have been told that this synchronizing force is what makes paralleling possible and that the more we have of it the better; we are told that it checks the displacement of the rotating parts of the engine resulting from the irregular crank pin effort, and that with great synchronizing power in the generators, it requires a decided effort on the part of the engines to prevent the generators running well in parallel.

This looks so plausible that we have for years accepted it against the evidence of our senses, when in fact there is just one small grain of truth in it, i. e., that some synchronizing force is necessary to make paralleling at all possible.

Synchronizing force is not one of the few goods things one cannot get too much of.

Synchronizing force cannot pull two generators into phase and hold them there any more than the force of gravity can pull an ordinary pendulum to the vertical position and hold it there. If we displace an ordinary pendulum to one side of the vertical position and release it, the force of gravity tends to pull it to a vertical position and to resist its going beyond that position, yet were the force ever so many times as great as it really is, it could never bring the pendulum to rest without the intervention of some extraneous force like friction or the resistance of the air.

If we have two masses in space connected by a spring capable of extension and compression, and if we displace these masses with respect to each other so that the spring is under stress, these masses if released would approach and recede from each other forever if subjected to no other forces, the amplitude of the motion depending on the primary displacement, and the period on the relation between the spring force and the masses.

The action of the synchronizing force between the alternators is analogous to the action of gravity on the pendulum, or to the action of the spring connecting two otherwise free masses as in the illustration cited above. The synchronizing force tending to check the relative displacement between the generators exists only after the displacement has occurred; when the generators are in phase the force is nil, and consequently there is nothing to hold them there.

I believe I am saying something new when I make the assertion that in every practical case, the effect of the synchronizing force of the alternators is to increase the irregularity of the angular speed of engine instead of to diminish it.

On first consideration this proposition seems absurd, but nevertheless it is capable of being demonstrated practically as well as mathematically.

The matter first suggested itself to me some two years ago in connection with the paralleling of some alternators in which the synchronizing power was rather large. The synchronizing force in an alternator can be varied by increasing or decreasing the field current, and in consequence, the voltage of the machine, and in these particular machines which were of the two-phase type, the synchronizing force could also be greatly reduced by running the machines with only one phase connected in circuit.

Some difficulty was experienced with the paralleling at the start, and a rather extensive line of experimental work was undertaken in the endeavor to locate the trouble and to overcome it. Having a tank load available, these experiments could be carried out independent of the demands of the regular lighting service, and consequently we were able to observe the action of the machines over any desired range of load and voltage. It was found that when the generators were run in single phase, they would parallel very satisfactorily, but when the second phase was cut in, the cross current would increase and quite serious transfers of energy would take place between the machines. At that time it was authoritatively denied by electrical engineers of high standing that any two-phase

machine would ever parallel more readily on one phase than on both, now, however, I believe the fact is freely admitted.

It was also determined beyond question, that by lowering the voltage to 80 per cent of the normal—or in other words decreasing the synchronizing force 20 per cent, the action of the machines in parallel was not open to criticism, even when running with both phases connected up.

The repetition of these experiments a sufficient number of times to determine that the observed phenomena were not accidents, but were in accordance with some fixed law, made it quite apparent that at least over the range covered by the experiments, the difficulties in paralleling increased with the synchronizing force of the generators.

Irrespective of whether a correction of the trouble could be effected by decreasing the sensitiveness of the governor, or improving the turning moment of the engine, or doing both simultaneously the indisputable fact remains that with the original engine performance a variation of 20 per cent in the synchronizing power made the difference between success and failure in operating the generators in parallel, and this seems to indicate the utter fallacy of specifying the same characteristics in the engine for alternators in which the synchronizing force may differ by two hundred or even three hundred per cent.

The fact that the synchronizing force does, under all ordinary conditions, increase the angular variation in the engine may be shown theoretically in a general way without recourse to any abstruse mathematics.

Fig. 1 represents a typical diagram of crank forces in a single crank double acting engine. A, B, represents the path of the crank pin for one revolution, and the ordinates of the curve represent to some chosen scale the tangential pressure on the crank pin at the corresponding point in the revolution; the area included between the curve and the base line A, B, represents the work per revolution in foot pounds.

A, C=B, D represents the mean resistance of a uniform load reduced to the radius of the crank, and neglecting friction the area of the parallelogram A, C B, D also represents the work per revolution in foot pounds.

The shaded portions of the area included between the lines C D and the curve if above the line C D, represent in length the portion of the revolution in which energy is being stored up in the fly-wheel and in area, the amount of this energy in foot pounds. In like manner the shaded areas below the line C D represent the portion of the revolution in which the stored energy is being given up by the fly-wheel, and the amount of this energy.

While the crank is passing from E to G, the fly wheel is absorbing energy and its velocity is increasing. Consequently at G, after having taken up the last foot pound of available energy, the velocity will have reached a maximum, and will then begin to decrease from G to I while the wheel is giving up energy, becoming a minimum at I; similarly other maximum and minimum points will be found at L and E. By mechanical integration of the curve in Fig. 1 referred to the base line C D we obtain a second curve, Fig. 2. The ordinates of this curve measured from the base line A, B, representing uniform mean velocity indicate the velocity of the crank pin above and below the mean velocity. The scale of these ordinates depends on the mass and radius of the fly wheel.

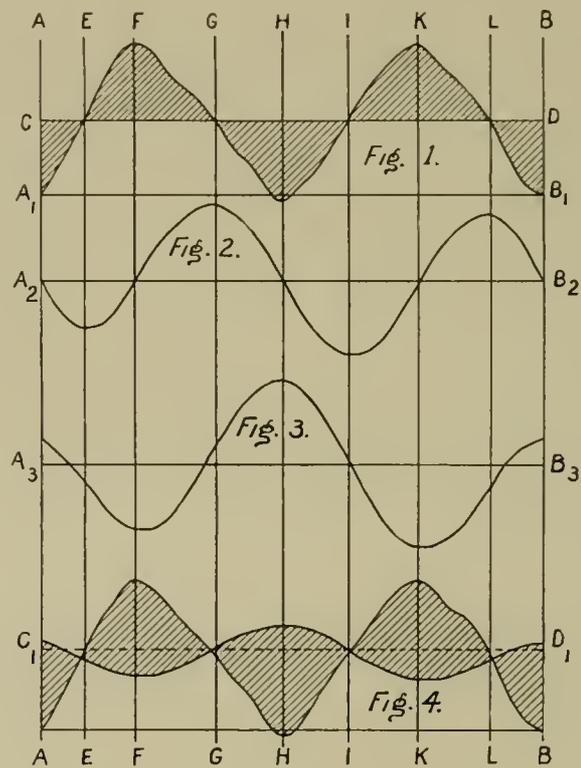
Referring to the velocity curve Fig. 2, it will be noted that the velocity is less than mean from A to F, and consequently at the end of this period, at the point F, the crank pin will be at a maximum distance behind the position corresponding to uniform angular speed. From F to I, the velocity is above the mean, and consequently at the point I the crank pin will be a maximum distance ahead of the position corresponding to uniform angular speed, and so on.

Integrating the velocity curve referred to the base line A, B, we therefore obtain a third curve, Fig. 3, the ordinates of which referred to a base line A, B, drawn midway between the highest and lowest points in the curve, represent the departure at any point in the revolution from the position corresponding to absolutely uniform angular speed.

It will be noted that the displacement curve, Fig. 3, and the curve of crank pin forces, Fig. 1, have a general resemblance in shape, in that each has the same number of nodes; but the nodes of one curve are directly opposite to those of the other. In other words, when the crank pin effort is above the mean and the surplus energy is accelerating the rotating masses, these masses are always behind the position corresponding to uniform angular speed, and when the

crank pin effort is below the mean and the rotating masses are being retarded, these masses are always in advance of the position corresponding to uniform angular speed.

Now let us consider the effect of the synchronizing force of the generators. For simplicity we will assume that the engine driven alternator is coupled in parallel with a number of turbine driven alternators running at absolutely uniform speed, and that the total mass of these alternators is such that the synchronizing force can effect no appreciable change in their velocity. Whenever the steam driven alternator is behind the position corresponding to uniform angular speed, the synchronizing force tends to accelerate the rotating masses, and whenever it is in advance of the position corresponding to uniform angular speed, the synchronizing force tends to retard the rotating masses. The intensity of these accelerating and retarding forces is represented at any point in the revolution by the ordinates of the displacement curve, the scale being proportional to the synchronizing power of the generator. It will therefore be readily seen that the synchronizing force acts in unison with the crank pin force. During the period of the revolution in which we have a



surplus of crank pin effort, this surplus is augmented by the synchronizing force, and during the period in which there is a deficiency of crank effort this deficiency is further augmented by the synchronizing force.

This may be shown graphically in Fig. 4, in which the crank effort curve is reproduced from Fig. 1 and the line of load resistance instead of being represented by a straight line is represented by a curve of the same general form as the displacement curve, indicating the change in load during the revolution, due to the synchronizing force. The shaded areas in this diagram illustrate the unbalanced forces resulting from the combination of the crank pin and synchronizing efforts. It will be noted that the unbalanced forces are very much greater than those due to crank pin effort alone, and as these unbalanced forces are the cause of the departure from the position corresponding to uniform angular speed, it is evident that whatever increases these unbalanced forces, will increase the variation from uniform speed.

The calculation of the exact amount by which the synchronizing force increases the displacement is a tedious and somewhat involved mathematical process. It is necessary to compute the displacement from the force diagram, and after finding the value for the synchronizing force, to construct a new diagram combining the two

forces, and compute the displacement corresponding to the new force diagram. This process must be repeated until no appreciable increase in the displacement curve is found.

As stated previously, the effect of the synchronizing force between the alternators is analogous to that of a spring capable of both extension and compression, and considered apart from all other forces, will produce an oscillation of the rotating masses, the period of which oscillation depends on the intensity of the synchronizing force and the magnitude of the masses.

The period of this oscillation has a very important bearing on the amount the angular displacement is augmented by the synchronizing force. With a period which I believe corresponds with the time of one revolution of the engine, the angular displacement seems to be increased indefinitely. As this natural period of oscillation is increased or decreased from the critical period, the effect of the synchronizing force on the displacement seems to decrease.

Of course if the synchronizing force were infinite, we would have the same effect as if the generators were solidly linked together, and the actual displacement would be the mean of the individual displacements of the several units in parallel, and would be less than that of any unit running independently. There is also perhaps a period of oscillation between the critical period, and an infinitely short period, which would not increase the displacement, and doubtless as the period decreases from the point, the displacement would decrease. I have however at the outset limited the general proposition to practical cases and these are not practical. The rotating masses must of necessity be of such magnitude that it is impracticable to have a synchronizing force sufficiently large to cause oscillations having a period much if any less than the time of one revolution.

I shall feel happy if I have succeeded in indicating a new line of investigation in connection with this troublesome problem, and shall be content to leave the investigation itself to those who are more able to carry it out to a finish.

I shall feel doubly happy if I shall succeed even in the smallest degree in making it plain to the electrical fraternity that the electrical, and the dynamic features in the case are so inter-related that real knowledge can come only when the electrical engineer and the mechanical engineer drop all petty differences and co-operate with each other in the most frank and hearty manner.

As long as one is expected to blindly and unquestioningly follow the dictates of the other, successful paralleling will be by accident rather than design.

The whole matter is one of compromise. Let it be freely admitted that the irregularities in the action of the engine do set up electrical disturbances. The reciprocating engine will always have an irregularity in angular speed and consequently electrical disturbances are inevitable. The engine builder can control the amount of this irregularity to a certain extent, but he is barred by constructional and commercial limits from reaching absolute perfection.

On the other hand, the electrical disturbances react on the engine augmenting the inherent irregularities in the latter, and the intensity of this reaction is within certain limits under the control of the electrical engineer.

It is therefore only when the engine builder and the electrical engineer each recognize the limits beyond which the other cannot go, and each endeavors honestly to make the task of the other as easy as possible, with due regard to the commercial excellence of the direct connected unit as a whole, that we may hope that the parallel operation of direct connected alternators will cease to be a subject for discussion.

PROJECTED ELECTRIC RAILWAY IN SPAIN.

A report from Consul General Julin G. Lay at Barcelona states that a royal decree of March 7th grants a concession to Don Teodoro de Mas y Nadal to construct an electric railway between the towns of Vich and Amer within the next six years. A memorandum of the project is filed in the Bureau of Foreign Commerce showing in detail the estimated cost of construction, the material required, water power available, and plans and profile of the road. The estimated capital for building this road is given at about \$1,200,000. This has not yet been subscribed but there is little doubt that Senor Mas will be successful in securing foreign capital for putting this road in operation. Contracts for this road will not be considered

until the capital for its construction is subscribed, but Consul Lay advises that manufacturers of electric railway equipment keep in touch with Senor Mas and communicate with him in Spanish at Vich, Spain.

KANSAS CITY NOTES.

A number of interesting changes have been made in regard to the Metropolitan Street Ry. since May 6th, when the new president, Mr. Bernard Corrigan, took charge of the company. One of these was the abolishing of all passes. Heretofore the company has furnished books of tickets to a large number of people, and while the outstanding books were not called in, all the books on hand were destroyed so that there are none to replace the old ones as they run out. No one is riding free in Kansas City now except employees of the company, policemen, firemen and charity nurses. This action has met with the approval of both the public and the press. Beginning June 5th a universal transfer system was inaugurated by the company. Transfers are given and received at every intersection of the line except where they would enable the passenger to "loop" back to his starting place. The new system adds somewhat to the transfer privileges heretofore enjoyed.

The merit system of discipline was put in effect on the Metropolitan line June 1st and a list of merits and demerits has been posted at each car barn with a notice explaining the operation of the system. So far the merits range from 1 to 50 and the demerits from 1 to 100. When a man is given several merit or demerit marks he received a slip in a sealed envelope telling him the time, place and date the accident occurred and the number of mark received. Another slip is posted at his reporting place giving the same facts but omitting the name of the man. When a man has received 100 more demerit than merit marks he is liable to discharge. This system is considered by both officers and men to be a great improvement over the "lay off" system which has previously been in force.

May 31st the employees of the Metropolitan remembered the former president and the general manager, Messrs. W. H. and C. F. Holmes, in a very pleasing way. During the afternoon of that day as many of the officers and employes as could be spared from their work assembled at the offices of Messrs. Holmes and presented each of them with a large group picture of all the officers and heads of departments of the company handsomely framed. The group contained 34 portraits, in the center of which were those of W. H. and C. F. Holmes, the retiring president and general manager, and around this were grouped all the other officers of the road. Many of the men had worked under the former management for more than 20 years. In addition to the picture they were presented with a valuable watch and fob, the latter being set with a large diamond. The recipients made proper replies to the presentation speeches and at times they displayed much feeling when referring to many pleasant instances of the past. The money for the purchase of the present was subscribed by the employes, and the gift was participated in by every one, from the highest to the most obscure positions.

WHEELING AS A TRACTION CENTER.

The city of Wheeling, W. Va., is rapidly becoming the center of a network of electric railways which radiate in a number of directions from this center. The lines which are built and building reach a population of over 100,000 people and include the Wheeling Traction Co. extension to Steubenville and a new line to St. Clairsville, the Pan Handle Traction Line now being built to Wellsburg and Lazeurville and the Wheeling and Elm Grove extension to West Alexander, Pa. The places reached by these lines include Wheeling, with a population of 46,000; West Alexander, 800; St. Clairsville, 2,500; Elm Grove, 800; Triadelphia, 500; Bellaire, 11,000; Bridgeport, 8,000; Shadyside, 500; Paltney Bottom, 500; Benwood, 6,000; McMechen, 2,500; Glendale, 300; Moundsville, 5,500; Martin's Ferry, 8,000; Tiltonville, 500; Short Creek, 100; Beech Bottom, 200; Wellsburg, 4,600; Warrenton, 500; Brilliant, 2,000; Mingo Junction, 6,000; Lazeurville, 1,000; Steubenville, 10,000.

Contracts aggregating \$500,000 have been awarded for the equipment required for the proposed street railway system at Dallas, Tex. The St. Louis Car Co. will furnish 20 cars, and the General Electric Co. the generators and electrical apparatus.

SECOND INTERNATIONAL TRAMWAYS AND LIGHT RAILWAYS EXHIBITION.

The second International Tramways & Light Railways Exhibition will be held at the Royal Architectural Hall, London, July 1st to 12th. The first of these exhibitions which was given under the auspices of the Tramway & Railway World was held in July, 1900. As announced at that time the utility of a well organized exhibition both to the street railway industries and the trade was suggested by the excellent service performed by the exhibition held annually by the American Street Railway Association.

Soon after the close of the first exhibition, which proved a most successful one, it was announced by the promoters that it would not be repeated for three years, but in the autumn of 1900 a new circumstance arose which led to the date of the second exhibition being fixed for July of the present year. An invitation was extended to the Union Internationale Permanente de Tramways by the promoters of the Light Railways Association to hold its twelfth biennial congress in London in 1902. The council of the Union expressed a desire that the tramways exhibition should be repeated at the time of the congress and on the assurance that this would be done if practicable, the invitation was accepted. The promoters of the exhibition found on communicating with a number of prominent manufacturers that the exhibition this year would be generally acceptable and the date was accordingly fixed for the early part of July; the four days' congress will take place on the first four days following the opening of the exhibition.

The success of this exhibition is practically assured, as previous to its public announcement, over 75 manufacturers had secured space for exhibits which included the greater part of the available space in the hall. Since the announcement of the exhibition the list of exhibitors has steadily grown and now comprises over 160 of the leading firms in the street railway industry.

The Permanent International Tramway Union has issued in advance of the meeting a book of 250 pages giving the response made by different member companies to the questions issued as a basis for the reports on current practice.

These questions coming up for discussion at this meeting are:

1. Transfers.
2. Standard and Narrow Gages for Rural Lines.
3. Correct Sizes of Motors and Generators.
4. Brakes.
5. Compensation for Franchises.
6. Obligations as to Paving.
7. Location of Stations.
8. Systems of Traction.
9. Ratio of Car Capacity to Traffic.
10. Central Stations.
11. Best System of Traction for Urban Lines.
12. Heating Systems for Cars.
13. Cost of Power.
14. Carrying Express, Baggage and Freight.
15. Fare Registers.

The first exhibition was recognized to have been the most successful business exhibition ever held in London, and that the second one will be found more successful is predicted from the fact that practically all of the exhibitors of 1900 have expressed their readiness to duplicate their exhibits in 1902, which involves much trouble and an expense by no means inconsiderable on the part of many of them. Both the daily and technical papers have expressed themselves favorably towards the undertaking and there is every reason to anticipate a highly successful affair.

Included among the partial list of exhibitors are the names of a number of American manufacturers, among which may be mentioned the Duff Manufacturing Co., Allegheny, Pa.; the Hale & Kiburn Manufacturing Co., Philadelphia, Pa.; the Ohmer Car Register Co., Dayton, O.; Ohio Brass Co., Mansfield, O.; Roebling's Sons Co., New York; William Wharton, Jr., & Co., Philadelphia, Pa. Mr. F. A. Estep, president of the R. D. Nuttall Co., will also attend the convention.

The official program of the Union Internationale Permanente de Tramways has been published and in addition to the discussion of the subjects mentioned heretofore a number of visits will be made for which invitations have been extended by street railways and other companies in London. The Tramways and Light Railways

Association of London has also tendered the Congress a banquet to be held on the evening of July 4th. The excursions which will be made by the delegates at the convention during the session include visits to the City & South London Ry., the Central London Electric Ry., the Waterloo & Baker Street Electric Ry., the London United Tramways, the London County Council Tramways and the Islington municipal lighting station. At the latter place the mayor and the officers of the corporation have invited the Congress to a breakfast tendered by the municipality.

Besides these excursions, invitations to visit the following places have been received: Messrs. Crompton's electric works, Bank Side electric lighting station, Westminster electric lighting station, Westminster hydraulic power station, Messrs. Siemens' electric works, Doulton's Pottery Works, the Mansion House, House of Parliament, Tower of London, Tower Bridge, etc. Carriage rides from London to Kew and to Richmond, and if time permits, an excursion on the Thames, will be arranged for certain evenings. There will also be arranged for July 5th an excursion to one of the great English industrial centers, probably to Wolverhampton, and the directors of the Dublin tramways have extended an invitation to Congress to visit the tramways and power house of that city.

NEW POWER PLANT FOR CHICAGO.

A plot of land containing over 616,000 sq. ft., situated on the south branch of the Chicago River between Morgan St. and Center Ave. has been purchased by the Commonwealth Electric Co., which proposes to spend from \$750,000 to \$1,000,000 this year and the same amount next year in the construction of the power house. Eventually the company expects to invest in the neighborhood of \$5,000,000 on this tract of land making in this locality one of the greatest electrical plants in the world. When completed it will contain machinery having a capacity of 100,000 h. p., which will be used partly for the Commonwealth Electric Co., and a large portion of it for the Chicago Edison Co., which is not able to keep up with the demand for current even with its present large equipment.

While the area of ground required seems an extraordinarily large one for this purpose, the experience of the Edison company has taught its officers the necessity for providing liberally in advance for future needs.

The machinery for the first 16,000 h. p. to be used in this plant has already been contracted for, and work on the site will be commenced as soon as the details of the business preliminaries are completed.

LOW FARES IN WHEELING, W. VA.

The Wheeling Traction Co. operates a short branch road running from Wheeling to what is known as Wheeling Island. It is a large island in the center of the river and has a population of about 7,000. The total length of this division is about a quarter of a mile. Mr. C. E. Flynn, general manager of the company, states that this road has probably the cheapest fare in the world as people are carried for one cent, or if they buy monthly tickets they secure 100 rides for 50 cents. The cars which operate on this division show a net earning of about \$16 to \$20 per day and after the summer traffic opens this amount will undoubtedly be somewhat higher. This division has only been in operation for about two months and as a result the bridge company which formerly charged 5 cents per round trip to walk over the bridge has been compelled to change its price and is now selling six tickets for 5 cents instead of two for 5 cents as heretofore; but as it is much easier to ride a quarter of a mile for one cent than it is to walk for the same price, it is probable that this reduction in fare will not interfere with the traffic of the cars to any extent. The railway company pays the bridge company about \$16,000 a year for bridge tolls.

The Chillicothe (O.). Mt. Sterling & Columbus Electric Ry. is now under construction, and progress is being made toward its completion. Isaac S. Cook is president of the company.

The United Railways & Electric Co., of Baltimore, is receiving the first consignments of the 110 new summer cars which have been ordered and will be put in commission of the Maryland Ave., Highlandtown and Dundalk lines.

SEMI-CONVERTIBLE CARS FOR A GREATER NEW YORK SUBURB.

The accompanying illustration shows one of a lot of cars now being received by the New York & North Shore Railway Co. from the J. G. Brill Co., of Philadelphia. This type of car, known as the Brill patented semi-convertible, has become so widely and favorably known as a suburban and interurban all year round car that it is not surprising to learn that nearly all the box cars in course of construction at the Brill company's shops are of that



BRILL CAR FOR SUBURBAN LINE.

style. It is a type which appeals to the public no less than the operators in that the car is always prepared to meet every change in the weather without going to the barn.

It is puzzling, even to an expert, to understand how large straight-glass windows are contained in the roof when not in use, without changing the appearance, inside or out, from that of a standard type car. Another feature that is hard to understand is the ease with which the windows are operated; their action is partly automatic, but so simple that it is next to impossible to get them out of order.

The length of these cars over the crown-pieces is 34 ft. 9 in.; width over the sills, 7 ft. 8½ in. and 8 ft. at belt. The interiors are finished in natural cherry with birch ceilings. Spring cane reversible-back seats for 36 persons are placed transversely.

Another lot of cars included in this shipment are 14-bench open, 39 ft. 4¾ in. over the crown-pieces, 6 ft. 9¾ in. wide over the sills, and 7 ft. 5 in. at the belt. All the cars include in their equipments the following Brill patented specialties: Angle iron bumpers, Dedenda gongs, radial drawbars and ratchet brake handles, and the open cars have round-corner seat-end panels. The trucks are Brill "Eureka" maximum traction which carry the car bodies as low as four wheeled trucks.

MOVING PLATFORMS FOR THE BROOKLYN BRIDGE.

Mr. Julien T. Davies, of the firm of Davies, Stone & Auerbach, attorneys of New York City, has made a proposition to the city of New York on behalf of the Multiple Speed & Traction Co., of Chicago, for the installation of a moving platform on the Brooklyn Bridge and other bridges across the East River. The proposition has been referred to the New York Rapid Transit Commission which now has it under consideration. Arguments in support of the proposition have been made by Mr. George S. Morison, the eminent civil engineer, and Mr. Walter D. Edmonds, a prominent patent lawyer of the city of New York. The chief engineer for the Multiple Speed & Traction Co. is Mr. Max E. Schmidt.

AMERICAN PRODUCTS FOR EUROPE.

In the rebuilding of the Royal Warehouses in Antwerp, Belgium, the Belgian Government has awarded to the Kinneer Manufacturing Co., Columbus, O., the contract for 422 "Kinneer" steel rolling doors. As this group of warehouses is considered one of the finest in Europe, the award to an American firm may be considered another instance of the progress of American standards.

NORWALK HOLLOW TROLLEY WHEEL.

The accompanying illustration shows the hollow trolley wheel now being placed on the market by the Norwalk Brass Co., of Norwalk, Conn.; special attention is directed to the large oil receptacle provided by making the hub hollow between the bearings. The company is also an extensive manufacturer of solid wheels. It makes a specialty of properly inserted bushings, and standard bearings and an excellent non-friction Babbitt are at all times carried in stock. The Norwalk Brass Co. has a special process for



NORWALK TROLLEY WHEEL.

making brass, aluminum, phosphor, Tobin and manganese bronze, and does a large business in rough and finished castings for marine and stationary engines, launches, automobiles, etc.

DELANEY CHEMICAL FIRE EXTINGUISHER.

The Delaney Oil & Lubricant Co., of Milwaukee, Wis., calls attention to the "Delaney" fire extinguisher which has proved to be very effective and is highly recommended by those who have used it. This extinguisher consists of a metal tube 2 in. in diameter and 22 in. long filled with a dry powder. At the upper end is a cover having a ring for hanging the extinguisher at the most convenient point; when needed the tube is pulled away from the cover and is ready for use.

The chemicals with which the tubes are filled, when thrown with force into the fire, produce gases which do not support combustion and the fire is blotted out, so to speak. In case of a chimney fire the powder is thrown on top of the fire in the stove and the gases generated pass up the chimney, extinguishing the fire; in kettle fires the powder is thrown on the surface of the burning fluid, and is particularly successful in this class of fires where the use of water or other fluids would increase the danger by spreading the fire.

The fact that the powder used is neither poisonous, explosive or corrosive is urged as an advantage when this device is compared with extinguishers using liquids.

Mr. J. H. Lancaster, secretary of the Fairmont & Clarksburg (W. Va.) Electric Railroad Co., advises us that the company expects to complete its 28 mile interurban by August 1st. Two power houses will be erected and two 400 kw. Westinghouse generators installed. The Jewett Car Co., Newark, O., will furnish the cars. The Fairmont & Clarksburg company obtained its charter in June, 1900. It has an authorized capital stock of \$1,000,000, of which \$500,000 has been issued. Eight miles of the proposed system are in operation, a part having been opened for traffic in May, 1901, and another in April, 1902.

REMODELED DIRECT CONNECTED UNITS.

The Chicago City Railway Co. is preparing to change two simple Green-Whelock engines, built originally for cable service, so they can be used for driving two 650-kw. General Electric railway generators. Each of the two engines, which were formerly parts of a twin engine, will be fitted with an 80,000-lb. fly wheel and a 21-in. hammered iron shaft, the generator being mounted directly on this main shaft. The engines have cylinders 32x60 in. and are rated at 1,250 h. p. at 80 r. p. m. taking steam at 125 lb. It will be noticed that the generators are considerably smaller in capacity than the capacity of the engines, but this arrangement was made necessary by the small diameter of the main engine bearings, these being but 17½ in., and it was feared heavier generators would cause trouble in these bearings. The engines were built to run 60 r. p. m. when geared to the cable machinery, but the speed will be increased to 80 r. p. m. for this directly connected electric service. All the parts necessary to effect the change will be supplied by the Filer & Stowell Co., of Milwaukee. The remodeled units will be installed at the 21st and Dearborn St. power house of the Chicago City Ry.

DOUBLE DECK STEPHENSON CAR.

The double deck closed car illustrated herewith is one of a number recently shipped by the John Stephenson Co. to Cheltenham, Eng., and is a modification of a type which is very popular in that country. It will be noticed that the stairways are reversed and enclosed so that in descending the passenger is entirely protected and cannot be thrown from the car as is possible when the stair faces outwards. The stairway has steel steps and a bronze hand rail and this arrangement is such as to form an efficient brace for the roof. It effectually prevents the longitudinal swaying which is noticeable in cars of this class. The design for the body frame is considerably stronger than that of the regular English type. There are four windows on each side with three large window posts. This strengthens the roof and makes a much stiffer construction than the old style which has only two windows and but one post between the corner posts. The bottom frame is of oak throughout



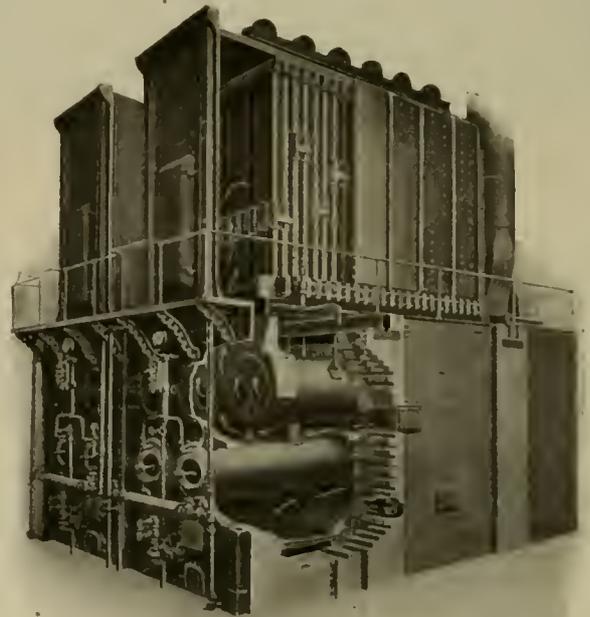
STEPHENSON CAR FOR CHELTENHAM, ENG.

finished with brass tie rods and corner irons. An iron dasher extends around the front of the platform and is connected with the body by a piece of grille work. The roof has a seating capacity for 26 passengers and the lower deck seats 20 passengers. Garden seats are used on the roof. These are made of slats with a single bar back and are of the Kling patent reversible style, arranged so that a dry surface is always available for the passenger. This is of importance in a climate like that of England where rain is frequent and the seats are without protection. The interior seats are longitudinal and are upholstered with springs and hair and covered with crimson plush. The interior finish is hand carved mahogany and the moldings throughout are carefully rounded so as not to collect dust. The trimmings are of bronze and the sash have bronze stiles with mahogany rails. The windows are all of polished plate glass;

the curtains are of the spring roller pattern and on each window post are buttons for signalling the conductor. Alarm gongs and signal bells are placed on each platform and the cars are also provided with sand boxes and electrical head lights. The window panels are decorated with the coat of arms of the city of Cheltenham, while the name of the company fills the lower panels.

THE AMERICAN WATER TUBE BOILER.

A novel combination of small steel shells with the ordinary fuel economizer is here made to form a water tube boiler occupying comparatively small floor space and possessing many features for which considerable superiority is claimed over other well known types. The illustration shows the arrangement of a double-deck boiler, the two lower and smaller shells without tubes of any kind, the upper one with two tubes located below the water line, and the



TWO 250-H. P. BOILERS IN BATTERY.

whole surmounted by an American fuel economizer through which the gases pass on their way to the chimney. A diaphragm of fire-brick located immediately above the lower shells places the latter in an envelope of the hottest gases directly above the fire and forces the gases to traverse the full length of these shells before passing upward and forward along and around the upper shell. The lower shells are entirely filled with water, the water line, as already noted, being about midway of the upper shell, above the flues. The absence of tubes obviates some of the usual difficulties experienced in tubular boiler maintenance, and the small size of the shells affords greater strength or thinner plates for equal pressures.

The gases of combustion passing to the chimney through the economizer tubes give up much of their heat and reach the uptakes at a very low temperature. The feed water enters at the rear and becomes heated as it flows through the tubes toward the front; thus the gases encounter progressively colder surfaces on their passage through. The greater portion of the total heating surface is in the economizer tubes, and the water reaches the boiler shells at a very high temperature. The economizer tubes are of cast iron, kept clean by the usual automatic scrapers. The scrapings fall into steel pans, which may be flushed out at intervals as required.

The whole boiler is suspended independently of the brickwork on steel beams and columns, suitable castiron fronts are provided, and the usual facilities for access to all parts are given proper attention.

At present the sizes made are of 250 and 300 h. p. The maker is the Bromell, Schmidt & Steacy Co., York, Pa.

MINIATURE RAILWAYS AT THE CHARLESTON EXPOSITION.

At the recent Charleston Exposition the lilliputian railways installed by the Miniature Railway Co. undoubtedly comprised one of the most popular attractions and best-paying amusement features on the grounds. The routes touched all points of interest from the Sunken Gardens and the Court of Palaces to the headquarters for hoky-poky, and patrons found these baby trains an indispensable convenience as well as a joyful novelty in the manner of transportation. The outfit consisted of locomotive and tender, with a total length of 9 ft. 6 inches, weighing 1,200 lbs., and cars 6 ft. long and



MINIATURE RAILWAY AT THE CHARLESTON EXPOSITION.

24 in. wide, weighing 125 lbs. each, all as complete in detail and as business-like in aspect as a transcontinental express. The difference, and that's in favor of the Lilliput, is that on this ideal system there are no baggage-men to ladger one, no porters that one must tip, nor any man with a megaphone voice to assail one with magazines and samples of chewing gum. Not since the days of Lohengrin's swan boat and Cinderella's pumpkin coach has a conveyance been invented which, for the fun of the thing, so completely fills the bill.

The Miniature Railway Co., whose address is at 301 Broadway, New York, has issued a catalog giving full descriptions of its various types of diminutive railways and pictures showing them in operation in many of the famous parks throughout the world. The company's exclusive specialty is the manufacture of light steam locomotives of every size and variety of design for any practical gage of track, wide or narrow. The locomotives are well adapted for industrial purposes where ordinary locomotives are unsuitable or too expensive. The logging railroads installed by the Miniature Railway Co. annually haul timber enough to denude 500 square miles, and are generally in use in the southern Atlantic and Gulf states, the northern lake districts and on the Pacific coast.

WHALOM LAKE AND PARK.

The Fitchburg & Leominster Street Railway Co. has published a handsomely illustrated pamphlet called the "Whalom Book," which presents typical pictures of Whalom Park, descriptions of which have been published in former issues of the "Review." The scenery in this park is unusually beautiful and the story of the park is well told by the series of illustrations which the book contains. The company takes great pride in the theater which it has operated for several years and the manner in which it is conducted. At present light opera, sung by the Whalom Opera Co., with a change of bill weekly is the attraction offered, and special attention has been paid to novel scenic effects. The popularity of this form of entertainment shows no sign of diminishing and considerable space in this book is devoted to showing the theater and stage settings, which are very elaborate.

The General Assembly of Virginia has passed a bill making it unlawful to expectorate or spit on any part of any street car in that state and providing a penalty of not less than \$1.00 fine nor more than \$10.00 for each offence.

AMERICAN POWER BRAKES FOR ST. LOUIS.

After operating its brake for three years on the lines of the Memphis Street Railway Co., and thus demonstrating the good qualities of the device, the American Power Brake Co., of Memphis, Tenn., secured a trial order from the St. Louis Transit Co., equipping six cars. After a thorough test the St. Louis Transit Co. decided to adopt the brake and made a contract for the equipment of the system, and the brake company is now placing the brakes on the cars. The American Power Brake Co. announces its willingness to place brakes on trial, being confident that a service test only is needed to bring out its advantages.

THE SUCCESS OF VAN DORN COUPLERS.

The W. T. Van Dorn Co., Monadnock Block, Chicago, is now filling orders for couplings from practically every state in the United States and also from several foreign countries. The Van Dorn coupler has come to be to the street railway what the M. C. B. coupler is to steam railroads, and the company stands prepared to furnish an automatic coupler for any condition or combination of conditions that can possibly arise in electric, cable or elevated railway practice.

Aside from filling contracts for Van Dorn couplers for standard street railway service the company is now working on orders for the Manhattan Elevated Ry., on which road Van Dorn couplers will be used exclusively; the Boston Elevated Railway Co., which called



NO. 5 VAN DORN COUPLER.

for a very special design in order to give perfect flexibility combined with great strength; the Chicago elevated roads and others. Mr. Van Dorn expects to announce shortly several other large orders from new companies for couplings for special service. A noteworthy feature in the making of these automatic couplers is the extreme care used in the finishing, all parts and surfaces being machine finished and fitted.

The accompanying illustration shows the Van Dorn coupling No. 5, which is the one most extensively used on city and interurban roads.

A race between an interurban electric car on the lines of the Union Traction Co. of Indiana and a train on the Big Four "Southwestern Limited" recently, resulted in a decided victory for the former. The race was over a six-mile stretch between Anderson and Indianapolis, and the distance was covered by the electric car in a fraction less than seven minutes.

PERSONAL.

MR. C. E. FLYNN, general manager of the Wheeling Traction Co., was a recent caller at the new offices of the "Review."

MR. J. M. CROMBLY has been elected secretary and treasurer of the Danbury & Harlem Traction Co., of Danbury, Conn.

MR. HENRY BERND has resigned as president of the Danbury (Conn.) & Harlem Traction Co., and will be succeeded by Thomas F. Barrett.

MR. W. A. SATTERLEE, general superintendent of the Metropolitan Street Railway Co., of Kansas City, has been appointed assistant to President Corrigan.

MR. F. A. ESTEP, president and treasurer of the R. D. Nuttall Co., of Pittsburg, will leave for England on June 20th to attend the Framway Convention to be held in London July 1st to 4th.

MR. GEORGE HENRY BOWERS, Secretary of the Peckham Co., New York, was on June 4th married to Miss Eula Constance Godfrey, daughter of Mr. and Mrs. William L. Godfrey, of Brooklyn, N. Y.

MR. SOL JAMES has been promoted from the position of superintendent of the 18th Street Division of the Metropolitan Street Ry. of Kansas City to second assistant general superintendent of the company.

MR. W. E. HAYCOX on June 1st resigned his position as general manager of the Ohio Central Traction Co., of Galion, O., and is spending some weeks at Magnetic Springs, taking a much-needed rest. Mr. Haycox has no intention of retiring from the street railway business, but found that a vacation was imperative.

MR. WILLIAM TYSON GOOCH, formerly of the firm of Harding & Gooch, architects, announces the dissolution of this firm and his association as a partner with the firm of Charles Henry Davis & Partners, to continue the practice of architecture.

MR. C. V. MILLS, formerly of Battle Creek, Mich., has assumed the duties of superintendent of the West Chester (Pa.) Street Railway Co. Mr. Mills has had many years' experience in the street railway field. He will supervise the construction of a number of extensions of the West Chester system.

MR. RODNEY CURTIS has resigned as president of the Denver City Tramway Co. and will spend the summer with his family in Europe. Mr. Curtis continues as a director and large stockholder in the Denver company. He will be succeeded as president by W. E. Evans, secretary of the company.

SENATOR NELSON W. ALDRICH has resigned as president of the United Traction & Electric Co., of Providence, R. I., and will be succeeded by B. A. Jackson, a member of a local banking firm. Senator Aldrich is reported to have accumulated over \$1,000,000 during the past six years through the rise in the value of his holdings of the United Traction & Electric Co.'s stock. This stock had no apparent market value nine years ago, but is now quoted at \$121 per share.

MR. W. R. W. GRIFFIN, who recently resigned as chief engineer and superintendent of motive power of the Lake Shore Electric Railway Co. of Cleveland, has been chosen electrician and superintendent of construction of the Rochester (N. Y.) & Eastern Ry. Mr. Griffin was formerly chief engineer of the Toledo, Fremont & Norwalk Ry. He was presented with a handsome gold watch by his associates on his departure from Cleveland.

MR. E. C. FABER, who recently retired from the general superintendency of the Cleveland Electric Railway Co., was presented on the eve of his leaving Cleveland with a loving cup by the employes of the road, who entertained for him the most cordial admiration and respect. The presentation ceremonies were held in a hall rented for the purpose, and were witnessed not only by all the

employes of the street railway system, but by many of Mr. Faber's friends in the management of the company. Mr. Faber is believed to be the youngest man holding a position of equal importance with any street railway in the country.

MR. EUGENE CHAMBERLIN has resigned as superintendent of equipment of the Brooklyn Heights Railroad Co., a position which he has held for the past three years and in which he has accomplished much toward standardizing the electrical and mechanical equipment of the company's rolling stock. Mr. Chamberlin was formerly in the service of the New York Central & Hudson River R. R. as master car builder of the Western Division for eight years. Since assuming the duties of superintendent of equipment of the Brooklyn Heights Company, he has introduced many innovations in the reorganized 52d St. shops, whose modern methods and improved equipment are largely owing to his effort. A number of his combination cars of a novel type, furnished with individual revolving seats, are now in service on the Brooklyn lines and are giving general satisfaction. In leaving the Brooklyn Heights company Mr. Chamberlin will continue in this business, but his plans have not, however, been definitely announced.

MR. GEORGE B. FRANCIS, who, since January, 1900, has been chief engineer of the street railways at Providence, has resigned this position to engage in the capacity of civil engineer with Westinghouse, Church, Kerr & Co., of New York City. In 1874 Mr. Francis entered the engineering department of the city of Providence, spending eight years in municipal work. He subsequently became connected with the engineering department of the West Shore R. R. and has been identified with the construction work undertaken by the Oregon Railway & Navigation Co.; the Northern Pacific Ry. and the Northern Pacific Terminal Co., of Portland, Ore.; the New Jersey Junction Ry., the South Pennsylvania R. R. and the New York Central & Hudson River R. R. As consulting engineer for the Third Avenue Railroad Co. of New York City, Mr. Francis designed the foundation for the company's Kingsbridge power station, which will be remembered as an engineering problem of considerable difficulty. From 1887 to 1892 he was principal assistant engineer of the New York, Providence & Boston R. R., and later, as engineer of the Terminal Company of Providence, designed and arranged the terminals in that city. Mr. Francis is a director of the Boston Society of Civil Engineers and a member of the American Society of Civil Engineers, and the Institution of Civil Engineers of Great Britain.

Capt. W. H. Lanius was born at Flushing, L. I., Nov. 26, 1843, and is of German extraction on his father's side; his mother's family was French Huguenot stock. His father's ancestors settled in eastern



W. H. LANIUS.

Pennsylvania as far back as 1731. Capt. Lanius removed to York, Pa., at an early age, and grew to his education in the York County maturity in that city. He obtained Academy and other private schools, and after completing his studies, embarked on a business career which has been marked with distinct success. At the age of 17 he enlisted in Company A of the 87th Pennsylvania volunteers and was advanced by successive promotions, receiving his commission as captain June 26, 1864; in October of the same year he was mustered out of service. He participated in many of the battles of the Civil War in all of which he proved himself a brave soldier and gallant officer. After returning from the war he was made a special officer of the United States Treasury Department and in 1865 he resigned this position to engage in the wholesale and retail lumber business, with headquarters at York and Williamsport, Pa. By 1884 he became convinced that the city of York was destined to become a large manufacturing city although at that time it had always been classed as an agricultural district. Capt. Lanius then turned his attention to the development of a number of interests in York and its surroundings. He became the chief promoter of the

West End Improvement Co. of York, an organization which in 1890 became the present York Trust & Real Estate Deposit Co. As the functions of this corporation include the buying and selling of real estate a large tract of land was purchased in the western part of the city and steps taken towards its improvement. In addition to laying out this section into lots and the erection of many handsome suburban residences Captain Lanius decided that it would be necessary to have a street car line to bring this section into closer relation with the central part of the city, so in 1886 he organized what is known as the York Street Railway Co. He was chosen president of the company and he proceeded to develop the system which now traverses all of the principal streets of the city in addition to forming a loop around the outside of the town. A number of other charters have since been granted to this company which is now extending its lines to the various hamlets and villages throughout York county. All of these lines owe their origin to Captain Lanius. He is also president of the Baltimore Harrisburg Railroad Co., a trustee of the old York County Historical Society, the first president of the Board of Trade organized in 1886 and a member of the York Lodge of Free Masons. He is also a prominent member of John Sedgwick Post of the Grand Army of the Republic and was its first commander, and he is a member of the Loyal Legion. In politics Captain Lanius has always been affiliated with the republican party and for a number of years has been recognized as one of the foremost republicans in York county as well as in the state. He was a national delegate to the convention nominating James G. Blaine for the presidency. Captain Lanius leads a very active business life and to him is due the organization of many of the successful business enterprises which have placed York in its present rank as a business center. He is a man of fine social and intellectual qualities and of courteous demeanor and has won many friends not only in York but throughout the state of Pennsylvania. He was married in 1867 to Miss Lucy Smyser, daughter of the late Michael Smyser, of York, and has a son and two daughters.

OBITUARY.

COL. C. C. HOWELL, general manager of the Knoxville (Tenn.) Traction Co., died Wednesday, May 7th, at Phoenix, Arizona, where



C. C. HOWELL.

he had gone in a vain attempt to stay the progress of a wasting disease of long standing. Mr. Howell was one of the oldest and most prominent street railway men of the South, and was one of the foremost business men of the state of Tennessee. He was essentially a man of action. Born in a small city of New York state in 1848 he started west at an early age and soon laid the foundation for a comfortable fortune, a considerable portion of which he invested in the street railway and electric lighting properties of Knoxville, Tenn. He went to Knoxville in 1895 and before his death he had brought three rival street railway companies and the electric lighting plant under the control of common interests and had given to the city of Knoxville a lighting and transportation system unsurpassed by any other property of equal size in the South. He was an active member of the Knoxville Chamber of Commerce, one of the founders and a vice-president of the city hospital, an ex-member of the state legislature and a director of several private commercial and financial enterprises. He leaves a wife and two daughters.

MR. WALTER V. CROUCH, secretary of the New Orleans & Carrollton Railroad Co., died May 16th last. Mr. Crouch had been identified with the New Orleans property for 27 years.

MR. GASTON MESSEUR, traffic manager of the Grand Rapids (Mich.) Grand Haven & Muskegon Railway Co., died at Grand Rapids June 8th, being stricken with paralysis while at dinner. Mr. Messer had assumed the duties of his new position but ten days pre-

vious to his death. He was 55 years of age, and before coming to Grand Rapids had been for a number of years assistant general passenger agent of the Missouri Pacific Ry.

MR. JAMES F. MANN, who since 1885 has been prominently identified with the development of the electric railway systems in Utica and vicinity, and who was, until a year ago, president and manager of the Utica & Mohawk Railroad Co., died recently at his home in Utica. Mr. Mann was one of the organizers of the Wood & Mann Steam Engine Co.

STRIKES OF THE MONTH.

At midnight on June 3d the employes of the United Traction & Electric Co., of Providence, R. I., went out on a strike, the immediate cause of which was the determination of the company to secure an adjudication as to the constitutionality of a 10-hour act applying to street railway companies, which was passed by the last Legislature, before complying with its terms. The demands made by the men included a specific observance of the 10-hour law, that all employes now receiving more than \$2.25 a day shall continue to have the same wage for 10 hours' work; that all others be paid 20 cents an hour for 10 consecutive hours the first year, and 22½ cents an hour thereafter; that all employes other than gripmen, motormen and conductors, whether in the car houses, repair shops or power houses shall be employed not exceeding nine hours a day and have the same pay given them, and that all work more than 10 hours shall be at the rate of 25 cents an hour.

The strike tied up practically all the street railways in Rhode Island.

On the night of June 5th there was much disorder and rioting, but on the following day the company was prepared to operate half of its cars.

The refusal of the city authorities to provide adequate police protection for cars resulted in such disturbances that on June 12th state militia were ordered to Pawtucket to restore order.

June 4th the trainmen of the Sheboygan (Wis.) Light, Power & Railway Co. struck for higher wages, and all rolling stock except mail cars were tied up.

At Oil City, Pa., the Citizens' Traction Co. on June 14th withdrew its cars from service and announced that no regular schedules would be followed until the public sentiment in regard to the boycott changed.

At Chicago the Amalgamated Association of Street Railway Employes has organized unions among the men of both the Union Traction Co. and the Chicago City Ry. The companies agreed that so long as no attempt was made to restrict their action in selecting men and dealing with employes, there would be no opposition to the organizations on the part of the company.

IMPROVEMENTS AT NEW ORLEANS.

The St. Charles Street Railroad Co., of New Orleans, shows the following results for the first five months of 1902: Gross receipts from fares, \$136,843; operating expenses, \$88,411; net earnings from operation, \$48,432; other income, \$1,954; gross income, \$50,386; deductions from income for taxes, interest, etc., \$14,183; net income for five months, \$36,203, which is at the rate of 9 per cent per annum on the present capital of \$553,300.

The company was organized in 1866, and having recently secured an extension of its franchises until 1956, has undertaken improvements that will cost about \$200,000. It now has 18 miles of track and will build 4 miles more, using 90 and 93-lb. rails; 78 cars are now operated.

The officers of the company are: President, Albert G. Phelps, and secretary, Charles J. Macmurdo; the engineers are Coleman & Maloche.

The Boston & Worcester Street Railway Co. expects to complete its line from Boston to Frammingham by September 1st, and to open the route between Boston and Worcester by October or November. The company has a capital stock of \$750,000 and will probably issue \$750,000 of 4½ per cent first mortgage bonds. The road will cost approximately \$1,500,000.

TRUCKS FOR HIGH SPEED INTERURBAN SERVICE.

One of the most interesting electric railway undertakings in the United States is that of the Aurora, Elgin & Chicago Railway Co., which will probably have the main portion of its line in operation by July 1st. This road belongs to the recently developed class of electric railways which as yet has been given no distinctive name, and has all the distinctive operating features of a steam railroad

The trucks on which the high speed cars will be mounted constitute a very important part of the equipment, and the accompanying illustrations and description will be of general interest. These trucks were built by the Peckham Manufacturing Co., of New York, and are known as the M. C. B. No. 30, and were designed expressly for high speed interurban, elevated or trunk line service.

The side frames combine the equalizing bars used in the Standard Master Car Builders' steam passenger car trucks with that of the diamond frame used in the M. C. B. freight car trucks, the idea of

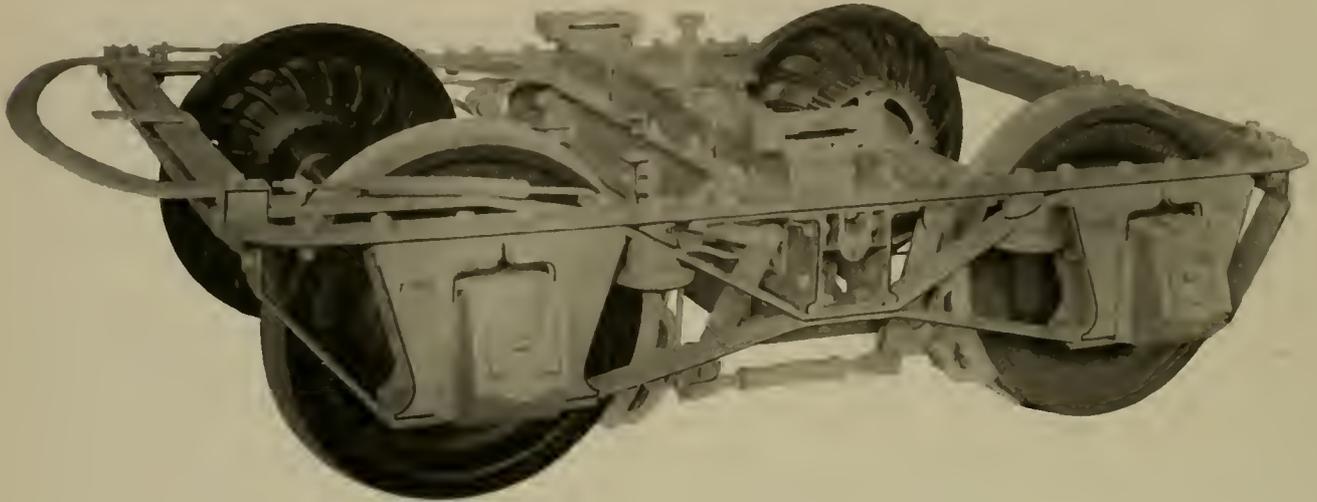


FIG. 1 PECKHAM'S M. C. B. NO. 30 TRUCK WITHOUT EQUALIZERS.

except the motive power. There are double tracks built the entire distance, except in towns, over private rights of way; the track rails weigh 80 lbs. per yard and the third, or conductor, rail, which is used for conveying current to the cars except in Aurora, weigh 100 lbs. per yard.

The line connects with the Metropolitan Elevated, of Chicago, at West 52d St., where there is an incline leading to the elevated structure, and thence west to Wheaton the distance is about 18 miles; at Wheaton the road forks, one branch extending northwesterly to Elgin, a distance of 14 miles, the other running south-

this combination being to give a double factor of safety, as the diamond frame alone is sufficiently strong to carry the weight of the car without the aid of the equalizing bars, which are arranged in pairs, one each side of the pedestals. To prevent the tilting of the top frames, an objectionable feature in the Standard Master Car Builders' steam railway trucks, the spring base of the truck is increased by locating helical springs each side of the journal boxes and supported from them by saddles. These pedestal springs carry a sufficient portion of the load to prevent the tilting of the top frames, the greater part of the load being carried by the equalizing

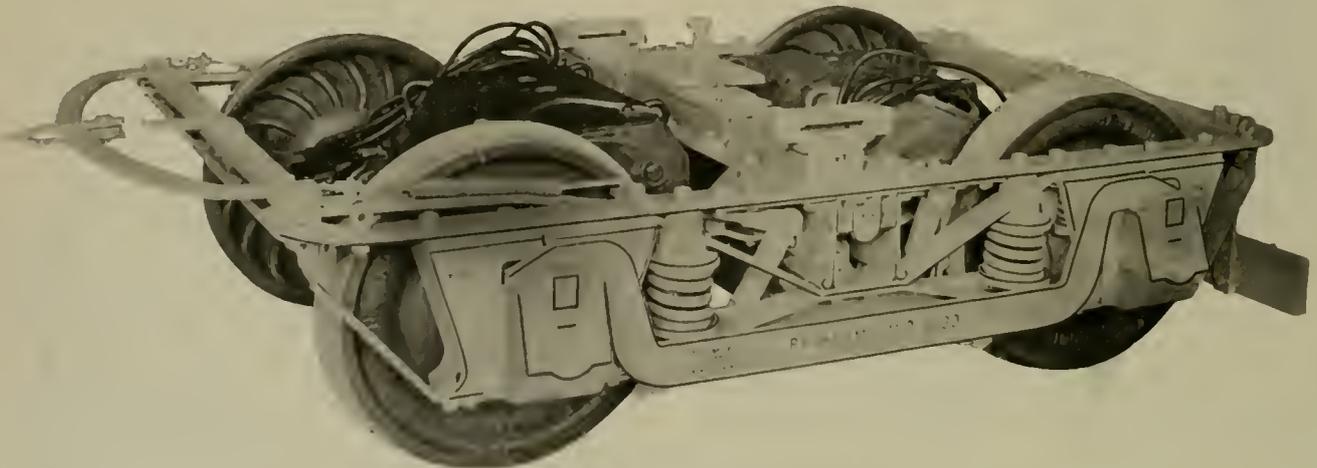


FIG. 2 M. C. B. NO. 30 TRUCK FOR AURORA, ELGIN & CHICAGO.

westerly to Aurora, about 12 miles; there is also a 5 mile branch to Batavia. The right of way is fenced except at highway crossings, and at these points the conductor rail is broken, the sections being connected by underground cables.

It is thus apparent that the physical conditions are such as to permit high speed, and the plans contemplate a schedule of 40 miles per hour, including stops, with a maximum of 65 miles per hour. It is understood that soon after the opening of the line experiments will be made at speeds up to 100 miles per hour.

bar springs. The side and end portions of the top frame are all in one piece, a forging, which insures the trucks always remaining square. The transoms are bulb angles 10 in. deep, which extend full size with the side truss frame to which they are very rigidly secured. Gussets of sheet steel connect the transoms to the side frames hold the frames rigid and square.

Peckham's patent swing bolster is used in this truck. It is constructed of plates in form of a channel 10 in. deep and is carried on four long coil springs and one elliptic spring which support the

bolster from the inside at its top, so as to hold it securely in a vertical position. Straps secured to the transom and extending over the bolsters prevent its being lifted out. The king pin is so secured that the car body cannot be lifted off the truck. The swivel plates are large in diameter, machine fitted, with a boss around the king pin which prevents the escape of the lubricating grease.

The arrangement of bolster springs, i. e., an elliptic in the center and two long helical springs at each end, is designed to give a much easier riding car than the old form of bolster used in steam cars, and it can be more easily regulated so as to prevent rolling motion of cars when running at high speed.

The journal boxes are the M. C. B. standard pattern with standard M. C. B. journals. The axles are 6½ in. in diameter, and the wheels 36 in. in diameter, with 4¼-in. tread and 1-in. flanges. The pedestals are made of cast steel, machine fitted where they come in contact with the journal boxes and top frames; all bolts are

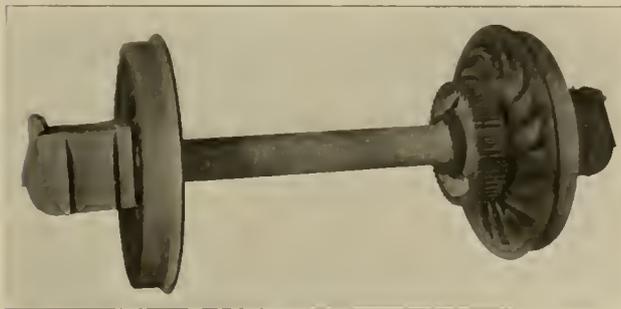


FIG. 3—AXLES AND WHEELS.

machined to size and are driven in reamed holes so as to tie the parts of the truck rigidly together.

The brakes are constructed with shoes on the inside of the wheels and can be easily adjusted to the wheels without placing truck over a pit.

Fig. 1 is an open view of the truck showing the diamond shape side frames and the brake mechanism without the equalizing bars. Fig. 2 is the truck complete with two G. E. 66 motors, 125 h. p. each, mounted; the fittings for the third rail contact are on the side opposite to that shown. Fig. 3 is a view of the wheels and axle used on the Aurora, Elgin & Chicago equipment.

The Peckham company builds the M. C. B. No. 30 truck in three different weights to meet varying conditions of service: Light weight, with 33-in. spoke wheels and 5-in. axles, 7,250 lb. Medium, with 33-in. double plate wheels, 6-in. axles, 8,600 lb. Heavy, with 36-in. double plate wheels and 7-in. axles, 10,350 lb. each.

We have just been advised that the Peckham company has received an order for 64 trucks of this type, with slightly modified bolsters, for one of the London underground roads.

CHICAGO FRANCHISE SUIT.

As was noted in the "Review" for May, the United States Circuit Court on May 8th sustained the demurrer of the city of Chicago to the bill in equity filed June 25, 1901, by W. L. Elkins of Philadelphia, to test the validity of the so-called 99-year act as affecting the street railway franchises of Chicago. Two amended bills were filed on behalf of Mr. Elkins, May 12th. The court dismissed the amended bills June 4th on the same technical grounds as those given when the original bills were dismissed. A decision which will permit a presentation of arguments on the merits of Mr. Elkins' cases is still hoped for, and the question of jurisdiction will be taken to the United States Supreme Court.

The Chicago & Milwaukee Electric Railway Co., in building a spur from Lake Bluff to Libertyville, offered to pay one farmer who opposed the route \$1,000 for the privilege of crossing his land. The man demanded \$3,000, which was exorbitant, and a condemnation suit was brought with the result that a verdict of \$200 was rendered. The vice-president of the company, however, ordered that the defendant be paid the sum originally offered, \$1,000, and it was gratefully accepted.

FINANCIAL.

PHILADELPHIA CO., PITTSBURG.

The Philadelphia Company and affiliated corporations have issued the following report for the month ending April 30th:

	1902.	1901.
Gross earnings from operations.....	\$1,114,509.57	\$989,512.62
Operating expenses and taxes.....	615,638.68	535,408.78
Net earnings from operations.....	498,870.89	454,103.84
Other income.....	101,433.39	29,820.64
Total earnings and other income.....	600,304.28	483,924.48
Total income.....	518,363.82	442,896.82
Fixed charges.....	324,425.08	264,255.98
Surplus.....	193,938.74	178,641.84
Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Company.....	308.47	5,662.94
Balance representing Philadelphia Company's interest in the total net income.....	193,630.27	172,978.90

BROOKLYN RAPID TRANSIT.

The Brooklyn Rapid Transit Co. has issued the following statement for the months of March and April, 1902, as compared with the corresponding period last year:

	March, 1902.	March, 1901.	Increase.
Gross receipts.....	\$1,030,917.42	\$955,503.50	\$75,413.92
Expenses, including taxes....	768,347.86	714,044.35	54,303.51
Net receipts.....	262,569.56	241,459.15	21,110.41
	April, 1902.	April, 1901.	Increase.
Gross receipts.....	\$1,041,706.38	\$989,993.54	\$51,712.84
Expenses, including taxes....	705,010.86	658,282.07	46,728.79
Net receipts.....	336,695.52	331,711.47	4,984.05

METROPOLITAN, NEW YORK.

Phenomenal results from operations are shown in the report of the Metropolitan Street Railway Co., of New York City, to the railroad commissioners for the quarter ending March 31st. The operating cost for the quarter was less than half the earnings of the road for the same period, and with taxes on all its property used in operating the system, and on earnings and capital stock, the expenses were but 4½ per cent above half the earnings.

	1902.	1901.
Gross earnings.....	\$3,415,388	\$3,283,208
Operating expenses.....	1,636,805	1,681,403
Other income.....	126,933	203,676
Fixed charges.....	1,171,968	1,128,967
Net income for March quarter.....	733,548	676,513
Net income for three quarters ended March 31.....	2,548,712	2,764,683
Operating cost per cent of earnings.....	47.91	51.21
Operating cost (including all taxes) per cent of earnings.....	54.55	57.27

GENERAL ELECTRIC CO.

At a meeting of the directors of the General Electric Co., June 6th, a stock dividend of 66 2-3 per cent to stockholders of record on July 1st was declared. The dividend is payable on July 15th and involves the distribution of about \$17,000,000 to the company's stockholders. Plans are under consideration for an increase of the company's stock to \$45,000,000 and it is understood that dividends at the rate of 8 per cent per annum will be paid on the new capitalization.

CHICAGO & MILWAUKEE RY.

The increase in the net earnings of the Chicago & Milwaukee Electric Railway Co. amounts to 85 per cent for the four months ending April 30th. The following report has been filed by the company:

	1901.	1902.
January.....	\$2,592.46	\$5,080.67
February.....	1,147.10	3,875.93
March.....	2,829.34	5,030.35
April.....	4,858.90	7,158.66
	\$11,427.80	\$21,145.61

UNITED TRACTION CO., PITTSBURG.

The United Traction Co. of Pittsburg, which is controlled by the Philadelphia company, has published the following report for the quarter ending March 31st:

Gross earnings	\$344,000	Inc.	\$28,041
Net earnings	87,135	Dec.	3,431
Total income	89,562	Dec.	2,401
Fixed charges	60,204	Inc.	9,502
Net income	29,358	Dec.	11,093
Net income preceding quarters fiscal year	129,936	Inc.	10,215

NORTHERN OHIO TRACTION CO.

The Northern Ohio Traction Co. has issued the following report for the month of April, showing a heavy gain over the corresponding period last year:

	1902.	1901.
Gross earnings	\$49,424.83	\$39,618.24
Operating expenses	28,526.06	25,476.51
Net earnings	20,897.87	14,141.73
Fixed charges	12,500.00	10,960.46
Surplus	8,397.87	3,172.27

One year ago the surplus lacked \$994.30 of the amount required to meet the charge of \$4,166.66 as the monthly dividend on preferred stock. This year the surplus meets the dividend charge and leaves a balance of \$4,231.21 to apply on common stock.

METROPOLITAN ELEVATED, CHICAGO.

The Metropolitan West Side Elevated Railway Co. has averaged an increase of 8,000 passengers per day since the opening of the Douglas Park extension, and the operation of the entire system shows an increase for the month of May of nearly 15 per cent. Following is the company's report for the five months ending May 31st:

	1902.	1901.	Gain.
January	\$ 98,029	\$89,699	\$ 8,330
February	100,466	97,659	2,807
March	105,512	98,339	7,173
April	109,246	97,020	12,226
May	105,799	92,572	13,227

SOUTH SIDE ELEVATED, CHICAGO.

The South Side Elevated Railroad Co. has issued its report for the five months ending May 31st as follows:

	1902.	1901.	Gain.
January	79,154	71,137	8,017
February	79,386	74,525	4,861
March	80,313	76,266	4,044
April	81,009	77,782	3,227
May	76,063	74,175	1,888

NORTHWESTERN, CHICAGO.

The Northwestern Elevated Railroad Co., Chicago, has issued the following report of operations for the five months ending May 31st:

	1902.	1901.	Gain.
January	62,010	52,022	9,188
February	64,760	55,256	9,504
March	65,362	57,193	8,169
April	65,430	58,623	6,807
May	63,199	56,099	6,200

MONTREAL STREET RY.

The report of the Montreal (Que.) Street Railway Co. for the month of April shows a large decrease in the operating expenses and a large increase in net earnings. The report is as follows:

	1902.	1901.
Passenger earnings	\$152,524.57	\$144,131.47
Miscellaneous earnings	1,805.16	662.03
Total earnings	154,389.73	144,793.50
Operating expenses	83,850.03	93,272.10
Net earnings	70,539.70	51,521.40
Fixed charges and interest on loans	15,847.71	9,287.80
Surplus	54,691.99	42,233.60
Expenses per cent. of car earnings	54.07	64.71

The bill for an injunction to restrain the city of Chicago from collecting taxes for 1901 from the Chicago Union Traction Co. and the Chicago Consolidated Traction Co. has been dismissed by the lower court. The money that was deposited by the traction com-

panies with the County Treasurer pending the outcome of the suit has been ordered to be distributed and the city will receive of the amount about \$100,000.

TOLEDO, BOWLING GREEN & SOUTHERN.

The Toledo, Bowling Green & Southern Traction Co., at a meeting at Cincinnati, June 9th, declared a dividend of one and a half per cent on the capital stock for the first six months of this fiscal year. Gross earnings for May, 1902, were reported at \$20,086.43, as against \$13,731.55 for May, 1901; operating expenses at \$10,672.59, as against \$8,249.43, and net earnings at \$9,458.84, as against \$5,482.12.

NEW PUBLICATIONS.

"STATIC STRAINS IN HIGH TENSION CIRCUITS AND THE PROTECTION OF APPARATUS," a paper which was recently read by Mr. Percy H. Thomas before the American Society of Electrical Engineers, has been reprinted in full and copies can be obtained from all district officers of the Westinghouse Electric & Manufacturing Co. The subject of this paper is treated in a comprehensive manner and as the work is not mathematical in character it will undoubtedly prove of interest to superintendents and station managers as well as to electrical engineers. The reprint is fully illustrated with views and diagrams.

AMERICAN STREET RAILWAY INVESTMENTS, published by the Street Railway Publishing Co. of New York. Price, \$5.00. The present issue of this well known authority on street railway investments which is generally known as the "red book" is its ninth annual edition. This edition contains reports of 1,281 companies and gives in detail the physical and financial conditions of these properties. The figures include both operating and leased roads as well as data for all new roads. There are 31 folding maps of the most important street railway systems in the United States and a table is included that shows by comparison the gross receipts of all companies earning \$25,000 or more during the past year. Following its usual custom the date of information, as supplied by the street railway companies making the report, is given with the report of each road and this comprises an important feature to any one desiring accurate information.

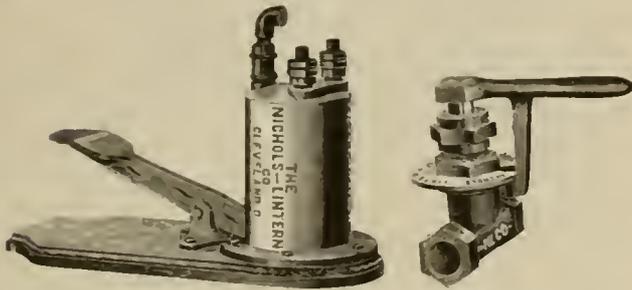
ARMATURE WINDINGS, by E. Arnold, professor at Riga Polytechnic School. Translated from the original German by Francis B. De Gress, M. E., of the Crocker-Wheeler Co. Cloth, 124 pp., price \$2. Published by D. Van Nostrand Co., New York. The difficulty of presenting to students in a simple manner the method of winding armatures for direct current machines so as to enable them to solve any problem in winding led the author to study out a general rule which is applicable equally to closed coil armatures of the ring, drum and disk types. The relation between these different armature windings is brought into prominence and the transition from one winding to another can be accomplished without difficulty by means of this general rule which embraces all known windings and gives a general solution of the winding problem. Many of the designs and connections shown in the work are of historic interest only, but the principle expressed is fundamental and of value to armature designers. The book is copiously illustrated with diagrams of all styles of windings the connections of which are deduced from the general rule established. The book will be found very useful to the student or designer in obtaining a clear understanding of the process of winding armatures.

HAND BOOK FOR STREET RAILWAY ENGINEERS, by H. B. Andrews, C. E., morocco, 202 pp., price \$1.25. Published by John Wiley & Sons, New York. This little work is published in vest-pocket size 3x5 in. and presents in compact form a collection of tables and other information particularly adapted to the use of the street railway engineer. Most of the information has been computed and compiled by the author during his connection with the Boston Elevated Railway Co. for the past eleven years and the entire contents has been selected with a view to its practical value in everyday work. The contents are divided into 13 chapters and covers the subjects of mensuration, curves of various kinds, miscellaneous information in regard to track construction, pavements, rails, etc., strength of materials, data for estimates, electrical information, etc. The character of the information contained makes the work a very handy one for reference purposes.

NICHOLS-LANTERN PNEUMATIC SANDER.

The Nichols-Lantern Co., of Cleveland, O., is meeting with excellent success in introducing its pneumatic sander on both electric and steam railways. While sanders are sometimes considered minor accessories in the equipment of a car, the results of an inefficient sanding device or none at all, are sometimes very serious and include waste of power, loss of time, abuse of the equipment and an increase of liability to accident. These sanders are applicable to cars either with or without compressed air.

The company makes a foot compressor, shown in the accompanying illustration, which renders it possible to locate the sander at any



FOOT PUMP.

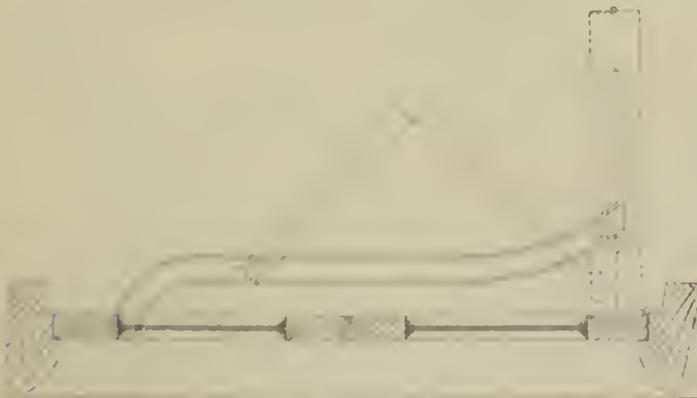
VALVE.

part so that sand can be applied right at the wheels on the driving trucks and prevent the slipping of wheels on starting. The company also uses an improved valve in connection with these equipments which is very durable and uses air with the greatest economy. It is claimed that the air consumption of this sander is so small an item that it can be entirely ignored. Its value in case a quick stop is necessary is very great and the fact that its action is automatic after the valve is open allows the motorman to apply sand while applying the brakes, which prevents skidding of the wheels.

NEW VESTIBULE FOLDING DOORS.

Street railway companies using vestibule cars or preparing to place vestibules on their car platforms will be interested in the Duner vestibule folding door which is designed for city, interurban and elevated railroad cars. The patents for these doors are controlled by the Chicago Equipment Co., 41 State St., Chicago, of which Mr. F. K. Howard is manager.

The advantages of vestibules, especially for interurban roads, have come to be generally recognized, but the difficulty of finding a



DOOR IN THREE POSITIONS.

vestibule door has heretofore been one of the objections to their use. The nature of the service makes it difficult to obtain a door that will not rattle, and the small amount of space available on the platform makes imperative a door that will not interfere in any way with the exit or entrance of passengers. The Duner door has been designed to fill the special requirements of street car service. It can be placed and handled as an ordinary swinging door would be used and may be arranged to swing back against the car

body or against the front wall of the vestibule as may be desired. It is, in fact, an ordinary swinging door divided down the center, the two parts being hinged and so arranged that when the door is opened one-half will automatically fold back upon the other half, thus reducing to a minimum the floor space necessary in which to make the swing. This action is accomplished by placing in the roof of the vestibule a curved slot or track in which slides a roller pin attached to one of the halves of the door. This groove slot is indicated by the curved solid lines in the diagram. It will be understood that the hinged half of the door, being free to move, is guided by this slot in the manner indicated by the dotted lines. This illustration shows the door in three positions—i. e., closed, half open and fully open, with the two doors folded back out of the way.

The Chicago Equipment Co. is prepared to furnish this door with or without retaining catches, and with or without operating levers. It has furnished doors for the Northwestern Elevated and also for the Lake Street elevated roads of Chicago, these doors, of course, being operated by levers from the inside of the vestibule. The door is also used by the Calumet Electric Street Railway Co., the South Chicago City Railway Co., the Dayton, Springfield & Urbana Ry., and by other interurban systems.

A PLEASANT DAY.

Taking a day for pleasure, he (the Englishman) attends the races, and sees the highest stakes won by an American horse, ridden by an American jockey. Looking over the evening paper, he reads of the placing in American shipyards of orders for American style battle-ships for European as well as Asiatic nations, and learns that the scene of the coronation of the King of England is to be painted by an American artist, and that the forty thousand gold, silver and bronze medals, ordered by the command of the king, to commemorate his coronation, are being made in Massachusetts.—From "America's Invasion of Europe," by George H. Daniels, in Four-Track News for June.

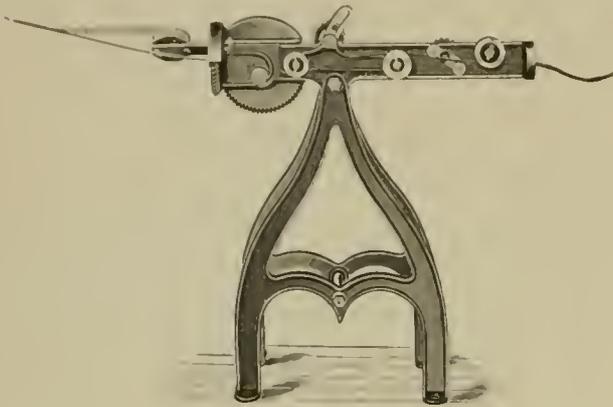


DUNER FOLDING DOOR.

The Gainesville & Dahlonega (Ga.) Electric Railway Co. which obtained a charter for an interurban line between the cities named in the title in May, 1901, expects to open its 34 mile road now under construction early in 1903. The company has an authorized capital stock of \$500,000, of which \$251,000 has been issued. W. W. Murray is president.

THE "DETROIT" FIELD RE-INSULATING MACHINE.

The Allen & Morrison Brake Shoe & Manufacturing Co., 721 Woman's Temple, Chicago, is now placing on the market the ingenious money and labor saving device illustrated herewith, which has been named the "Detroit" field re-insulating machine. This machine draws the wire from the old field, straightens it, removes the old insulation, re-insulates the wire, and winds it onto the new field coil, all in one operation. The construction is simple and easily understood from the illustration; no extra help is required, and no additional power transmission is necessary to drive the machine. Motion for the tapping device is taken from the wire as it is drawn through the machine, and a strap brake and pulley mounted on the shaft carrying the old field coil to give proper tension in the wire, are all the additional apparatus necessary. In case the



FIELD RE-INSULATING MACHINE.

wire of the old coil is broken in one or more places, it may be spliced in the ordinary way and allowed to continue through the machine.

In our issue of March, 1900, page 175, we published a sketch showing this device before it had been perfected for placing on the market, and at that time it had been used with success in the shops of the Detroit Citizens' Street Railway Co. Since then the Allen & Morrison company, which is the sole agent for the sale of the machines, has placed them in other street railway shops, where they are giving equally satisfactory service.

The company refers to letters received from Mr. T. J. Nichol, vice-president and general manager of the Rochester (N. Y.) Railway Co., and Mr. Willard J. Hield, general manager of the Twin City Rapid Transit Co. The former writes: "The machine has certainly saved us a great many hundreds of dollars in both material and labor. We would not care to get along without it, even if it cost us a good deal more than it did." Mr. Hield says: "The insulating machine which we are now using is in every way satisfactory, and is a money saver."

OHIO NOTES.

A suit has been brought in the name of the state of Ohio against the Toledo street railway company to compel it to issue universal transfers.

The directors of the Cincinnati, Dayton & Toledo Traction Co., which was organized to take over the Southern Ohio Traction Co., the local lines at Hamilton and some other properties in that section, are as follows: Will Christy, Akron; M. J. Mandelbaum, F. T. Pomeroy, W. H. Lamprecht, H. C. Lang, A. E. Feihl and R. S. Brintnell, of Cleveland; and O. V. Parrish and Peter Schwab, of Hamilton.

It is reported that negotiations have been completed whereby the Cincinnati Traction Co. will in the future operate the Mill Creek Valley and the Hamilton, Glendale & Cincinnati Traction properties under lease. One company is to be formed with a capital stock of \$2,100,000 to own both properties. Of this \$1,100,000 is to be preferred and \$1,000,000 common. The Cincinnati company is to pay 5 per cent on the preferred stock and a graduated rate on the common stock, beginning at one-half of one per cent and increasing

annually until it reaches 4½ per cent. This will give the traction company a line from Fontaine Sq. to the center of Hamilton, although there remains some track to be built at Hamilton. The injunction issued against the road there has been dissolved and work has been resumed on it. The officers of the new company are as follows: President, M. J. Mandelbaum; vice-president, Will Christy; second vice-president, C. V. Parrish, Hamilton; treasurer, F. T. Pomeroy, Cleveland, secretary, H. C. Lang, Cleveland.

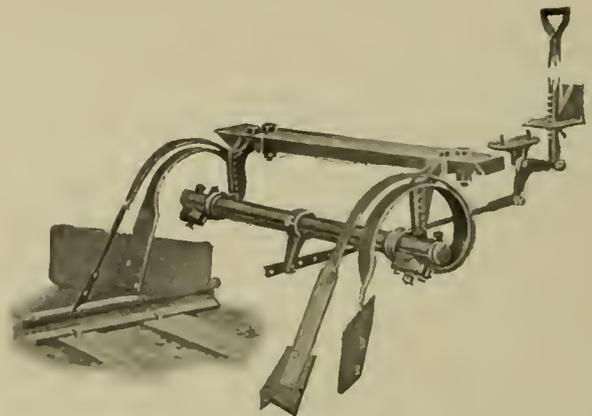
Arthur E. Appleyard, head of the Appleyard syndicate which controls roads between Dayton and Urbana, Springfield and Columbus and Columbus and Newark, has opened an office in Cincinnati for the purpose of handling securities in that market. C. H. MacLille will have charge of the office.

A line is being surveyed from Six-Mile Ferry at Pittsburg to Salem, Ohio. It crosses the Ohio river at Georgetown, a short distance above East Liverpool, and it is the intention to make connections with other lines to reach Canton and some other Ohio towns. It is said that Cleveland, Pittsburg and New York capitalists are behind the plan.

The Canton-Akron Electric Railway Co. has increased its capital stock from \$600,000 to \$1,600,000 in order to be in position to purchase the Canton-Masillon line and also to extend the Navarre line south to Philadelphia.

ROOT TRACK CLEANER.

A device for cleaning the dirt from tracks and flanges of trolley cars has been put on the market by the Root Track Scraper Co. at Kalamazoo, Mich., and is shown in the accompanying illustration. It is built to stand wear and tear, being made very strong, but is light in weight. Both the scraper and the flanger springs are oil tempered spring steel and any pressure desired can be put upon the track, the pressure being maintained by the lever on the car platform. The flanger works independently of the front scraper as the shoe of the former is only the width of the rail, and it is always on the track, even where the rail is several inches below the pavement. This assures a clean rail at all times, which means good electrical contact for the wheels. The front springs of this device are 3¼ in.



ROOT TRACK SCRAPER.

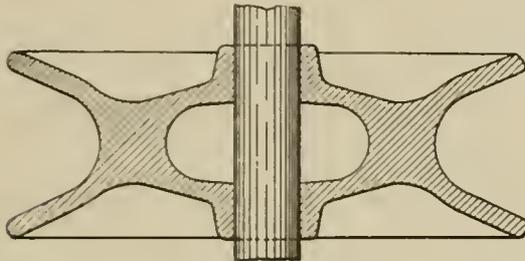
wide of No. 2 gage spring steel, and the rear springs 2 in. wide of No. 8 gage. These springs are fastened to 2-in. wrought iron gas pipe with bolts and jamb nuts. The lever arm in the center is fastened to the pipe so that the lever handle can be placed in any position on the platform as desired. The flanger spring is fastened with a set-screw so as to operate independent of the other spring according to the condition of the track.

The Lewiston (Me.), Brunswick & Bath Street Railway Co. set apart Wednesday, June 11th, as hospital day, donating a large proportion of the proceeds for that day to the Maine General Hospital at Lewiston.

The first through car between Dayton, O., and Newark, over the Columbus, London & Springfield Ry., was run Saturday, June 7th, carrying J. S. Harshman, president, and H. A. Fisher, vice president and general manager, and a number of guests.

NEW MORRIS TROLLEY WHEELS.

The accompanying illustration shows a section of one of the special trolley wheels which is being manufactured by the Morris Electric Co., at its factory in East Orange, N. J. It will be seen from this that in the center of the wheel surrounding the shaft a chamber is cored out which is filled with grease by means of which the bearings are kept thoroughly lubricated. In addition to the special



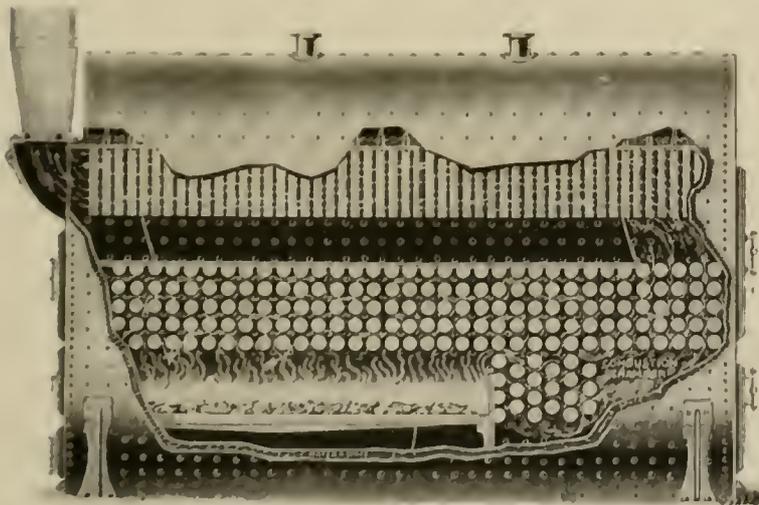
SECTION OF MORRIS TROLLEY WHEEL.

wheel, the company is turning out almost every style of trolley wheel now on the market and its factory contains a large amount of special machinery for this branch of the business. As has been previously stated, the factory is being enlarged to three times its former capacity, which indicates the growth and the present extent of the company's business. Another specialty which will shortly be introduced by this company is a complete line of jackknife switches and panel boards for feeder lines.

The new brass foundry which is being added to this factory will be kept very busy as in addition to the other specialties there will be turned out about 1,000 trolley wheels per day.

THE KINGSLEY BOILER.

The illustrations herewith show vertical cross and longitudinal sections of an internally fired, self-contained boiler of the tubulous or tubular pocket type which is constructed of metal throughout and requires no brickwork for either setting or lining. As appears from the line drawing the cross-section is oval in shape with an inner shell, which extends the full length of the boiler and is secured to the outer shell by staybolts, thus providing a water space



THE KINGSLEY BOILER.

around the periphery, the water space is 6 in. at the bottom and 3 in. at the sides, and the distance from the top of the outer shell to the crown sheet is 36 in. at the center. From each side of the inner shell project banks of horizontal tubes screwed into the shell at one end and the outer end closed by a blank; these are spaced so as to leave a fire box and ash pit as shown in the half tone engraving. From the crown sheet depend other pocket tubes, staggered as indicated in the line drawing. A bridge wall is placed at the back

end of the grate and a horizontal baffle plate over the horizontal tubes, thus providing for a circulation of the gases that will carry them to all parts of the heating surface. In a boiler rated at 300 h. p. 516 horizontal tubes 3 in. in diameter and 475 vertical tubes 2 in. in diameter are provided.

Access to the interior is had through large cleaving doors at both ends and by hand holes at the bottom, front and back. Water enters at the front of the boiler between the shells at the bottom. It is apparent from the construction that no support or setting other than cast iron legs or saddle blocks, is required.

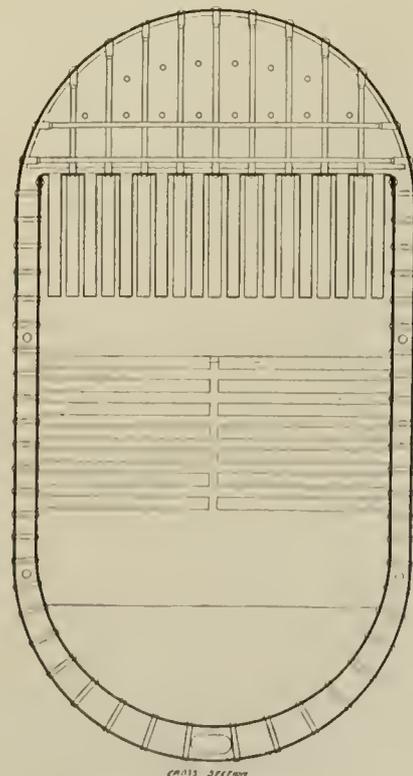
The Kingsley boiler is the invention of Mr. George Kingsley, and is made by the Kingsley Patent Boiler Co., of 30 Broad St., New York. The advantages claimed by the maker include: economy of fuel, economy of space, economy of installation, ability to carry high pressure and make dry steam rapidly, ease of management, safety and durability.

IMPORTANT CONTRACT FOR STOKERS.

The Underfeed Stoker Co., with general offices in the Marquette Building, Chicago, last month secured an order from the Milwaukee Electric Railway & Light Co. for 34 Jones underfeed stokers. This apparatus will be placed under the boilers in the main station of the Milwaukee company. The contract is a noteworthy endorsement of the Jones stokers inasmuch as the contract was given after competitive tests lasting four months, in which the Jones apparatus was brought in direct competition with several other makes of stokers.

EMPLOYEES' BENEFIT AT SYRACUSE.

The Mutual Benefit Association of the Syracuse Rapid Transit Railway Co.'s employes was given a benefit performance at the Valley theater, Syracuse, on the evening of June 6th, the success of which is another proof of the public approval and widespread popularity which this organization of Mr. Connette's promoting has gained. The performance was of a highly meritorious order and was largely attended.



VERTICAL CROSS SECTION.

The Seattle (Wash.) Electric Co. has applied for a franchise for a new loop system which will afford the cars of the Seattle Tacoma Interurban Railway Co. an entrance into Seattle.

ADVERTISING LITERATURE.

THE GOULD STORAGE BATTERY CO. has published its bulletin No. 1 on Isolated Plants. The bulletin describes a plant supplied by this company at Biltmore, N. C., for the residence of Mr. George W. Vanderbilt.

THE PROTECTED RAIL BOND CO., of Philadelphia, Pa., has issued an advertising folder under the title of "A Drop in Metal." The folder calls attention to the fact that in this case "protected" means protected from theft as well as corrosion.

THE PETTIBONE BROTHERS MANUFACTURING CO. of Cincinnati, O., has issued a small pamphlet entitled "About Swords and Sword Making in America." The pamphlet described a large number of the characteristic swords used by different nations, which are adapted to be worn with the various styles of uniforms made by this company.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, Pa., has published its bulletin No. 72 on the application of storage batteries to isolated plants. The bulletin refers especially to residential lighting and power plants and is illustrated with views of a large number of isolated plants in private residences which have been installed by this company.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., of Pittsburg, Pa., has issued a circular No. 1059 in regard to electrical motor vehicle equipments. This company manufactures motors, controllers, switches and all the necessary electrical apparatus for the complete equipment of storage battery vehicles. The motors are made in a number of different sizes and are of the enclosed pattern.

THE ARNOLD ELECTRIC POWER STATION CO., of Chicago and New York, has published its bulletin No. 6 describing the Grand Rapids, Holland & Lake Michigan Rapid Ry. for which it was the engineer and contractor. The bulletin is a reprint of the paper read before the Chicago Electrical Association by George A. Damon and William D. Ray, an abstract of which was published in the "Review" for March, 1902.

THE OHIO BRASS CO., of Mansfield, O., has published its bulletin No. 9 on "All Wire Rail Bonds." This bond is a "one piece" bond of which the terminals are formed directly from the ends of the cable of which it is composed, so that there are no cast or welded joints in the bond to become loose and interpose additional resistance. These bonds are manufactured in a variety of types and styles all of which are illustrated in the bulletin.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. recently issued an interesting circular describing electric motor vehicle equipments. This company has supplied motors to the electrical vehicle industry for the last five years and is now prepared to furnish a complete line of standard automobile equipments comprising every part of the electrical appliances except the storage battery. These parts are made in sizes adapted to electrical vehicles of any type or capacity. The circular will be mailed upon request.

REYNOLDS-CORLISS ENGINES is the title of a handsomely illustrated catalog published by the Allis-Chalmers Co., of Chicago. The first part of the catalog is devoted to the general views of the company's work at Milwaukee and Buffalo and is followed by a handsome collection of illustrations showing various parts of the shop and office. The catalog gives a brief description of the design, material and economy of the standard engines as well as its pumping engines, hoisting machinery, etc., and concludes with illustrations and descriptions of a large number of plants in which its machinery is installed.

THE CROCKER WHEELER CO., of Ampere, N. J., has issued a small catalog under the title of "Small Power Motors" which contains descriptions and illustrations of various types of small motors made by this company. Small motors may be said to be the specialty of this company as when it started in business in 1888 it confined its attention to building small motors exclusively and although it has since advanced until it now turns out machines up to 1,000 h. p. capacity, the company has built up a reputation for its small motors which has won it a wide reputation. It manufactures these in large quantities, thereby decreasing the cost of production and enabling shipments to be made at a day's notice.

THE CHRISTENSEN ENGINEERING CO., of Milwaukee, Wis., has published a catalog, No. 51, on Motor Driven Air Compressors of both stationary and portable types. These compressors have been designed to form a compact self contained unit with the

electric motor and they can be operated from any railway, power or lighting circuit. They can also be installed at any convenient point for distribution, thereby avoiding expensive piping. The parts of these machines are all made from jigs and templates and are all interchangeable. The working parts operate in an oil bath. Their operation is automatic, the governor being so arranged as to stop the motor as soon as the air pressure reaches a predetermined maximum pressure and to start it when the pressure is reduced to a minimum. The power is therefore used only in proportion to the work being performed.

STREET RAILWAY PATENTS.

List furnished by T. Reed Clift, Patent Attorney, Washington, D. C., from whom all additional information can be secured.

No. 600,167, May 6, 1902, Joseph P. Hasty, Superior, Neb. Switch actuating mechanism.

No. 600,340, May 6, 1902, Harry M. Loughlin, Stapleton, N. Y. Railway car.

No. 600,573, May 6, 1902, Fred N. Rost, Kalamazoo, Mich. Track scraper adjustment for street railway cars.

No. 600,590, May 6, 1902, Albert A. Stolle, New York. Electric railway.

No. 600,640, May 13, 1902, Gottfred Aye, Kittanning, Pa. Trolley head or wheel.

No. 600,643, May 13, 1902, Robert J. Barney, Westboro, Canada. Controlling attachment for trolley poles.

No. 600,787, May 13, 1902, George L. Campbell, Nyack, N. Y. Electric railway system.

No. 600,895, May 13, 1902, Ludwig Perlhefton, Vienna, Austria. Fare collector.

No. 600,986, May 13, 1902, William Sullivan, St. Louis, Mo. Car fender.

No. 700,084, May 13, 1902, John B. Quinn, Chicago, Ill. Track.

No. 700,126, May 13, 1902, Charles J. Kintner, New York, N. Y. System of electric railways.

No. 700,386, May 20, 1902, James A. Tancock and James C. Coch-rill, London, Canada. Automatic switch.

No. 700,400, May 20, 1902, Frederick Becker, New York, N. Y. Rail brush.

No. 700,461, May 20, 1902, William D. Vabdeear, Grand Rapids, Mich. Electric railroad signal.

No. 700,615, May 20, 1902, Edwin E. Carneal, Washington, D. C. Railway switch.

No. 700,716, May 20, 1902, Alexander Beck, Atlanta, Ga. Fender.

No. 700,719, May 27, 1902, Patrick A. Allen et al., Toledo, O. Water closet receptacles for cars.

No. 700,810, May 27, 1902, Edgar Peckham, New York, N. Y. Car truck.

No. 700,811, May 27, 1902, James S. Perry, Kalamazoo, Mich. Switch and frog.

No. 700,818, May 27, 1902, Charles W. Cowell, Green Island, N. Y. Brake mechanism for cars.

No. 700,836, May 27, 1902, Charles C. Scott, Boston, Mass. Illuminated sign.

In the "Review" for May 20th, our list of patents included No. 608,197, for an adjustable trolley supporter invented by Thomas E. Stucky and Edward Ware. The latter name should have read Edward Hill, and we desire to make this correction as Mr. Hill has experienced some trouble in receiving correspondence under the wrong name.

PROVIDENCE, R. I. AND RETURN, \$18.90.

On account of the B. Y. P. U. meeting at Providence, the Wabash will sell excursion tickets from Chicago as above July 7, 8 and 9, via Niagara Falls. Return limit, August 15. Write for B. Y. P. U. illustrated folder containing maps and full information. City Ticket Office, 97 Adams St., Chicago.

The serial calendar card mailed by the Bullock Electric Manufacturing Co., Cincinnati, to friends and patrons, for June bears a handsome colored portrait of James Clerk Maxwell on a panel decorated in gold and several colors. The reverse of the card gives a concise and interesting biography of the great physicist.

THE NEW FARE REGISTER.

The latest design of fare register made by the Sterling-Meaker Co., has a familiar appearance, being similar to the "Meaker," but we are assured that the mechanism has so many new features that it may almost be considered an entirely novel construction. One idea that has been followed is that of simplicity—to reduce the number of parts, to avoid complexity, to assure direct and positive action, to strengthen the details, to obtain certainty and durability. The size of the machine is about 9 in. square. The company has taken its time in the construction of this machine, has had some of the best register talent engaged on the problem, and the tests have been exhaustive. Patents have been applied for at home and abroad.

ENLARGEMENT OF THE GOLD CAR HEATING CO.

Announcement is made that the Gold Car Heating & Lighting Co., which has just been incorporated under the laws of New York with a capital of \$1,000,000 has purchased outright the entire business of the Gold Car Heating Co., of New York, Chicago and London, and also the entire business of the Gold Street Car Heating Co. The new company takes possession on the first of next month of all the property of both of these companies and in addition to nearly one hundred patents formerly owned by these concerns, has acquired a number of new and valuable patents covering electrical heating apparatus.

The business of the Gold companies has increased enormously during the past few years and now extends all over the world wherever railway cars are operated by steam or electricity. The foreign business of the company is larger than ever before, there being at the present time over 2,000 sets of car heating apparatus under construction at the company's shops for shipment abroad within the next three months.

Among the large contracts for electric heaters recently received is one from the Louisville (Ky.) Railway Co. for over 300 sets of electric car heating apparatus. Orders are in hand for about 100 equipments for street railways in New Jersey as well as others for the Boston & Maine R. R., the New York, New Haven & Hartford R. R., the Massachusetts Electric Companies and the South Side Elevated R. R. of Chicago. A contract has recently been closed with the Metropolitan Street Railway Co., of New York City, for electric heating apparatus which will be a departure from anything of this character heretofore undertaken.

The \$1,000,000 in capital stock of the new company has been fully paid in. There are no bonds issued by the new company, and there is no preferred stock. The capital is represented by 10,000 shares of common stock, par value \$100 per share, fully paid and non-assessable, and the statement is made that the company has no other liabilities whatever. The entire property taken over by the new company is valued at \$1,050,000.

Mr. Edward E. Gold of New York City has been elected president of the new company and made chairman of the executive committee. All of the stockholders of the old companies will be numbered among the stockholders of the new company, the plans for the enlargement having received the unanimous approval and consent of every shareholder in all the properties purchased.

The main office of the new company will continue to be at Frankfort & Cliff Sts., New York City, where Gold apparatus has been made for many years.

MR. H. F. SANVILLE, formerly secretary of the Morris Electric Co., of New York, has opened an office for himself in the Girard Building, Philadelphia, Pa., where he will deal in street railway supplies. He will represent among other well known houses Albert & J. M. Anderson, of Boston.

EXCURSION TO PORTLAND, ME.

The Wabash road will sell excursion tickets July 5 to 9 inclusive, from Chicago to Portland, Me., at \$21.50 for the round trip via Niagara Falls; \$20.50 via Montreal. Return limit, August 15th. For full information call at or address City Ticket Office, 97 Adams St., Chicago.

TRADE NOTES.

DIXON'S SILICA-GRAPHITE PAINT is being used to protect the structural steel work of the Hotel Astor, Long Acre Sq., New York City.

THE DUFF MANUFACTURING CO., of Allegheny, Pa., will make an exhibit at the Tramways and Light Railways Convention in London next month.

THE KENNICOTT WATER SOFTENER CO. of Chicago has established its New England Agency in charge of Mr. J. Edwin McNamee, 10 Sargent St., Boston, Mass.

JOHN A. ROEBLING SONS' CO. was represented at the Charleston Exposition by Cameron & Barkley, agents, of Charleston. Roebling products were well represented, the exhibit including magnet wire, rope, cables, rail bonds, etc.

THE GREEN FUEL ECONOMIZER CO. has received through its Boston office an order from the Massachusetts Electric Companies for its well known fuel saver to be installed in the electric company's new power station at Newport, R. I.

THE GOULD STORAGE BATTERY CO. recently received the contract to furnish a battery of 255 cells with booster and switch-board for the Berlin (Ont.) & Waterloo Street Railway Co. The capacity is 66 kw. with allowance for 50 per cent increase.

THE IRONSIDES CO., Columbus, O., advises us that its latest acquired additional specialty, the "Ironsides" improved patent Tormay oiler, is being rapidly adopted by the principal plants of the country and that the general demand has taxed the company's facilities.

THE WAGNER-BULLOCK ELECTRIC CO. arranged an interesting display of its apparatus in Machinery Hall at the Charleston Exposition. The exhibit included dynamos and motors and general electrical apparatus, charging sets for automobiles and launches, etc.

THE ELECTRIC INSULATION CO., a New Jersey corporation of which Elijah Woodward is president, on May 29th voted to dissolve. It is reported that L. A. Ziegler, attorney for the company, states that it had bought a secret process which proved to be a "gold brick."

THE STANDARD PAINT CO., of New York City and Chicago, through its Southern agents, the Cameron & Barkley Co., of Charleston, exhibited at the Charleston Exposition, ruberoid roofing, insulating paper, waterproof paper, sheathing paper, and a full line of P. & B. paints and compounds.

THE Q. & C. CO. announces that beginning June 1st it will operate in its own name manufacturing railway specialties, machinery and pneumatic tools. The principal offices will be in the Western Union Bldg., Chicago; New York office, 114-118 Liberty St.; general sales department at the shops, Chicago Heights, Ill.

THE WALWORTH MANUFACTURING CO., of Boston, had at the Charleston show a full line of valve fittings and tools for steam, water and gas plants, including cast and malleable iron pipe fittings, brass and iron valves and cocks, die plates, etc. The exhibit was in charge of Cameron & Barkley Co., agents, of Charleston.

CAMERON & BARKLEY CO., general agents for machinery and supplies, with headquarters at Charleston, S. C., had one of the largest displays in Machinery Hall during the Charleston Exposition. The company showed a diversified stock of specialties for which it is selling agent in the South. Mr. H. R. Thomas was in charge.

THE SPRAGUE ELECTRIC CO., New York City, is supplying large orders for motors to electrotyping and photo-engraving houses where a particular advantage is gained from the use of electrically driven machines. Such an equipment was recently placed in the plant of the United States Playing Card Co. at Cincinnati with highly satisfactory results.

THE PARTRIDGE CARBON WORKS, Sandusky, O., recently had a small fire in the furnace room, of which some greatly exaggerated reports have been published. The fact is that only a small portion of the furnace room was disturbed and this can easily be replaced. The furnaces themselves are fireproof and were not affected in the least.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., manufacturer of electric traveling cranes and hoists, report among orders recently booked the following: the Falk Co., Milwaukee, one 30 ton with 5 ton auxiliary hoist; the Allis-Chalmers Co., for the West Allis, Wis., plant, two 5-ton wall and one 2½-ton wall hoists; the Milwaukee Electric Railway & Light Co., one 30-ton hoist; the

Pennsylvania R. R., for the Altoona shops, two 12½ ton hoists; the American Foundry & Construction Co., Hazlewood, Pa., two 10-ton hoists, and the Baldwin Locomotive Works, Philadelphia, six 10-ton hoists.

THE PENNSYLVANIA STEEL CO. was represented at the Charleston Exposition by its Southern agents, R. C. Hoffman & Co., of Baltimore, Md. The company exhibited its well known steam railroad and street railway specialties, including grooved and girder rail sections, "New Century" switch stands, switch lamps and parts, and samples of special work.

THE PEERLESS RUBBER MANUFACTURING CO., of 16 Warren St., New York, had a booth at the Charleston show where samples of its various packings, beltings, discs for valves, gaskets, hose, etc., were displayed. This company has won an enviable reputation for superior quality of the various kinds of mechanical rubber goods which it produces.

JENKINS BROS., of New York and Chicago, makers of valves, disks and packing for steam, gas, water or acid pipes, had an interesting display of their goods at the Charleston Exposition. These goods are made from special patterns and embody the latest improvements suggested by years of experience in this line. Mr. J. W. Odiome had charge of the exhibit.

THE AMERICAN STEEL & WIRE CO. had practically the same display at Charleston as was shown at the Pan-American Exposition. It consisted of a huge pyramid forming a covered booth, in which several hundred different products were displayed for examination. The American Steel & Wire Co. supplied all the steel wire fencing used around the Charleston Exposition grounds and the street railway terminals.

THE PITTSBURG GAGE & SUPPLY CO., of Pittsburg, reports an excellent demand for its "White Star" filters. A recent shipment included four filters for the Varbic mines, Japan. The company has also taken orders for its continuous oiling system using duplex types of the "White Star" filters, to be installed in the plants of the Union Steel Co., Pittsburg, and the Citizens Railway, Light and Power Co., Mansfield, O.

THE UNITED STATES ELECTRIC SIGNAL CO., West Newton, Mass., manufacturer of automatic electric signals for street railways, has issued a mailing card estimating the risk assumed by companies whose lines are not equipped with proper signaling apparatus. The United States company's signals are in successful operation in nine foreign countries, 15 states in the United States and on over 50 of the largest street railway systems in the world.

THE PITTSBURG REDUCTION CO., operating the Hall patents, is stated in the report of the United States Geological Survey to be the sole producer of aluminum in this country. The production of aluminum in the United States during 1900 amounted to 7,150,000 lb., and the price per pound remained practically stationary throughout the year. The total imports of all forms of aluminum in 1901 were valued at \$109,748 as compared with \$50,444 in 1900.

C. J. HARRINGTON, 15 Cortlandt St., New York City, has received a contract for 250,000 ft. of conduit to be shipped to Seattle for Stone & Webster, of Boston, Mass. This is a large contract and there are other large contracts in view. C. J. Harrington has but recently taken up the management of the sales for the Scranton Firebrick & Conduit Co., of Scranton, Pa., and the business done in this line indicates that the firm will be one of the largest dealers in conduit in the country.

THE FALCON ELECTRIC MANUFACTURING CO., No. 432 East 71st St., New York, announces that owing to the large demand for its switches, switchboards, flush receptacles, etc., it has opened an office for the convenience of contractors and the electrical trade at No. 15 Cortlandt St. (Telephone No. 3901 Cortlandt), where it will carry a complete line of the company's standard products. In the future, all communications with the Falcon company should be addressed to No. 15 Cortlandt St.

THE UNDERFEED STOKER CO. of America reports a large number of contracts recently closed for installing Jones underfeed mechanical stokers among which can be mentioned the following: Phoenix Roll Works, Pittsburg; Bureau of Public Lighting, Allegheny, Pa. (second order); Newport Mining Co., Ironwood, Mich. (third order); Michigan Salt Manufacturing Co., Marine City, Mich.; Cornplanter Refining Co., Warren, Pa.; Lehigh Portland Cement Co., Wellston, O. (second order); White Swan Mills, Clinton, Mo.; Bausch & Lomb Optical Co., Rochester, N. Y. (fourth

order); National Biscuit Co., Toledo, O.; Milwaukee Electric Railway & Light Co., Milwaukee, Wis. The company has issued an interesting little pamphlet showing views of a large number of public buildings in various parts of the country which have been equipped with the Jones underfeed stokers.

THE SPRAGUE ELECTRIC CO., New York City, on May 17th gave the employees of the office and sales department in both the New York and Watessing offices a pleasurable outing at New Dorp, Staten Island. The principal feature of the afternoon's entertainment was a ball game in which the chiefs of the departments participated. The outing was voted a great success, and special thanks were tendered Messrs. Bourgeois and Vanderhoof who managed the affair in a highly acceptable manner.

ARTHUR KOPPEL, 66-68 Broad St., New York City, manufacturer of forged steel shoes and dies, railway materials for mines, plantations, industrial works, etc., has issued a booklet concerning the Arthur Koppel shoes and dies which are used for ore stamping mills; single switches, right or left hand, for use in portable track, and turntables made in all styles and sizes. A clever cover-illustration in colors represents the gnomes at work with Koppel dies. The book is especially distinguished by the ingeniousness and merit of the one illustration.

WORK AT THE CAR BUILDING establishment of the John Stephenson Co. has been steadily increasing during the past year, and within the last few months has been so rapid that considerable inconvenience has been experienced from want of power. To remedy this condition, as the works are entirely without line shafting, an electric generating set is necessary. A contract has just been signed for a 300-kw. General Electric generator, and a 450-h.p. tandem compound engine, with cylinders 20 and 34 by 28 in. The installation will be put in operation at the earliest possible date.

CROCKER-WHEELER CO., Ampere, N. J., manufacturer of generators and boosters for electric railways, and electrical engineers, reports a very satisfactory increase in orders received during May over those of the preceding month. Some of the orders booked for May included generators of from 30 to 200 kw. capacity, 50 crane motors with outputs ranging from 1½ to 50 h. p. and a consignment of nine motors. The Crocker-Wheeler Co. has under construction a new building which will increase the floor space by 60,000 sq. ft. and will be occupied by the winding department, the machine shop and a part of the office force.

POWER PLANTS OF THE PACIFIC COAST is the title of a paper recently read before the New York Electrical society by Dr. A. C. Perrine. The paper describes a large number of the long distance transmission plants for which California is famous, and is highly illustrated with half tone views of these plants and their surroundings. The plant of the Standard Electric Co. of California is specially mentioned as being the boldest attempt in the direction of high voltage which has so far been undertaken. This plant operates at 50,000 volts and was designed and supplied by the Stanley Electric Manufacturing Co., of Pittsfield, Mass.

THE ILLAM SAND BOX CO., of Troy, N. Y., has recently shipped a large order of sand boxes to the Brooklyn Rapid Transit Co., making a total of 2060 Illam sand boxes now in use on this system. Among other large users of Illam sand boxes are the Cleveland City Ry., with 1168 in use, and the Glasgow Corporation Tramways, Glasgow, Scotland, which has 1804 in service. The Electric Tramway & Carriage Works, of Preston, England, has placed in service a total of 5100 Illam sand boxes. Besides these large users, the Illam sand box is to be found on nearly every electric railway in this country, as well as abroad.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has recently closed a contract with the Greenfield & Turner's Falls Street Railway Co. for the installation of a battery of "Chloride" accumulators. This battery consists of 200 cells having a capacity of 200 amperes for one hour with tanks sufficiently large to allow of a 40 per cent increase, and will be placed in the new car houses at Cheapside, a distance of ten miles from the power house. The battery floating on the line is to be used at this point to regulate the drop in voltage due to the heavy grade which occurs near this station at the terminus of the railway company's line.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has furnished eleven 15-h. p. and three 40-h. p. 500-volt, shunt-wound direct current motors for the smelters and refineries of the Boston & Montana Consolidated Copper & Silver Mining Co., at

Great Falls, Mont. Four years ago the latter company installed a number of Westinghouse 180-volt electrolytic generators, and at the same time put in a number of Westinghouse motors for driving ventilating fans and other machinery about the smelters. Although the smelters are filled with sulphur dust and are extremely dirty the Westinghouse motors have given excellent satisfaction.

J. C. STEWART, the American contractor, whose record brick-laying performance in connection with the erection of the British Westinghouse Electric & Manufacturing Co.'s works at Manchester, England, recently caused so much discussion, has been engaged by the Midland Railway Company to supervise and expedite the work at the large Midland Railway Hotel at Manchester. The contract is in the hands of Messrs. William Brown & Son, of Salford, England, and it is said that they are to receive \$100,000 in bonuses if the work is finished within a year, and \$10,000 a month for each month shorter than that time. The total price is \$5,000,000.

THE GENERAL ELECTRIC CO. had a comprehensive exhibit at the Charleston show, including a complete illuminated model of its several factories and an extensive working exhibit of its electrical machinery and apparatus. This space was the center of the distributing system for furnishing lights and power for all the grounds and buildings. The three-phase transmission lines from the power house of the Charleston Consolidated Railway, Gas & Electric Co. led directly to the General Electric space, and the current was there converted and transformed for the different uses so that the exhibit made an actual demonstration of the work the General Electric Co. is doing in this line.

THE MALTBY LUMBER CO., of Bay City, Mich., recently shipped a special trainload of cedar ties for the street railway of Des Moines, Ia. This is part of an order which the company has been shipping for some time and it took occasion to make quite a display in connection with this trainload. Each car had two large cards 3x4 ft. square on each side bearing an advertising display and by special arrangement with the railways over which the train ran it laid over nights and ran only during daylight hours. The scarcity of cars for western shipment and the scarcity of room in railroad yards have delayed the shipment. If these troubles can be overcome the second shipment of the same kind will be made within two or three weeks. The company is also figuring on a similar display with a telephone pole order to be shipped to points in Arkansas.

THE J. G. BRILL CO., of Philadelphia, had an unusually elaborate exhibit of cars and trucks at the Charleston Exposition. The semi-convertible and convertible cars recently brought out by the Brill company attracted considerable attention, as these types of cars are well adapted to Southern climates. A full line of trucks was exhibited. The Brill solid forged side frame 21 E truck occupied a conspicuous position in the exhibit space. This truck follows standard locomotive practice. The entire yoke, including jaws, spring seats and extension pieces, are forged in one piece. The Eureka maximum traction truck, built for heavy city service, received attention from officials of city roads. A placard on this truck stated that over 4,000 of this type are in use. The "Universal" truck, with equalized center pivotal support, for use under open or closed cars, using single steps, and the "Perfect" truck, No. 27, for fast suburban and interurban service, were also exhibited. The space also

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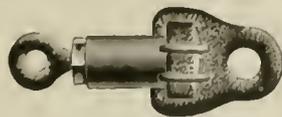
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contained stands of photographs of cars and trucks, illustrating the wide range of the company's activities.

THE ALLIS-CHALMERS CO. reports the following among its list of sales of Reynolds-Corliss engines for May, 1902: Wolf River Paper Co., Shawnee, Wis., two "1900" frame engines. Southern Cotton Oil Co., New York City, five girder frame engines. Surry Rubber Co., Baltimore, Md., one "1900" frame engine. S. P. Brown & Co., Albany, Ga., one girder frame engine. Devoc & Reynolds Co., Chicago, Ill., one "1890" frame engine. Carnegie Steel Co., Pittsburg, Pa., five pairs of vertical, cross-compound blowing engines. Jones & Laughlin Co., Ltd., Pittsburg, Pa., one air cylinder. Rapid Transit Subway Construction Co., New York City, two combined vertical and horizontal engines, Union Steel Co., Pittsburg, Pa., three horizontal, cross-compound, direct coupled engines. Willis Coal & Mining Co., Murphreysboro, Ill., one girder frame engine. Gunther Foundry Machine & Supply Co., San Antonio, Tex., one girder frame engine. Buffalo Union Furnace Co., Buffalo, N. Y., one vertical end cross-head blowing engine. Studebaker Brothers Manufacturing Co., South Bend, Ind., one "1890" frame horizontal cross-compound direct coupled engine. Colorado Milling & Elevator Co., Monte Vista Mill, Colo., one girder frame engine. Great Western Gold Co., Cal., one girder frame engine. Park City Sampling Mills, Utah, one "1890" frame engine.

THE DORNER TRUCK & FOUNDRY CO., of Logansport, Ind., reports an extremely satisfactory business in its single and double trucks, and several large orders have been shipped during the current month. Among the roads using Dorner trucks are: Stark Electric Ry., Alliance, O.; Alabama City (Ala.), Gadsden & Attalla Ry.; Ogden (Utah) Rapid Transit Co.; Redlands (Cal.) Street Ry.; Logansport (Ind.) Street Ry.; Kokomo (Ind.) Railway & Light Co.; Union Traction Co. of Indiana; Wabash River Traction Co., Wabash, Ind.; Ft. Wayne (Ind.) Traction Co.; Kanawha Valley Traction Co., Charleston, W. Va.; Toledo (O.) & Western Ry.; People's Gas & Electric Co., Defiance, O.; Springfield (O.) Street Ry.; Dunkirk (N. Y.) & Fredonia R. R.; Evansville (Ind.) Street R. R.; Northern Ohio Traction Co., Akron, O.; Cleveland (O.) City Ry.; Kentucky & Indiana Bridge Co., Louisville, Ky.; Charleston (W. Va.) Traction Co.; Alliance (O.) Street Ry.; Owosso (Mich.) & Corunna Electric Co.; Cleveland Electric Ry.; Oakland Ry., Birmingham, Mich.; Schuylkill Electric Ry., Pottsville, Pa.; Urbana & Champaign (Ill.) Railway, Gas & Electric Co.; Consolidated Light & Railway Co., Huntington, W. Va.; Washington (Ind.) Street Ry.; Cleveland & Eastern Ry.; Cleveland, Berea & Elyria Ry.; Fairmount Construction Co., Philadelphia, Pa.; Bangkok Tramways Co., Bangkok, Siam.

THE BRIDGEPORT BRASS CO., of New York, has issued a new pamphlet published in the usually attractive style for which this company's advertising matter is well known. The pamphlet is entitled "Phono-Electric Telephone and Telegraph Lines" and contains 38 pages of well written text, interspersed with clever pen sketches, all going to demonstrate why "Phono-Electric" wire makes the best working lines for telephony and telegraphy. "Strong" and "tough" are the adjectives that most properly describe the distinctive characteristics of this wire which is now being made by the Bridgeport Brass Co. in enormous quantities for all manner of overhead transmission lines for electric current.

The Bel Air (Md.) & Havre de Grace Railroad & Power Co. expects to begin the construction of its interurban electric line between the cities named in the title this summer. A large power house is to be erected half way between Bel Air and Havre de Grace. John H. Reckord is president of the company.

The Pittsburg, McKeesport & Connellsville Street Railway Co. has placed orders with the Westinghouse Company for additional equipment, which will double the present power house capacity of the interurban system and increase the street railway company's recent expenditures for power facilities to \$1,000,000. The feeder system has been completed by the acquisition of the 12-mile line between Greensburg and Youngwood, and the Connellsville suburban railway, three miles long. Twenty-five palace traction cars, manufactured by the John Stephenson Co., have been delivered and will be put in commission this summer on the Pittsburg, McKeesport & Connellsville company's lines through the coke region.



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NO. 7

The applications for space from manufacturers who wish to make exhibits at the Detroit convention of the American Street Railway Association are more numerous than ever before. The convenient location of Detroit with respect to those states in which electric railways are already numerous and new enterprises are being rapidly developed, insures a large attendance of street railway men, and all indications point to this being an exceptionally successful meeting.

As at all the A. S. R. A. conventions since 1899, one of the leading features will be the "Daily Street Railway Review," which will be published on October 8th, 9th, 10th and 11th.

An illustration of the difficulty of pleasing all patrons, which is the aim of every street railway manager, a recent meeting of the Chicago Council Sub-Committee to consider the electrical equipment of the North Shore branch of the St. Paul railroad is instructive. Delegation of residents of many of the northern suburbs were present and although the residents of these towns have been clamoring for several years for electric transportation to Chicago over the Evanston branch of the St. Paul, they were so divided on the question of fare that the sub-committee found it impossible to draft an ordinance acceptable to all. While part of the delegation demanded a 5 cent fare into Chicago, as many more advocated a 10-cent fare in order, as they asserted, to maintain property values and exclude fat building which are comparatively unknown in some of these suburbs. As no decision could be reached the meeting was adjourned until the public interested in the matter could decide upon what they wanted.

Since the advent of the trolley the personnel of the uniformed employees of street railways has vastly improved both as to general appearance and character. It is well known to all street railway managers that the improvement in character and appearance of the men on the car, results in an equal improvement in service and for this reason much attention is now being paid to the question of providing desirable and attractive accommodation for the men when off duty. The custom of providing club rooms equipped with baths, lockers, games and other features of amusement as well as

instruction has become very general, especially upon the larger roads and several of these club houses for street car men have been described and illustrated in the columns of the "Review" from time to time.

Club rooms have been provided in Brooklyn for the use of the employes of the Brooklyn Rapid Transit Co. and President Great-singer recognizing that the men while off duty have nowhere to go for recreation but to saloons, has taken great interest in providing suitable places for the men in order to offset the influence of the saloons. A number of car barns on the company's lines have had rooms fitted up as reading rooms and these have proved so beneficial that the company has decided to advance this plan another step by procuring sites for the erection of a number of club houses. The company is going to establish the new club rooms upon the same system that is followed by the Young Men's Christian Association and similar attractions will be provided in all of them, and every inducement is to be made to get the men to frequent the clubs.

The practicability of operating both steam and electric trains on one track is a subject of wide interest at the present time owing to the desirability as well as the demand for frequent car service on the suburban divisions of many of the large steam roads. The question has been investigated by a number of roads in this country and has also been for some time under consideration by a number of the English roads having terminals in the city of London. While this practice has not been undertaken to any great extent a few cases are now in evidence from which it would appear that no great difficulty exists in operating both classes of service over the same tracks provided that the electric cars are operated under dispatcher's orders and submit to the same rules and codes of signals which govern the steam trains.

One illustration of this practice may be found in the case of the Washington, Alexandria & Mount Vernon Ry. which runs upon the tracks of the Pennsylvania Railroad for a considerable distance. In this case the electric trains have the same status as the steam trains as soon as they enter upon the steam railroad tracks, and are subject to the same regulations as the steam trains. As long as the trains are on scheduled time, their movements are regulated absolutely by the time table without orders from a dispatcher. They are operated under train numbers and their class is indicated on the time table. A full description of the method of operation in this case was published in the "Review" for June, 1902.

Another instance of this practice is found in the case of the Peoria (Ill.) & Pekin Terminal Ry. which combines under one management a steam railroad, an interurban railway and a street railway, all operating upon the same tracks although here the steam locomotive service is used principally for transferring freight and is in a measure subordinate to the electric service. In this case the organization and management of the road are exactly similar to those of steam roads, all trains, whether steam or electric being numbered and operated under the same code of signals. This road, which has now been in operation for several years, has been a decided financial success and no trouble whatever has been reported as due to the mixed character of the service.

Elsewhere in this issue is to be found a paper on "Electric Suburban Railways" by Mr. E. A. Evans, describing the conditions on the Quebec Railway, Light & Power Co's. road, a part of which system was formerly the Quebec, Montmorency & Charlevoix Ry. which is a steam road covering a distance of 30 miles. A service of electric cars upon the same tracks running between the usual steam railway trains was inaugurated and the results have more than justified the innovation and the expenditure incurred. From the figures given in this paper it will be seen that the total number of passengers carried in 1899 on the steam road alone amounted to 253,054, while for 1901 on both the steam and electric cars this figure arose to 571,374. The figures for the year 1900 are omitted as the work of electrically equipping the road was then under way, but during the period from 1899 to 1901 as shown by these figures, the passenger traffic had more than doubled, this result being due almost entirely to the frequent service provided by the electric cars.

Another road using both steam and electric propulsion has been projected to run between Rome and Naples, Italy, and it seems apparent that this mixed service could be generally adopted in the suburban service of steam roads with excellent results.

Probably the most serious difficulty to contend with in the case of such a service is the interference with the electric signals used by many steam roads by the high voltage current of the trolley cars. The practice is to bond a track of the steam road for the return circuit of electric signals and this would be impracticable where the track return was used for electric cars. This difficulty, however, may be considered as merely a matter of detail as other means for operating the return circuits for the signals will undoubtedly be forthcoming when the necessity for them arises.

The meeting of the American Institute of Electrical Engineers which was held at Great Barrington, Mass., last month, was a notable one in regard to the number of papers presented bearing upon electric railways. Among these papers may be mentioned "Comparative Acceleration Tests with Steam Locomotives and Electric Motor Cars" by B. J. Arnold and W. B. Potter; "Method of Ascertaining By Means of a Dynamometer Car the Power Required to Operate the Trains of the New York Central & Hudson River Railroad Between Mott Haven Junction and the Grand Central Station and the Relative Cost of Operation by Steam and Electricity" by B. J. Arnold; "A Study of the Heating of Railway Motors" by A. H. Armstrong, "Railway Speed-Time Curves" by C. O. Mailloux and the announcement of two systems for utilizing electricity for railway propulsion on trunk lines, one by B. J. Arnold, and another by H. Ward Leonard.

The announcement of Mr. Arnold of his electric pneumatic system for long distance railway working was an important feature of the Great Barrington meeting and while it was generally known that Mr. Arnold had developed an alternating system for street railway work the originality of the method he proposes came as a surprise to his hearers. It will be remembered that Mr. Arnold was the pioneer in the use of alternating current with rotary converter sub-stations for interurban work and the announcement of his electric pneumatic system stamps him as a pioneer in the field of electric trunk line railroads.

The principal feature of the new system is the use of a single phase or multiphase motor which is always connected to the line and in which either the rotor or stator or both are always in motion. The rotor is connected directly to an axle and both the rotor and stator are connected to compressed air engines in opposite relation to each other. The air compressed by these motors is stored in tanks and is used to assist in starting the car, helping over grades, for switching purposes and for the operation of the brakes. By means of this arrangement the motor operates continually in synchronism and any excess of power developed, not required by the car, is taken up by the compressed air engines and subsequently utilized anew. When the car is at rest the rotor would therefore be also at rest and the normal speed of the motor would be attained by the stator in compressing air. To start the car, the engine connected to the stator would be throttled and the rotor then begins to revolve and propel the car at a speed equal to the diminution of speed of the stator, as the synchronous relations between the two must be maintained. When the stator is brought to rest the motor has attained normal speed and if a higher speed is desired the stator is revolved in the same direction as the rotor by means of the compressed air in the storage tank. The engine of the rotor can also be put in operation to assist the latter in case a higher than normal torque is required. The use of single-phase current permits this system to conform to the overhead construction of today except that a much higher working voltage can be used and in case this voltage is too high for direct use upon the motor a static transformer can be placed upon each car to reduce the line voltage to the pressure desired for the motors.

Other features of the system involve a multiple-unit and simple system of control and the use of electro-magnetic clutches by means of which either the rotor or stator may be disconnected from the car wheels when it is desired to compress air only. It is also to be noticed that the system of control is entirely mechanical and that there is no manipulation of the electrical circuits; the operations are all effected automatically by a controller lever. The pneumatic auxiliary of this system makes the single phase alternating motor which has been inflexible in regard to speed even more flexible than the present direct current railway motor and the fact that in this system the motors run continually at their normal output and store

energy for use in emergency, which is under ordinary circumstances dissipated as heat, points to a good efficiency for the system. The air storage feature will also be found of great value in a number of circumstances. As pointed out by Mr. Arnold, it will allow the active conductor to be stopped where the private right of way ceases and the car to proceed through the city or town on any tracks, whether electrically equipped or not, until it reaches the point where it can take up the working conductor again. This feature is also valuable in switching work and eliminates the necessity for electrical conductors except on the main line of track.

The other system of electric propulsion for heavy service, announced by Mr. H. Ward Leonard, involves the use of single phase, high voltage transmission, single phase motors upon the cars driving direct current generators which in turn supply the car motors. The Ward Leonard system of control by varying the voltage is used and a system of multiple unit control has also been devised. The system has been taken up by the Oerlikon Works where a 44-ton locomotive is being built for operation upon a 15,000 volt circuit.

* * *

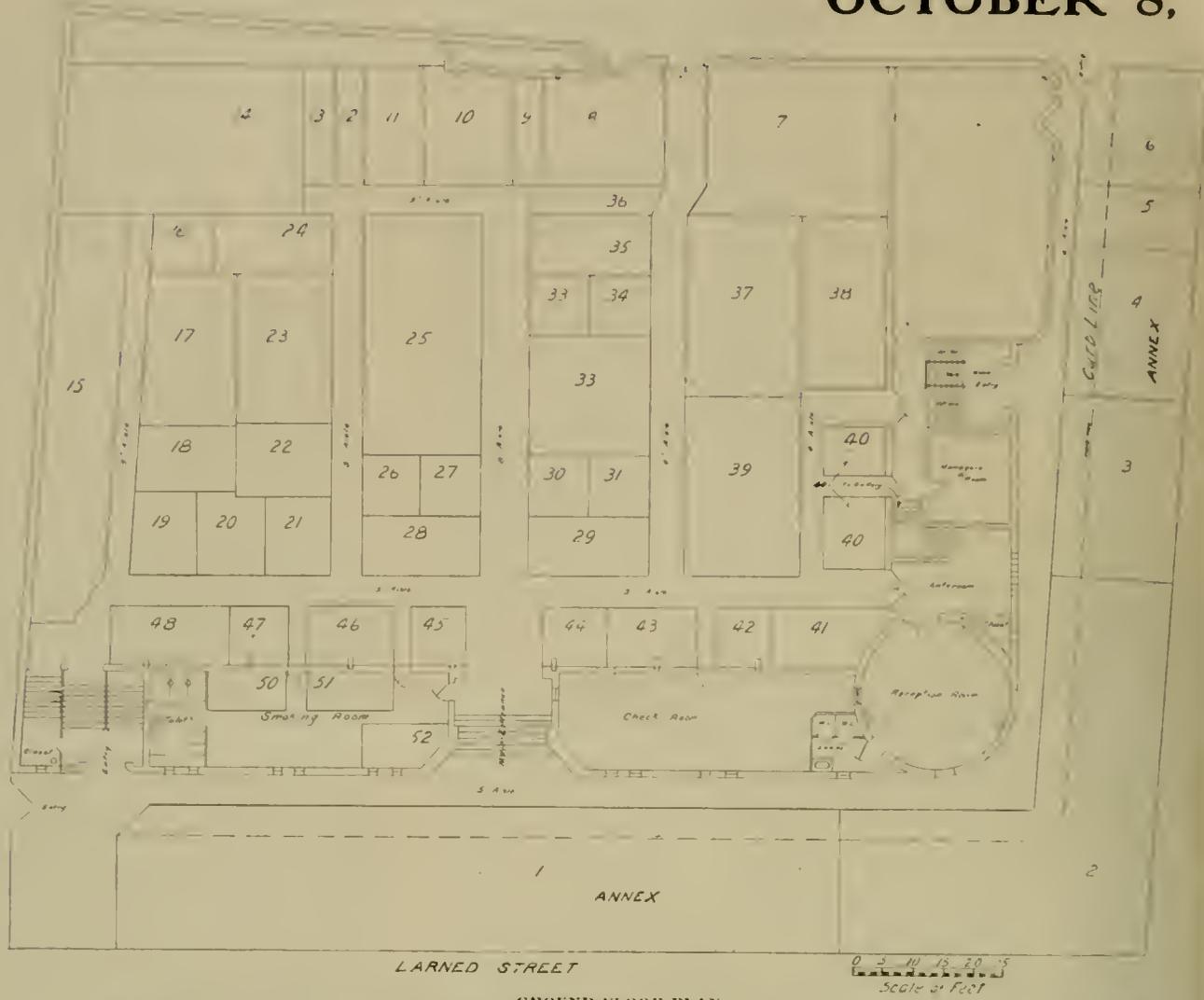
The problem of electrically equipping long distance railways for electric service has been an alluring one to electrical engineers for several years but the limited distance to which direct current distribution is applicable and the unsuitability of alternating current motors for railway work have heretofore proved barriers of such importance that no attempt at converting long steam roads to electricity has been seriously considered. There is no doubt in the minds of most engineers that alternating current, either simple or polyphase at high potentials, is the only practicable method of covering long distances and in all the schemes for long distance work which have recently been brought to public attention the main features have consisted in adopting alternating motors for electric railway work. The systems of Mr. Arnold and Mr. Leonard already mentioned, as well as the Ganz system, which is about to enter the railway field in this country, have all been brought to public attention almost simultaneously so that at present the prospects for the development of electrically operated long distance heavy service roads looks extremely promising. The solution of this question which will undoubtedly be reached in a comparatively short time bids fair to establish a new department of electric railway business of even greater extent than the systems of urban and suburban lines already established.

A decision of the New York Court of Appeals which is of much importance to electric railway companies doing a freight and express business is reported on another page of this issue. The litigation arose because the Stillwater & Mechanicsville Street Railway Co., operating an electric trolley line, sought to secure a physical connection of its tracks with those of the Boston & Maine R. R., a steam line, and to interchange freight with the latter. The contention of the Boston & Maine company was that to compel track connection between electric and steam lines would be to impose a burden on the latter not contemplated when the railroad law was enacted, but the Court of Appeals held that travelers and shippers of merchandise and freight are entitled to use all the facilities provided for in the articles of incorporation of transportation companies and the provisions of the railroad law. Further that New York in its legislation has recognized electric railways as an integral part of the transportation system of the state.

The court after referring to the fact that steam railroads have become great arteries over which the greater part of the commerce of the country is carried says: "It has not been considered profitable or practical for steam roads to be constructed to every village, hamlet or productive district in the country. This, however, is rapidly being accomplished by the numerous electric roads that are in process of construction or are contemplated. By their means the farmer, the mill owner and the merchandise vendor in distant places may be able to reach the steam railroads, and through them the great markets of our cities with their merchandise and products, and in this way one road may become the feeder and distributor for the other."

It is apparent from this language that the court does not consider the interest of the two classes of roads to be antagonistic to any serious degree, but regards the electric lines as filling a need which the steam railroads has as yet not been able to supply with advantage to their own stockholders.

Diagram of Floor Space of L Where Exhibits Will Convention of the American OCTOBER 8,



GROUND FLOOR PLAN

Assignment of Exhibit Space for American Street Railway

Space.	Exhibitor.	Sq. Ft.	Space.	Exhibitor.	Sq. Ft.
68	Adams & Westlake Co., 110 Ontario St., Chicago.....	200	67	Curtain Supply Co., 93 Ohio St., Chicago.....	200
45	American Brake Shoe & Foundry Co., Mahwah, N. J.....	100	66	Dearborn Drug & Chemical Works, Rialto Bldg., Chicago	200
42	American Car Seat Co., 18 Guernsey St., Brooklyn.....	100	20	Doig-Stivers Mfg. Co., Denver, Col.....	150
36	American Machinery Co., Grand Rapids, Mich.....	100	56	Duff Mfg. Co., Pittsburg.....	100
33	American Railway Supply Co., 24 Park Place, New York.	100	30	Electrical Review, New York.....	100
10	American Steel & Wire Co., Chicago.....	300	25	Electric Storage Battery Co., Philadelphia.....	300
35	Atlas Railway Supply Co., 1523 Manhattan Bldg., Chicago	200	54	Garton-Daniels Co., Keokuk, Ia.....	150
22	Berry Bros., Ltd., Detroit.....	200	2	General Electric Co., Schenectady, N. Y.....	2000
51	Bidwell Car Telephone Co., Grand Rapids, Mich.....	100	62	Globe Ticket Co., Philadelphia.....	80
81	Bishop Gutta Percha Co., 420 E. 25th St., New York.....	100	48	Gold Street Car Heating Co., New York.....	200
57	R. Bliss Mfg. Co., Pawtucket, R. I.....	100	31	Gould Storage Battery Co., 25 W. 33d St., New York..	100
58	Geo. F. Brandeau, 4 Oak St., Utica, N. Y.....	100	18	Griffin Wheel Co., Chicago.....	150
65	Brady Brass Co., 95 Liberty St., New York.....	200	70	Hale & Kilburn Mfg. Co., Philadelphia.....	300
3	J. G. Brill Co., Philadelphia.....	600	75	Ham Sand Box Co., Troy, N. Y.....	100
8	Harold P. Brown, 120 Liberty St., New York.....	400	6	C. J. Harrington, 15 Cortlandt St., New York.....	400
15	Christensen Engineering Co., Milwaukee.....	800	12	Heywood Bros. & Wakefield Co., Wakefield, Mass.....	100
44	R. W. Conant, 28 Williams St., Cambridge, Mass.....	100	72	International Register Co., 124 W. Jackson Blvd., Chicago	150
37	Consolidated Car Fender Co., 39 Cortlandt St., New York	600	41	H. W. Johns-Manville Co., 100 William St., New York .	200
47	Consolidated Car Heating Co., Albany, N. Y.....	100	23	Knell Air Brake Co., Battle Creek, Mich.....	400
9	Continuous Rail Joint Co. of America, Newark, N. J.....	100	5	G. C. Kuhlman Car Co., Collingwood, O.....	200
43	Crane Co., Chicago.....	150	7	Lorain Steel Co., Lorain, O.....	700
11	Creaghead Engineering Co., Cincinnati.....	200	64	Ludlow Supply Co., Cleveland.....	300

For Space and Full Particulars, address the Chairman of Exhibit Committee,

JO

Assistant Gene

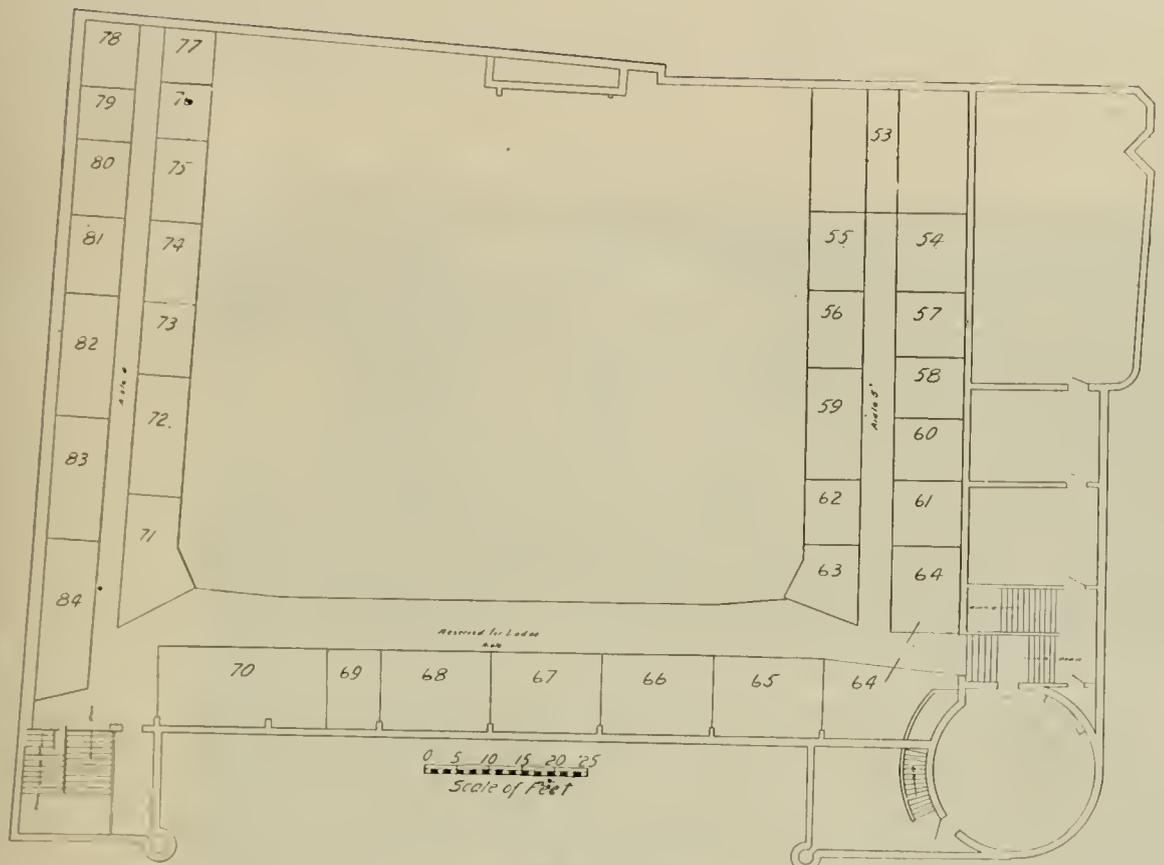
The Annex shown on the Diagram of the Main Floor is formed by an iron frame structure, properly roofed and lighted. There will be a sufficient number of ways as desirable for exhibits as space in the interior, and particularly valuable

Light Guard Armory, Detroit,

Use Made During the

Street Railway Association

and 10, 1902



GALLERY FLOOR PLAN

Association Convention, Detroit, Mich, October, 1902..

Exhibitor.	Sq. Ft.	Space.	Exhibitor.	Sq. Ft.
13 Lumen Bearing Co., Buffalo.....	100	1 Standard Traction Brake Co., New York.....	100	
76 McLaughlin Car Coupler Co., 1624 N. 9th St., Philadelphia	70	21 Standard Varnish Works, 29 Broadway, New York.....	150	
18 G. P. Magann Air Brake Co., Detroit.....	450	25 Stanley Electric Mfg. Co., Pittsfield, Mass.....	400	
12 Malby Lumber Co., Bay City, Mich.....	100	60 Star Brass Works, Kalamazoo, Mich.....	100	
60 Monarch Fire Appliance Co., 27 William St., New York.....	100	84 Sterling-Meaker Co., Newark, N. J.....	200	
13 Morris Electric Co., 15 Cortlandt St., New York.....	400	82 St. Louis Register Co., Security Bldg., St. Louis.....	150	
15 National Carbon Co., Cleveland.....	100	29 Street Railway Journal, New York.....	200	
14 National Lock Washer Co., Newark, N. J.....	100	28 Street Railway Review, Chicago.....	200	
71 L. H. Newcomb, 136 Flatbush Ave., Brooklyn.....	100	4 Taylor Electric Truck Co., Troy, N. Y.....	500	
7 New Haven Car Register Co., New Haven, Conn.....	150	26 Tramway & Railway World, London, Eng.....	100	
7 Northern Electric Mfg. Co., Madison, Wis.....	100	74 Union Stop & Signal Co., Fall River, Mass.....	100	
9 R. D. Nuttall Co., Pittsburg.....	150	17 United States Steel Co., 145 Oliver St., Boston.....	400	
9 Ohio Brass Co., Mansfield, O.....	600	50 Universal Sanitary Cuspidor Co., Worcester, Mass.....	100	
1 Olmser Car Register Co., Dayton.....	150	24 Van Dorn & Dutton Co., Cleveland	200	
9 Partridge Co., 29 Broadway, New York.....	100	13 Weber Railway Joint Mfg. Co., 1645 Old Colony Bldg., Chicago.....	100	
1 Pennsylvania Steel Co., Philadelphia.....	1000	27 Western Electrician, Chicago.....	100	
0 Frank Rollon Co., 200 Summit St., Boston.....	200	1 Westinghouse Electric & Mfg. Co., Pittsburg.....	3000	
1 Road Track Scraper Co., Kalamazoo, Mich.....	100	1 Westinghouse Air Brake Co.....	100	
1 Terwin Williams Co., Cleveland.....	150	32 William Wharton, Jr., & Co., Philadelphia.....	400	
1 Peter Smith Heater Co., Detroit, Mich.....	150	16 Wheel Truing Brake Shoe Co., 166 Miami Ave., Detroit.....	100	
7 Spear Carbon Co., St. Mary's, Pa.....	70			

N. H. FRY,

Passenger Agent, Detroit United Railway 12 WOODWARD AVENUE, DETROIT, MICH.

using the sidewalks and to the center line of the streets with a substantial amount of windows and an abundance of electric light making the Annex in every respect the exhibitors of heavy apparatus.

Probably of such a many steam. The practical circuit of track return may be co-operating forthwith.

The in which was notable upon elect "Comparat Electric M of Ascertain Required t River Ra Central St Electricity Motors" I C. O. Ma electricity Arnold, at

The an system for of the Gr that Mr. railway was surprise to the pioneer sub-station electric power electric tr

The primary phase or and in motion. rotor and relation t stored in over gear brakes. tually i required l subsequent would the would be car, the rotor then the dmir between t to rest t is desired by means of the rotor a higher current p tion of t used and motor a the line.

Other system o of which car when noticed there i are all auxiliary which l the present system

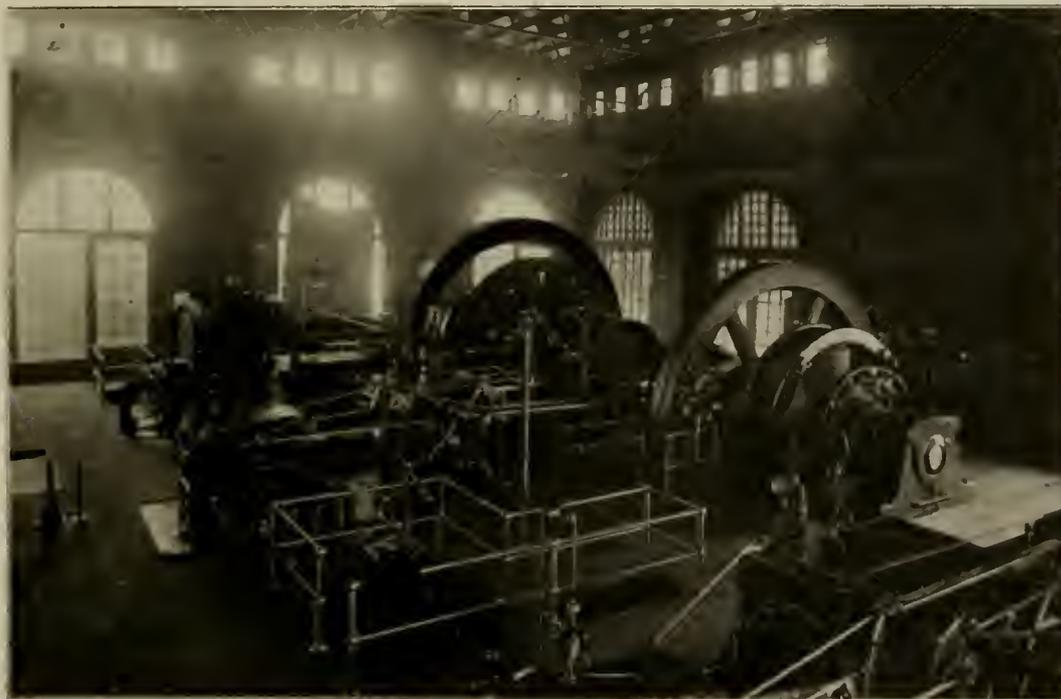
New Orleans & Carrollton Railroad, Light & Power Co.

Topography and Climatic Conditions—Track and Roadbed—Pole and Line Construction—Rolling Stock—
Special Emergency Wagon—Hose Bridge—Car House, Shops and Shop Practice—Daily
Report Mileage Blanks—Method of Inspection and Car House
Repairs—Cost of Power.

As regards its conditions for street railway operation New Orleans—the Carnival City of America—is in many respects a city ideal. Its general topography, especially the absolute freedom from grades, makes possible the most advantageous distribution of lines and feeders. The entire freedom from heavy snow and sleet storms eliminates many of the vexing difficulties that interfere with schedules and time tables in less fortunately situated localities. The water way and steam railroad facilities render available good qualities of coal at reasonable cost, and the nearby fuel oil fields of Texas give promise of making possible still greater economy in the cost of producing power. The cars move, as far as the New Orleans & Carrollton road is concerned, on a grassy strip of ground reserved down the center of the streets, and known as "Neutral Ground." On either side of this are roadways for vehicles, with sidewalks for pedestrians on the outside of the roadways; as

It is often a greater thing to take advantage of opportunities than it is to find them, and in the improving and developing of the New Orleans properties those responsible for the management have not only taken advantage of all opportunities offered, but have created new ones. The companies, and in particular the New Orleans & Carrollton company, have proceeded on the belief that money was well spent when expended in giving the public what it asked in reason, and even in providing conveniences and accommodations unlooked and unasked for. The New Orleans & Carrollton company has worked on that basis from the start, and in demonstrating its faith in the aphorism the very highest engineering and executive skill has been obtained and retained in every department. This is the secret of the company's success.

As outlined in the news columns of the "Review" virtually all the gas, electric lighting and power, and street railway interests of



INTERIOR OF POWER STATION NO. 2, NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO.

pedestrians and vehicles are thus diverted from the Neutral Ground the chance of collision and accident is reduced to a marked degree; furthermore, the noise is very much less, the dust even in dry weather is inconsiderable, and the grass and shade trees bordering the track conduce to the comfort of passengers and the attractiveness of the ride. The population of the city is about 300,000, and is made up of a pleasure loving, industrious and prosperous people, that liberally patronizes the street cars both as an aid in executing their business and in seeking their recreation and amusement. Moreover, the city is growing in population, in volume of exports and imports, and in manufactures, at a rate that has already placed it far in the lead of the cities of the South, and will soon bring it to equal standing with the largest cities of the North.

All this, be it understood, is not belittling the difficulties that have beset the originators and builders of the electric railway transportation systems in their work of bringing the properties to their present efficient state. They have had their own serious troubles to meet and they have met and solved the difficulties well.

New Orleans have been merged under one corporate control. It is the purpose of this article, however, to deal only with the property and methods of the New Orleans & Carrollton Railroad, Light & Power Co., which this month passes into the hands of new interests. This property, although of but medium size, deserves to go into record as one of the most interesting, well designed and well managed city street railways in this country.

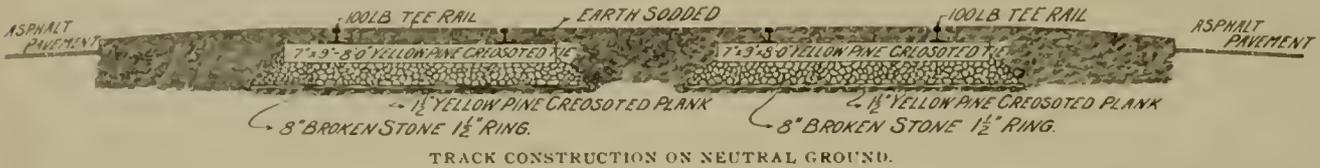
TRACK AND ROADBED.

The company operates 34 miles of track, comprising for the most part a double track belt line around the heart of the city—and this "circle," or belt, is the distinctive feature of the entire system. The "circle" is about 11½ miles in circumference, cars making the entire circuit in one hour. From the main belt line lead off short spurs to reach the docks and ferries, the railroad depots, certain resident and manufacturing districts, and Canal St., the Broadway of New Orleans. Cars are operated in both directions around the belt and as most of the belt track is heavy T rails laid in Neutral Ground, a

frequent, fast, clean, smooth-riding service is maintained both ways from early morning until late at night, the result being that the cars of the company are comfortably filled at nearly all hours of the days with passengers either on business or pleasure bent.

The converging point for all cars operating in the city of New Orleans is Canal St., and it is good-naturedly admitted that this is the only safeguard the stranger in New Orleans has against getting lost in the labyrinth of crooked streets with unpronounceable names; all routes lead to Canal St. and if the stranger boards a car and remains on it long enough he is sure to arrive at that thoroughfare.

of ballast and ties have been tried in New Orleans, but the best results have been obtained with stone broken to pass a 1½-in. ring, and cypress or yellow pine creosoted ties. The standard design adopted for all new work on Neutral Ground may be described as follows: A trench for each track is excavated to a depth of 2 ft., in the bottom of this is laid a flooring of 1½-in. yellow pine creosoted plank. On this is laid 8 in. of broken stone, on which is placed yellow pine creosoted ties, measuring 7x9 in. x 8 ft., placed 2 ft. c. to c. On the ties are laid 100-lb. A. S. C. E. standard T-rails, or 75 lb. girder rails, as the case may be. The space between the



TRACK CONSTRUCTION ON NEUTRAL GROUND.

It will be information to many that owing to this convergence of routes there are, at certain hours, more cars passing up and down the busiest section of Canal St. than pass up and down Broadway in New York City during the heaviest periods of the day, or converge at the Brooklyn Bridge at the rush hours. This traffic, however, instead of converging on two tracks is distributed over six tracks, all of which are placed in the center of the street on raised Neutral Ground. On Canal St. this reserved space is paved with asphalt, but on virtually all other streets and avenues it is covered with grass without paving.

The present management of the New Orleans & Carrollton company about three and one-half years ago, undertook the task of thoroughly reconstructing the property, and today the track, rolling stock, overhead work and power house equipment may be said to be up to the condition of a newly constructed road.

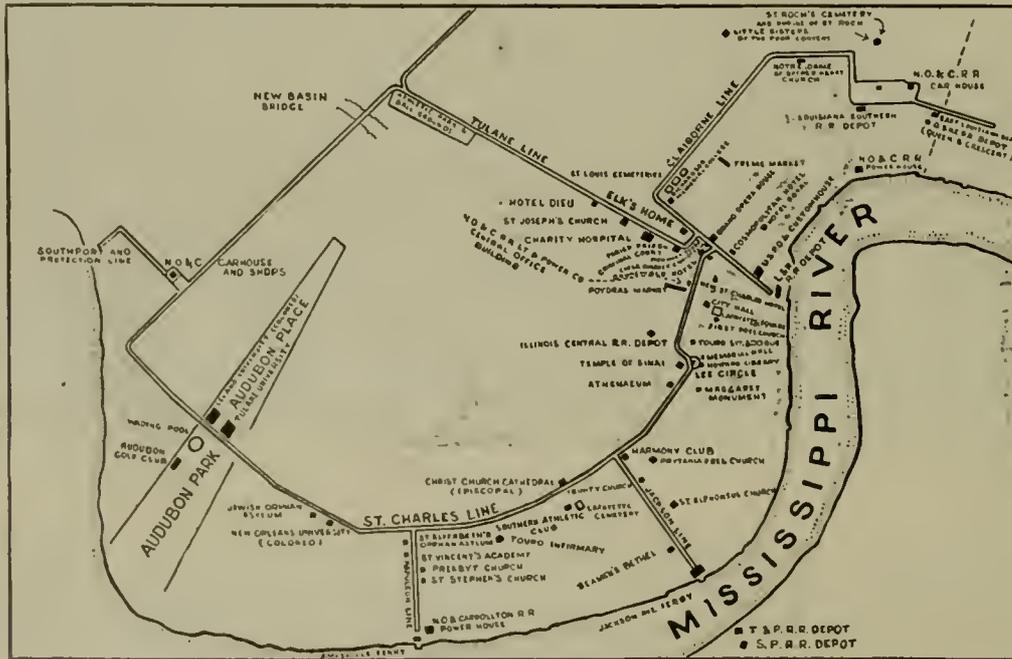
rails and outside the rails is filled in with dirt brought flush with the tops of the rails. In paved streets a 93-lb. girder rail is used. All new special work is supplied by the Lorain Steel Co. The track is bonded with "Crown" bonds under the angle plates.

POLE AND LINE CONSTRUCTION.

The location of the double track in the center of the Neutral Ground gave rise to a special design of center pole double flexible bracket construction for carrying all the overhead work for both tracks as well as railway feeders, and in places electric light wires.

The poles for this purpose are extra heavy iron tubular poles 32-ft. long, made in three sections with shrunk and swedged joints. Two types of poles are used, one 4½ in. in diameter at the top, and one 5½ in. in diameter at the top.

As in the track construction, the saturated condition of the



MAP OF NEW ORLEANS & CARROLLTON STREET RAILWAYS.

Of the total track, 13 miles are laid with 100-lb. T-rail, and 10 miles with 75 lb. girder rail, the rest of the track being of various weights. As before stated the largest portion of the mileage is on Neutral Ground without paving.

As is generally known New Orleans is wholly below mean water level, and the sub-soil in and about the city is so thoroughly impregnated with water that sub-surface drainage is impossible, and excavations made in the streets almost immediately fill with water. It needs no explanation to realize that these conditions of affairs introduced complications in track building. Various kinds

sub-soil called for special precautions in setting poles. They are usually placed with from 7½ to 8 ft. of the base in the ground and each pole rests on a cypress block. Large broken stone is tamped around the base and the hole is then filled with concrete.

The double flexible brackets were designed by Ford, Bacon & Davis and are made by the Creaghead Engineering Co., of Cincinnati, O. The bracket arm is structural steel tubing 23½ in. outside diameter and .22-in. gage, the bracket supporting rod being of structural steel, 1.90 in. outside diameter and .20-in. gage. All of the dimensions are shown on the drawing. The feeders are carried on glass

company owns no open cars, but operates the standard closed car the year around. It would seem as though an open car would be a necessity in a city as far south as New Orleans. As a matter of fact the type of car adopted, in combination with the fast schedules given over Neutral Ground rendered an open car unnecessary, and in truth, undesirable. The New Orleans weather in summer is apt

colors adopted are olive green and white, and it is interesting to note that the company, in re-painting cars, has discontinued the practice of surfacing the rough stuff. And the foundation work in painting cars is done by "plastering," all rubbing being eliminated. It is found that this reduces the cost of painting a car at least \$10 or \$12, and as a matter of fact the body colors are found to retain their luster and condition better than with the older fashioned "surfacing."

The company owns 120 cars, 70 of which are equipped with two



LADDER WAGON IN USE.



EMERGENCY WAGON LOWERED.

to be unsettled, heavy showers being of frequent occurrence, and chilling winds are often noticeable at the close of a summer day. The closed car, with its large windows and low sash rail, give practically all of the comfort of an open car when the weather is fine, and a great deal more comfort than an open car when the weather is inclement.

The car finally adopted as standard has the following principal dimensions: Length over all, 30 ft. 8 in.; length of body, 20 ft. 8 in.; platform length, 4 ft.; length of step, 3 ft.; width over all, 8 ft. 2 in.; height of body, 9 ft.; height of window sills from floor,

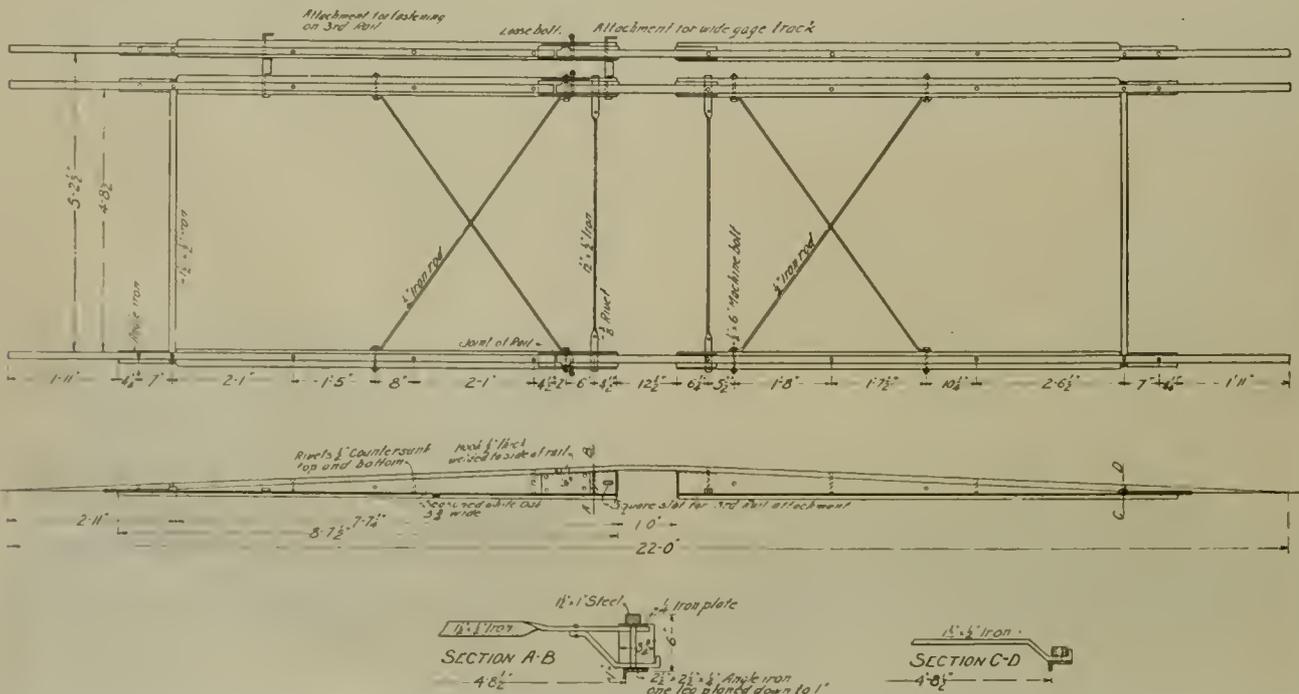
G. E. 1,000 motors each, 15 with one G. E. motor to each cars, and 35 with one G. E. 800 motor to each car.

The cars were built by the American Car Co. and the St. Louis Car Co.

The truck adopted as standard is the "Lord Baltimore" single truck, which is giving entire satisfaction.

SPECIAL HOME-BUILT EMERGENCY WAGON.

The company maintains one hurry-up repair wagon, shown in the half-tone engravings. The tower wagon is not intended for new



HOSE BRIDGE-NEW ORLEANS & CARROLLTON R. R.

28 in.; width of aisle, 20 in.; width of seat, 33 1/2 in. There are seven Hale & Kilburn seats on each side of the aisle. The double sliding doors are of mahogany, the ceilings of maple, and the corner posts and bottom frame of white oak. Exceptionally good light is furnished at night by 15 16-c. p. lamps in the ceiling. The uniform

construction work, but is for repair work only. It can be very easily handled with one horse, which is found to be much more satisfactory than two horses and less expensive to the company.

As will be seen the tower is raised or lowered by a hand windlass, and the tower, when at its full height, permits the men to

work on the overhead line without interfering in any way with the operation of cars.

The working platform is supported at the top of a supporting piece that is practically an extension ladder in two sections. A second supporting piece goes to the edge of the platform, as shown, and serves as an additional brace. The main supporting ladder is hinged to the body of the wagon, and when in the elevated position most of the weight of the platform and linemen is carried on two short uprights as shown, the leverage being such that when the tower is raised to its full height it will safely sustain 400 lb. weight on the elevated platform if the wagon is standing level.

The elevated platform is fitted with a sliding extension foot piece which enables the men to work close to the wire. The platform is mounted on a turn-table, and the men can work either from the sides or ends, as seems most convenient, although the position shown in the engraving is the one most commonly used. The turn table is self-locking at each quarter turn, and is easily handled by one man. The tower can be raised from the collapsed position to full height ready for working by one man in 50 seconds. An automatic safety stop or catch is placed inside of the ladder as an extra protection against the tower falling in case anything about the windlass should suddenly give way.

As the running gear of the wagon is connected very short it can be turned around in very limited quarters, and it also runs much more easily than would a longer geared vehicle. The wagon is home built and is the design of Mr. H. A. Davis, superintendent of the company.

HOSE BRIDGE.

To avoid many of the delays and interruptions to traffic when the fire companies are forced to stretch their hose across the tracks to fight fires occurring along the car routes, especially on the business streets, Mr. H. A. Davis, superintendent of the company, devised the hose bridge or jumper shown in the working drawings reproduced on page 382. The bridge is made in two parts or halves, which bolt together, end to end, by means of loose pins passing through hook attachments. Aside from these two divisions all parts are rigidly joined together and the bridge does not fold up. It is drawn to the scene of the fire on a separate flat car

The two side frames of the bridge are formed of seasoned white oak. Riveted to the under side of each of these side frames is an angle iron strap 2½ in. wide by ¼ in. thick, having its under face planed down to form a perfect contact with the track rail, the angle iron being designed to fit any section of rail, either T, grooved, or girder. To the upper side of the frame is fastened a



INTERIOR OF CAR BARN SHOWING ELEVATED TRACKS.

1½-in. steel bar, upon which the car wheels run when a car is running over the bridge. The loose pins for coupling the two parts together are chained to the side frames and cannot be lost.

As shown in the drawing the bridge is 22 ft. over all and has a total rise at the center of 6 in., the oak timbers of the side frames being tapered toward the ends to give an easy and gradual incline. The opening at the center for the hose is 12 in. As the cars of the Carrollton company run over certain streets that are occupied by a company operating wide gage, the bridge is provided with a third side-frame, designed to be placed on the third or wide-gage rail, so that the cars of both companies can pass over the hose line.

CAR HOUSE, SHOPS AND SHOP PRACTICE.

In laying out the company's present car shed and shops the same attention to details and systematic consideration of the desired



PAINT ROOM.



ARMATURE ROOM.

attached to a motor car, and two men can place it in position in three minutes. Although the device might be handled somewhat more conveniently if it was made to collapse or fold, it is believed its strength would be greatly impaired, it would take longer to lay in place, and its general usefulness would be reduced.

ends in view are noticeable that are in evidence in all other departments of the company. The inter-relation of the various shop departments is recognized, and the various repair rooms, and the work done in each, are arranged to give the best possible results. Cars and car parts passing through the shops go from room to

room with the least possible handling and loss of time, and all converge at one point where the assembling and final inspection is made. Careful records are kept of every detail of the work, largely by the use of the card system, and by advance estimates and reports from foremen of departments, the master mechanic is enabled to arrange the work and his working force to secure the best results. The broad principle on which the work is carried out

system practically eliminates the chance of cars being disabled on the road through "dropped" bearings or burned out armatures.

This "watching" is accomplished in the following way: The mileage for every car is made up each day in the accounting department from the trip sheets, by multiplying the number of trips made by each car on each line by the length of the line. From



EXTERIOR OF CAR SHED AND SHOPS.



WHEEL REMOVING APPARATUS.

is expressed in the maxim "inspection is cheaper than repair." To this end the condition of the cars and every part of all cars is watched, first by a system of car mileage records and then by actual inspection.

When an armature, bearing, wheel or other part is placed on a car a record is made of the part number and the car number.

these figures calculations per car-mile, and per car-hour are made. After the auditor has obtained such data as he desires from the car-mileage sheet the latter goes to the master mechanic for watching the car parts and equipment. Every six months the sheets are returned to the accounting department and bound and filed away as records in the accounting department. The totals for each car

(PAGE FROM BOOK FOR RECORD OF MILEAGE OF CARS AND PARTS.

Car No.....

Cost of Body.....
 " " Truck.....
 " " Equipment.....

Date		Body	Truck	Elec. Equipment	Life	Total Mileage	Particulars
Brought	Fwd.						

(Page 12 inches wide.)

The car mileage made by this car is then watched with special reference to each part, and when the mileage approaches a pre-determined figure the car is called into the barn for the express purpose of examining that part. If the part in question is found to be in condition for still further service it is given a new mileage limit which, in the judgment of the inspector, the part from its condi-

are, of course, added to the previous record, so that the clerk in the master mechanic's office has on his desk a list of cars with the mileage each has made up to date. This is compared every day with the records showing the date on which each part was put in service, and the prescribed mileage for each individual part. For instance, suppose that a set of bearings were put in car No. 10 on

DAILY REPORT OF CAR MILEAGE.

Car No.	TRIPS.					CAR MILES.					TOTAL TO DATE
	St. Char. Ave.	Belt Line	Jackson Ave.	Napol'n Ave.	Clalh. Ave.	St. Charles Avenue	Belt Line	Jackson Avenue	Napoleon Avenue	Claiborne Avenue	
76											
77											

FORM FILLED OUT IN AUDITOR'S OFFICE AND SENT TO MASTER MECHANIC.

tion ought to go, and the car is again put in service. When the new mileage limit is approached the car is again called in and the part either removed or given a new lease of life. The parts requiring most attention in this way are, of course, bearings and armatures, although trolley wheels, car wheels, axles, etc., are included in the same systematic "watching." It will be evident that this

July 1st, and their life was estimated at 15,000 miles. When car No. 10 is shown by the sheet on the clerk's desk to have run nearly 15,000 miles from July 1st, the clerk fills out a small notice on the foreman of the repair shops that the bearings in question will need attention on or before a certain date. At the first opportunity the car is called in and the bearings inspected. If in the

opinion of the inspector they will go 5,000 miles additional they remain in the car, a new record is made, and as the new 5,000 mark is approached a new notice is written by the clerk and served on the foreman, who again inspects the bearings at the first opportunity and either replaces them or gives them a new lease of life. All this, it will be understood, is done irrespective of the fact that the bearing are giving no trouble whatever.

The estimated length of life for the parts are determined by previous experiences. In practice, chilled car wheels are estimated to run 50,000 miles, "Kalamazoo" trolley wheels 13,000 miles.

confounded with the storekeeper's card index, which is kept at the general office and is always taken as the official record of stock.

A somewhat unique feature in this plant is that there are no pits whatever in the car barn or shops, due to the fact, as already pointed out, that excavations made anywhere in the soil in or about New Orleans quickly fills with seepage water. The office of pits is therefore taken by elevated tracks. In the main car barn are seven tracks for the storage of extra cars, two of these being on an incline forming elevated tracks at the rear of the barn

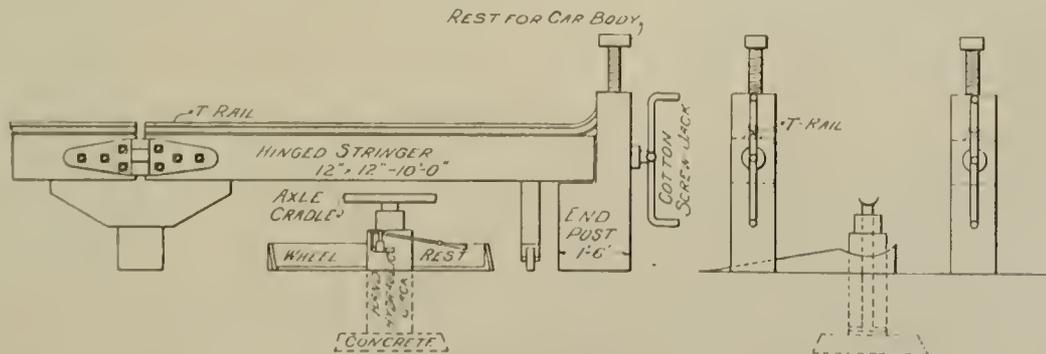


WHEEL CHANGING DEVICE.

steel pinions 150,000 miles, gears 250,000 miles, G. E. 800 bearings 15,000 miles, G. E. 1,000 bearings 20,000 miles. A car after making 45,000 miles is called in to be revarnished, and after 180,000 is repainted. The accounting department reports to the master mechanic the car mileage each day on the blank shown herewith as "A Daily Report of Car Mileage."

A departure from the usual custom is the fact that the general storekeeper has his office in the main downtown offices of the company and seldom actually visits the storeroom, which is at the

main repair shop. He transacts all the details of checking stores in and out through the medium of blanks. The system of storeroom accounting is given elsewhere in this issue under the heading of "Accounting." For his own information and protection, however, the master mechanic keeps a set of "material cards" in his office at the shops, from which he can always inform himself as to the amount of any stock on hand and is therefore in a position to issue requisitions on the purchasing agent for such stock as he will require for the repair and maintenance of cars. Both sides of this card are reproduced herewith, but this material card must not be



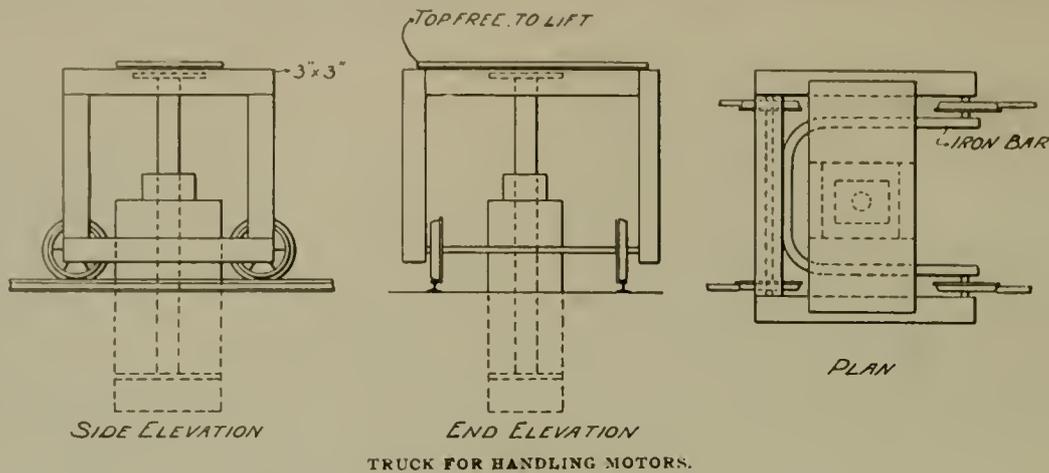
DETAILS OF CAR HOIST.

main repair shop so that an armature or motor may be dropped from the car onto the table and pushed out into the shop. Permanently embedded in the floor between each of the elevated tracks is a hydraulic lifting jack which is used in the operation of dropping the motor to the small moving table. The table is pushed over the jack head so that the top of the table or platform rests upon the jack head. The top of the table is detachable, and when the jack is raised this top is carried up with the jack cylinder and forms a rest for the motor or armature. When the jack has been raised so as to bring the platform in contact with the motor the bolts are

main repair shop so that an armature or motor may be dropped from the car onto the table and pushed out into the shop. Permanently embedded in the floor between each of the elevated tracks is a hydraulic lifting jack which is used in the operation of dropping the motor to the small moving table. The table is pushed over the jack head so that the top of the table or platform rests upon the jack head. The top of the table is detachable, and when the jack is raised this top is carried up with the jack cylinder and forms a rest for the motor or armature. When the jack has been raised so as to bring the platform in contact with the motor the bolts are

slackened off and the jack is lowered until the top of the table rests in place on the moving frame. The frame carrying the motor can then be pushed out from over the jack to the overhead cranes and the motor or motor parts can be taken to the various tools in the shop. The moving platform with its detachable top, or table, as it

rest on the end posts, but they are each provided with a leg having at its lower end a small wheel. It will be seen that the operation is to first roll the car up onto these tracks and the weight is then taken off the track rails by means of two cotton screw jacks on the end posts. When the weight of the car is all on the screw jacks



may be called, is illustrated in the working drawings herewith. As may be seen the track has four wheels but only one axle, which permits it to pass over the jack in the manner shown. A small stop is placed on the rail so as to bring the truck in exact position over the jack. The jack is of the Watson-Stillman type with 4 ft. lift and

the hydraulic jack in the center of the track is raised until the axle rests in the axle cradle, on the jack. The two stringers carrying the track rails are then swung outwardly and the jack is lowered, carrying with it the pair of wheels to be removed. The wheels are then turned at right angles to their natural position and rolled

Lot No. _____ ARTICLE _____
NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO. **MINIMUM STOCK**

DATE	RECORD OF MATERIAL ISSUED																															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
January																																
February																																

STOCK RECORD (ORIGINAL 8 1/4 X 4 1/4 IN.)

is set in a 5-in. pipe capped at the bottom which in turn is set in concrete in the floor.

There is a third set of elevated tracks which is used principally for removing axles and wheels and truck parts. This device is also shown in the half tone and line drawings accompanying this

down the small incline onto the car barn floor, where they may be rolled or carried by cranes to the tools as desired.

The room in which these elevated tracks are located is known as the pit shop, and is a steel and galvanized structure 82x212 ft. In this room is a 40-h. p. economic boiler for steam heating the entire

FORM 305, 24-12 01.

Lot No. _____ ARTICLE _____
NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO. **MINIMUM STOCK**

	On hand last day of previous month	Due on Requisition	Received by Requisition	Received by Transfer	TOTAL	Amount Issued	Remain- ing on hand	REMARKS
January								
February								

REVERSE SIDE OF STOCK RECORD.

article. It consists of an ordinary hydraulic jack set in the car room floor having attached to the upper end of the piston a cradle for receiving the car wheel axle. The jack is set 10 ft. from the end of the elevated tracks. The 12x12-in. timbers which carry the rails of the elevated track are cut at the second post and fitted with two heavy steel hinges each. The inside hinge has a removable pin and acts as a fish plate when closed. Normally these stringers

shops. There are a wheel press, emery wheel and drill press operated by independent motors. There is also located here an air compressing plant for compressing the air used in air hoists and for general cleaning purposes. Air is put under pressure by means of a Pedrick & Ayer compound compressor having a capacity of about 150 cu. ft. of free air per minute and driven by a shunt wound motor taking current from the line. The air is stored in a steel circular

COST OF POWER IN NEW ORLEANS.

POWER HOUSE No. 2.—ELYSIAN FIELDS STREET.

	Labor	Coal *	E. Oil	Cy. Oil	Waste	Packing	Compound	General Supplies	Supplies— Engine	Electrical	Average Employees	Total Cost	Cost per kw. h.	Total kw. h.	Lb. of Coal	
1900.																
Sept...	\$ 707 40	\$1591 84	\$ 51 48	\$ 56 33	\$ 20 76	\$ 28 04		\$ 89 14	\$ 3 00	\$ 15 85		\$1,563 84	\$.89	287,840	994,900	
Oct....	753 70	1849 12	41 85	52 36	21 84	13 27		41 70	8 44			2,782 28	.88	314,600	1,155,700	
Nov....	749 60	1850 47	46 65	60 20	32 04	7 87		84 61	16 64		17	2,888 08	.92	309,300	1,184,600	
Dec....	721 80	1974 88	24 30	34 42	15 78			53 20			14	2,824 38	.88	321,960	1,234,300	
1901.																
Jan....	817 49	1780 48	39 00	31 36	20 94	5 00		122 73	3 65		15	2,820 65	1.00	282,110	1,050,800	
Feb....	830 75	1941 06	26 40	37 38	26 55	2 80		82 57	6 50		14	2,954 01	.93	314,980	1,198,870	
Mar....	910 83	1924 00	29 85	33 04	25 03			233 71	29 31		15	3,185 77	.96	331,120	1,242,600	
Apr....	850 55	1946 24	35 17	41 30	17 54			115 38			16	3,006 18	.94	319,790	1,216,400	
May....	830 95	2142 81	37 32	51 67	22 94	7 02		198 66	3 30	16 50	13	3,311 17	.91	361,846	1,326,000	
June...	814 46	2296 00	68 91	71 86	20 68	18 65		138 60	36 75	20 89	15	3,486 83	.94	370,148	1,373,100	
July....	923 80	2014 39	20 52	58 30	15 99			183 77	276 10	4 99	14	3,497 86	.88	394,040	1,450,000	
Aug....	975 76	1840 11	34 28	62 27	25 26			143 96	185 00	1 16	14	3,267 74	.79	411,028	1,424,930	
Total.	9887 03	23511 40	455 73	590 49	265 35	24 68		1488 03	568 69	59 39		36 548 79	Av. .90	4,018,782	14,856,200	

POWER HOUSE No. 1. NAPOLEON AVENUE.

	Labor	Coal *	E. Oil	Cy. Oil	Waste	Packing	Compound	General Supplies	Supplies— Engine	Electrical	Average Employees	Total Cost	Cost per kw. h.	Total kw. h.	Lb. of Coal	
1900.																
Sept...	\$ 807 10	\$1714 03	\$ 32 45	\$ 45 08	\$ 9 99	\$ 4 31	\$ 3 20	\$ 8 88				\$2,625 04	\$ 1 02	257,185	1,023,305	
Oct....	767 60	1904 14	27 79	38 08	10 79	6 38	3 60	15 13			11	2,778 36	1 08	256,509	1,136,800	
Nov....	707 60	1831 04	18 08	32 08	9 05	15 74	4 81	36 57			11	2,654 97	1 10	222,560	1,093,172	
Dec....	716 45	1866 22	13 09	29 69	10 17			48 65			15	2,684 27	1 15	231,625	1,114,160	
1901.																
Jan....	718 50	1818 56	17 63	28 20	9 95	8 85	5 82	55 96	30 78		13	2,694 25	1 12	238,855	1,085,710	
Feb....	813 55	1611 20	13 81	24 08	10 50	7 99	4 92	101 25			16	2,587 39	1 11	232,600	952,385	
Mar....	706 00	1788 93	21 00	26 74	13 45			31 77	6 42		12	2,594 31	1 04	248,585	1,071,770	
Apr....	705 65	1782 65	16 80	18 48	10 10	3 50		28 38			13	2,565 56	1 05	242,325	1,064,270	
May....	705 19	1774 79	21 63	25 49	12 49	10 90	2 46	50 56	175 55		12	2,779 06	1 09	253,870	1,049,090	
June...	688 34	1690 51	19 29	21 31	12 18	11 99	8 27	105 65	15 80	\$ 345 17	12	2,918 51	1 20	235,645	1,029,450	
July....	719 68	1692 54	21 95	23 55	14 47			166 43	3 35	27 11	12	2,669 08	1 20	212,380	1,031,250	
Aug....	708 54	1809 36	17 68	25 97	12 10	15 50		157 39	19 03		12	2,765 57	1 35	203,515	1,101,230	
Total.	8764 20	21283 97	241 20	338 75	135 33	85 16	33 08	806 62	255 78	372 28		32,316 37	Av. 1 13	2,835,654	12,752,592	

* Cost of coal per ton at Power House No. 1, \$3.20; at Power House No. 2, \$2.25.

tank 4 ft. in diameter by 24 ft. high, having a capacity of about 360 cu. ft. of air, which is stored under 100-lb. pressure. By the use of suitable nozzles the air is used for cleaning the floor of the shops, for cleaning out cars, cushions, curtains, seats, etc., and for blowing out electrical equipments. There is also in this same shop a portion devoted to blacksmithing work, where are located two soft coal forges with telescoping hoods, one small Bradley coke forge for babbitting bearings and one Bradley coke forge 14 ft. long for long heats.

The paint shop is 36x202 ft. and contains two tracks with a total capacity of 10 cars. The room is lighted from large, high windows, and as the walls are covered with white water paint the light is unusually good, a fact that is reflected in the high grade work turned out by the painters in this shop. Another detail that has given very satisfactory results is the boxing in of the heating pipes. This room is heated by low pressure steam carried in coils of pipes placed around the walls near the floor. By boxing these in and forming something of the nature of a wooden conduit open top and bottom, the air is given a circulation that is found not only to give a more even temperature, but also much drier air. The air enters the bottom of the box and the heated air passes out at the top with a slight impetus which carries it directly upward along the walls from which it gradually turns and curves out into the center of the room some distance above the floor. Before the steam pipes were covered in this way the air was free to dissipate itself directly into the room without any definite circulation. The movement of air, of course, is not enough to cause a draft, but just sufficient to keep the atmosphere changed and in good condition. As will be noticed, the paint room is long and narrow, and it is the practice when painting or varnishing cars to divide the immediate section in which cars are located into practically a room by itself by means of heavy canvas drop curtains, which will be seen in one of the engravings, rolled up near the top of the room. These curtains keep out all drafts, prevent sudden changes of temperature in the room, keep out dust and render the air dry.



DECORATED STACK.

The scaffolding for painting cars is supported by brackets embedded in a line between the tracks. These brackets are made of boiler tube set in concrete, the brackets for carrying the board forming the scaffold projecting out from the pipe stand about 3 ft.



A. H. FORD,
Lately General Manager New Orleans & Carrollton Company.

8 in. This bracket is free to swing on the stand and can be raised or lowered. It is held in place by pins fitting in holes directly over the stand. The paint room is, of course, supplied with lockers for the use of the men. The varnishing is done in a separate room 30 ft. by 60 ft., where all sash, doors, etc., are taken to be finished. It is the practice here when sash are to be revarnished, not to scrape or sand paper the old varnish off, but use a solvent made by the Eureka Solvent Co., of Chicago. This compound eats the varnish and not the paint, and if any happens to be left on it hardens and gives no trouble.

POWER GENERATION.

The New Orleans & Carrollton company owns four power houses, two exclusively for electric lighting service and two exclusively for street railway service. Both of the street railway stations are equipped with comparatively modern direct current railway units of conventional design, and both are showing a remarkable degree of efficiency, the kilowatt hour costing at the bus bar at power station No. 1, 1.13 cents, and at power station No. 2, .90 cents, these figures, however, not including cost of maintaining apparatus and

buildings. The data on cost of power accompanying this article are for the last fiscal year, when coal was burned as fuel at both plants. In the spring of the present year Beaumont oil was substituted for coal at both stations and the cost per kilowatt hour has thereby been materially reduced as compared with the figures given. (For information as to the saving effected see "Oil as Fuel" in the "Review" for May, page 322.)

Railway power station No. 1 is on Napoleon Ave., and located advantageously near the center of heavy load.

It contains the following units: Three 350-h. p. Lane & Rodley tandem compound condensing engines, 16 and 32 in. by 48 in., running 72 r. p. m., each belted to a 200-kw. General Electric railway generator, and connected to independent jet condensers and single acting air pump, 12x14x16 in., made by the Buffalo Steam Pump Co.; one 350 h. p. Rankin & Fritch tandem compound condensing engine, 16 and 32 by 48 in., running 72 r. p. m., belted to a 200-kw. General Electric railway generator, and connected to Worthington



H. A. DAVIS,
Acting Manager Railroad Department.

independent jet condenser and duplex air pump $7\frac{1}{2} \times 10 \times 10\frac{1}{4}$ in. Condensing water is supplied by one Blake single acting pump, $14 \times 16 \times 24$ in., one Blake duplex compound pump, $10 \times 16 \times 10\frac{1}{2} \times 18$ in., and one Smedley single acting pump $10 \times 12 \times 26$ in. There is also one small air pump for cleaning apparatus by compressed air.

Steam is generated in four 150-h. p. Babcock & Wilcox water tube boilers with Hawley down draft furnaces, and two 225-h. p. Babcock & Wilcox boilers with ordinary fire grate furnaces. Feed water is supplied through three Worthington duplex outside packed boiler feed pumps, $7\frac{1}{2} \times 4\frac{1}{2} \times 10$ in., and one Knowles single acting well pump, $10 \times 7 \times 7\frac{1}{2}$ in. There are two Smith & Vale open feed water heaters.

Railway power station No. 2 is located at Elysian Field St. near the river and some little distance east of the belt circle.

It contains the following units: Two 450-h. p. Reynolds-Corliss tandem-compound, condensing engines, 16 and 32 by 42 in., running 100 r. p. m., each direct connected to a 300-kw. General Electric railway generator, with Reynolds independent jet condensers and air pump $8 \times 12 \times 20$ in., with Reynolds-Corliss valve gear; one 1,275-h. p. Reynolds-Corliss cross-compound condensing engines, 26 and 50 by 48 in., running 80 r. p. m., direct connected to an 850-kw. General Electric generator, with Reynolds jet condensers and air pump, $12 \times 16 \times 32$ in., with Reynolds-Corliss valve gear.

The boiler equipment comprises two 350 h. p. Edgemore water tube boilers with Hawley down draft furnace ($52\frac{1}{2}$ sq. ft. grate surface), and two 450-h. p. Edgemore boilers with Hawley furnace (60 sq. ft. lower grate surface). There are two 700-h. p. Webster open feed water heaters.

Formerly the feed water was taken from the 8-in. artesian well, which is 850 feet deep, by ordinary steam lifting pumps, but recently the arrangement has been changed and the feed water is raised from the well by compressed air, which arrangement has proven eminently satisfactory and nearly twice as economical as the steam pump.

The change was made by lowering into the $8\frac{1}{2}$ -in. pipe to a

depth of 260 ft. Inside of this pipe was placed a $1\frac{1}{4}$ -in. pipe which discharges air under pressure into the 4 in. pipe at a depth of 161 ft. It will be understood this air rising to the surface lifts the water with it. The motor discharges into a 12,000-gallon storage tank supported at an elevation of 25 ft., the water flowing to the feed water heaters by gravity.

The compressed air for this service is furnished either by a Westinghouse large air compressor or a style "B" straight line air compressor with radial air valves. These compressors also furnish air for cleaning purposes in the station, and either one may be connected to the artesian well as desired. The air compressors are driven by steam and their exhaust steam goes to the feed water heaters. It is found it takes about 65-lb. pressure of air to start the water from the well and 45 lb. to maintain the flow.

The power house employes and wages paid per month are as follows:

Power house No. 1: One chief engineer at \$125; one assistant engineer at \$85; three oilers at \$50 each; three firemen at \$55 each; two coal passers at \$45 each; one boiler cleaner at \$45; one helper at \$45.

Power house No. 2: One chief engineer at \$125; one assistant engineer at \$85; one assistant engineer and oiler at \$60; two oilers at \$55 each; two coal passers at \$45 each; two helpers at \$50 each; one boy at \$30.

The foregoing was the scale in force for the period corresponding to that covered by the data given in the table, when coal was burned as fuel. Since oil fuel has been substituted the services of four coal passers and two firemen have been dispensed with.

PERSONNEL.

The officers of the New Orleans & Carrollton Railroad, Light & Power Co. are: President, J. K. Newman; vice-president, Joseph H. De Grange; assistant secretary and auditor, W. B. Brockway; general manager, A. H. Ford; superintendent of equipment, H. A. Davis; master mechanic, E. W. Miller. All the recent engineering work has been carried out under the supervision of Ford, Bacon & Davis, of New York and New Orleans. Since the foregoing was written Mr. A. H. Ford has resigned as general manager to enter the office of Isidore Newman & Co., New Orleans, and Mr. H. A. Davis has been appointed acting manager of the railroad department.

STREET RAILWAY ACCOUNTANTS' REPORT.

Secretary Brockway, of the Street Railway Accountants' Association of America, has issued under date of July 1, 1902, the official report of the organization meeting of the Association, held in Cleveland, Mar. 23-24, 1897. The publication of this report, which was only recently authorized by the association, will be welcomed by the membership, as it completes the file of the association's proceedings, and the full discussion on the papers presented in March, 1897, is for the first time made available to members. The book comprises 108 pages, and has as a frontispiece a half-tone portrait of the late Morris W. Hall, secretary of the Camden (N. J.) & Suburban Railway Co., who served as chairman at the organization meeting.

Secretary Brockway prefaces the report with the following "explanation:"

"The verbatim report of the meeting at which this Association was organized has never before been published in book form. A synopsis of the proceedings was printed in the April 15th, 1897, issue of the 'Street Railway Review,' which paper was instrumental in the calling of the meeting, formulating the program and making the arrangements necessary for such a gathering.

"There have been many requests for the publication of the complete report in a form to correspond with those issued annually, so that a set of the reports will contain a history of the association, and it is in response to these that the issue is now made.

"The publication is made possible by the courtesy of the 'Street Railway Review,' which furnished the minutes of its stenographer.

"The comparison of the first thoughts and ideals and hopes as recorded in the following pages with what has been accomplished in five years will serve to encourage the association, as well as be interesting history to those members who have, since the organization, added their zeal and strength to the effort toward accomplishing something for the common good."

Accounting Department of the New Orleans & Carrollton Railroad, Light & Power Co.

Requisitions and Records of Stores—Material Card for General Storekeeper—System of Classification for Securing Accurate Costs on Small Items—Use of Trip Sheets—Forms of Register Report—Combined Pay Roll and Time Sheet—Organization of the Department—Auditor's Monthly Report.

Mr. W. B. Brockway, who is widely known through his prominent identification with the work of the Accountant's Association, holds the office of assistant secretary and auditor of the New Orleans & Carrollton company. Mr. Brockway has courteously placed at our disposal for publication a number of his blanks and

received the purchasing agent checks the bill with the purchasing order, and if the prices and other data agree he sends the duplicate purchasing order with the bill to the general storekeeper in the accounting department. In the meantime the goods have been received and the employe receiving the goods has made out a blank (form 307), this employe having no information whatever as to the quantity ordered or the price to be paid. This blank or receipt goes to the general storekeeper who compares it with the duplicate purchasing order and the bill, already in his possession, and if O. K., all three forms go to the general manager for approval.

If they are approved by the manager the blanks and bill are returned to the general storekeeper, who at the end of each month prepares from them vouchers for material purchased during the month.

The general storekeeper keeps his record of stock on cards here shown as "General Storekeeper's Material Card." There is, of course, a separate card for each item of material. Goods received into stores are entered in the column at the left, and notation of goods delivered out of stores is made in the square spaces at the right. As is apparent there is a square for each day of each month of the year, the only recording necessary being to enter the quantity issued in the proper square. There is also a line in each month's space for striking balances. One side of the card carries the record from January to June, and the reverse from July to December.

Every lot of the same kind of goods received is kept separate and distinct from all other lots, both in the storeroom and in the accounting, and each lot is charged out at the actual price paid for it. This distinction is preserved by giving each lot in addition to its designating number a designating letter. Thus 1/2-in. bolts might be lot No. 120. The first lot of bolts received would be called lot No. 120. If it became necessary to order a new supply of 1/2-in. bolts before the first lot was exhausted the new lot would be designated lot No. 120A, and would be



GENERAL VIEW ACCOUNTING DEPARTMENT.

labor-saving methods, several of which are novel and are original with him.

On this road, contrary to the usual practice, the general storekeeper has his office in the accounting department under the general supervision of the auditor, and does all his stock recording and accounting through a system of well devised blanks.

kept separate and distinct from all other lots, both in the storeroom and in the accounting, and each lot is charged out at the actual price paid for it. This distinction is preserved by giving each lot in addition to its designating number a designating letter. Thus 1/2-in. bolts might be lot No. 120. The first lot of bolts received would be called lot No. 120. If it became necessary to order a new supply of 1/2-in. bolts before the first lot was exhausted the new lot would be designated lot No. 120A, and would be

Form 307-1201

NEW ORLEANS & CARROLLTON R. R., L. & P. CO.

RECEIVED FROM		NEW ORLEANS, LA.....190....		Requisition No.
CASES	OPENED BY	ARRIVED VIA		
PACKAGES	COUNTED BY	DELIVERED BY		
	BY			
CASE MARKS	Quantity	ARTICLES	LOT NO.	

GOODS RECEIVED BLANK (ORIGINAL 8 X 7 IN.)

The purchasing agent issues purchasing orders or requisitions in triplicate. The original goes to the merchant or supply house; the triplicate remains in the book as a permanent record; the duplicate is held by the purchasing agent until the bill for the goods arrives. (It is an iron-clad rule that dealer must transmit the bill at the same time the goods are shipped.) When the bill is

kept separate in the bins. Requisitions would be filled from lot No. 120 until the supply was gone, when lot A would be opened and used. This permits of a more careful checking of stock than would be possible if the two lots were mixed and used indiscriminately. In the inventory just taken the material checked practically exact with the cards.

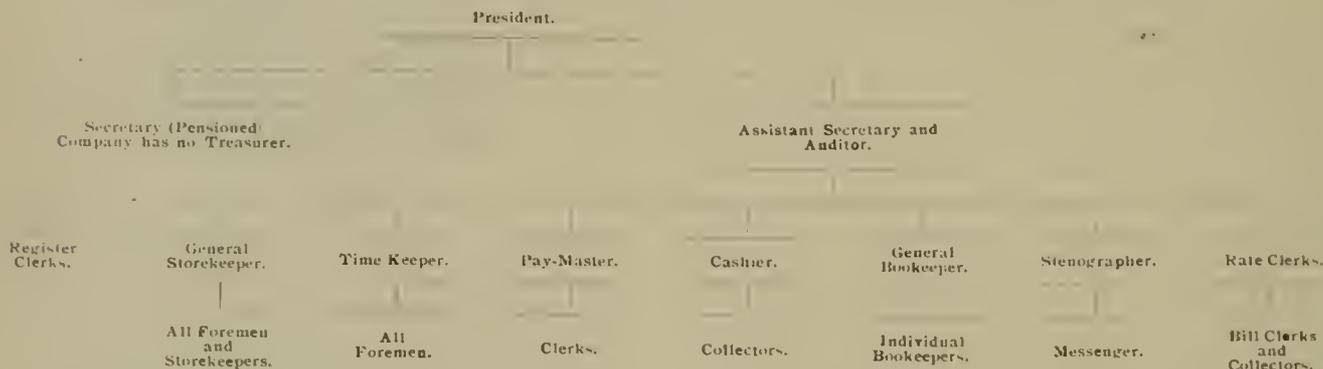
squares shown in the center of the sheet. At the end of each 15-day period the sheet is completed, recapitulated and paid. The paymaster makes one trip over the road and pays off the entire system. He pays with cash and the money is not put up in individual envelopes. The paymaster has one clerk helper, who handles the small receipt blank. The men form in line, receive and sign their receipt blank, and present it to the paymaster at the next window in exchange for their money. At regular periods the pay sheets are permanently bound and filed away.

The statement was made that all materials and supplies are purchased by the purchasing agent. There is one exception to this in that all blanks, forms, and stationery for the entire company are purchased and approved by the auditor, this serving to secure uniformity in size and style.

ORGANIZING OF ACCOUNTING DEPARTMENT.

The accompanying diagram shows the organization of the accounting department of the New Orleans & Carrollton company. The entire force employed in this department comprises 18 clerks and one porter, all reporting to the auditor. Both the railway and electric lighting accounting is performed in this same department.

ORGANIZATION OF ACCOUNTING DEPARTMENT, NEW ORLEANS & CARROLLTON RAILROAD, LIGHT & POWER CO.



Mr. Brockway has designed a set of six blanks for showing the comparative statement of income and expenses, general balance sheet, and operation data for the railroad and the light and power departments of the company which will be found very interesting. These blanks constitute the auditor's monthly report.

Each of the six sheets is 16 1/4 x 20 3/4 in. and printed on one side only; they are intended to be folded once making the size 10 3/8 x 10 1/8 in., which is more convenient for handling. Each sheet has on it two rectangles 9 1/2 x 15 1/8 in. ruled in black within which are the tabular rulings, these latter being in red. The six sheets are numbered consecutively 1 to 6.

Sheets Nos. 2, 3, 4 and 5, are reproduced herewith (about one-half the original size) with no alteration except that the tabular rulings are in black instead of red ink. The right hand half of Sheet No. 6 is blank save for the border and this space we have utilized showing the contents of Sheet No. 1. The "Summary" (shown here on the right side of Sheet No. 6) occupies the right side of Sheet No. 1, while the title shown below the "Summary" is on the left hand side of Sheet No. 1 and when the report is folded serves as the title page.

The items and column headings on these various blanks are self explanatory. The columns having blank headings are provided for use in making comparisons or to serve special purposes.

CLEVELAND THREE-CENT FARE ROADS DEFEATED.

In the suit to enjoin the promoters of the proposed three-cent fare lines in Cleveland from proceeding under the franchises granted a few months ago to John B. Hoefgen, the Circuit Court rendered a decision, June 21st, overruling the recent decision of Judge Strimple which had dissolved the temporary injunction against the promoters of the three-cent fare roads, and holding the ordinance to construct a railway over three out of the seventeen routes originally advertised for by the city, as illegal. The Court

pointed out that in the original ordinance calling for bids all of the 17 routes were regarded as one road comprising 75 miles, but that in the ordinance as passed only three routes, comprising 13 miles, were considered. This was claimed to be illegal on the grounds that other bidders, who had not cared to compete with Mr. Hoefgen under the provisions of the original ordinance, might have offered to carry passengers for less than Mr. Hoefgen on the 13-mile road subsequently proposed. Such possible bidders had not been given an opportunity to bid on anything but the entire 17 routes comprising 75 miles.

It was also held by the Court that the routes originally advertised for were changed in the ordinance which was passed by the council. The change in one instance was considered unjustifiable as, at the time the routes were advertised for, it was known that it would be almost impossible to secure the necessary consents on the streets covered by this route, a fact which may have prevented possible competitors, who could not have known that the routes would be changed later, from bidding.

The Court also declared against the municipal ownership and labor arbitration clauses in the ordinance as unreasonable provisions. Mayor Johnson, through whose efforts the defeated ordinance had

been passed a few months ago, is quoted as stating that the case will not be appealed to the Supreme Court, but that separate ordinances will be prepared for each of the desired routes and that another and better-advised attempt will be made to secure the low-fare roads.

BUFFALO, SPRINGVILLE & AURORA.

The Buffalo, Springville & Aurora Railway Co., mention of which was made in the "Review" for June in connection with our publication of the drawings of the high bridge to be erected by this company, is at work securing the rights of way over private property for a route of 34 miles. The company will have 38 miles of track which will be operated from the central power house and two sub-stations. The rolling stock now contemplated comprises six passenger cars, each seating 48 persons, 10 freight cars and two electric locomotives weighing 40 tons each. The officers of the company are: President, Henry L. Moench, Boston; vice-president, U. L. Upson, 940 Ellicott Square, Buffalo; secretary, Theodore Tindy, Otto; treasurer, W. A. Oakes, Cattaraugus; chief engineer, Charles G. Locke, Randolph, N. Y. The company was chartered Feb. 8, 1902, with an authorized capital of \$1,000,000; at the present time only \$38,000 of this has been issued.

The Rapid Railway Co., of Detroit, contemplates inaugurating a 15-minute schedule on its lines between Detroit and Port Huron to accommodate the steadily increasing traffic. At present cars are run every hour in each direction.

The Montreal (Que.) Street Railway Co. has practically completed several miles of new double track and is extending its system further into the suburbs of the city. In connection with the street railway company's extensions, the city is widening some of the streets through which the lines pass.

Month of

2

Income	Whole Property.	PERCENTAGE	PERCENTAGE
Exchange Railroad Property			
Exchange Electric Property			
Exchange Street Railway Property			
Exchange Other Property			
Total Exchange Property			
Income from Operations			
Income from Real Estate			
Income from Investments			
Income from Other Sources			
Total Income			
Expenses			
Operating Expenses			
Interest on Bonds			
Interest on Notes			
Interest on Debts			
Depreciation			
Income Tax			
Other Expenses			
Total Expenses			
Net Income			

Condensed Balance Sheet 190

ASSETS	LIABILITIES
Railroad Property	Capital Stock Preferred
Light Plant	Capital Stock Common
Cash	Bonds, N. O. & C. R. R. Co.
Material and Supplies	Bonds, N. O. & C. R. R. Co.
Fuel	Bonds, C. & C. R. R. Co.
Lamps and Carbons	Bonds, Edison Elec. Co. 5%
Debt from Consumers	Bonds, Merchants El. Co. 5%
Accounts Receivable	Accounts Payable
Items in Suspense	Per Roll
Stock Owned	Customers' Deposits
Other Assets	Employees' Deposits
	Corporation Interest
	Other Liabilities
	Surplus

Cash Receipts and Disbursements.

RECEIPTS	DISBURSEMENTS
From Railroad Conductors	For Accounts Payable
Electric Department Collections	For Rolls
Accounts Receivable	Interest on Bonded Debt
Employees' Security Deposits	Dividends
Customers' Deposits	Employees' Security Deposits
Various Sources	Customers' Security Deposits
	Various
Balance from Last Month	Balance on hand last day of Month
Total	Total

ELECTRIC SUBURBAN RAILWAYS.*

BY E. A. EVANS, QUEBEC.

A paper was recently read by Mr. C. H. Davis, C. E., before the Canadian Society of Civil Engineers, on the competition of parallel steam and electric lines, in which, among other conclusions, Mr. Davis said: "Steam railroads will, in the near future, handle their suburban and short distance interurban passenger traffic and mail, express, baggage and light local freight carried in these suburban and interurban passenger trams by electric motive power; and this, irrespective of whether operating expenses are affected favorably or unfavorably." In this conclusion the writer firmly agrees, and to show that to carry out this conclusion it is not even necessary to construct a parallel, but on the contrary, steam trains and electric cars can be safely operated upon one and the same track.

The writer (as manager of the Quebec Railway, Light & Power Co., part of which company's system was formerly the Quebec, Montmorency & Charlevoix Railway, a steam road operating between the city of Quebec and Ste. Anne de Beaupre and St. Joachim, a distance of 30 miles), inaugurated a service of electric cars upon the same track and running between the usual steam railway trains. The scheme was generally considered a bold one and one that would not meet with the success anticipated; the results, however, as will presently be shown, have more than justified the innovation and the expenditure incurred.

The Quebec, Montmorency & Charlevoix, as it was formerly called, after leaving Quebec, passes along the flats comprising the North Shore of the River St. Lawrence; for six miles there is a continuous row of farmers' and other dwellings running on both sides of the highway, which, however, is on the top of a cliff running parallel to the railway and at a distance varying from one-half to one mile from the track; at Montmorency the line runs through a small village, the inhabitants of which are mostly operatives in a large cotton factory, and from here the line is through the following parishes: L'Ange Gardien, population about 1,400; Chateau Richer, population about 2,000; Ste. Anne de Beaupre, population about 1,500, and St. Joachim, population about 1,000. Before the operation of the electric system, this population was served in the winter by two daily steam trains leaving Quebec at 8:50 a. m. and 5:15 p. m., and leaving Ste. Anne de Beaupre at 7:15 a. m. and 11:40 a. m.; in the summer by four daily steam trains, leaving Quebec at 7:30 a. m., and 10 a. m., 5 p. m., and 6:15 p. m., and Ste. Anne at 5:45 a. m., 7:23 a. m., 11:50 a. m., and 4:10 p. m. There was also an additional steam train between Quebec and Montmorency, leaving Quebec at 2 p. m. and returning at 3:45 p. m. Special trains, as required, were also put in service to convey the large numbers of pilgrims visiting the shrine of Ste. Anne.

The residents in the thickly inhabited port on top of the cliff, between Quebec and Montmorency, previously mentioned, did not patronize the railway, but traveled by omnibuses, of which there were eight or ten.

In 1889, the year prior to the introduction of the electric cars, the steam trains carried 253,054 passengers, including about 41,500 pilgrims, to Ste. Anne de Beaupre. This did not appear to the writer to be satisfactory, especially during the winter, when residents would take advantage of the good winter roads and drive, rather than have the inconvenience of having to wait and be at a railway station at a certain fixed time to catch a train; as a result it was decided to electrically bond the existing track, put an overhead trolley wire, high enough to allow of brakemen traveling with safety on top of box and freight cars, put in an alternating current—direct current generator at the electric power station at Montmorency and operate electric cars between the steam trains. These cars were each equipped with four 50-h. p. motors and Westinghouse air brakes, operated by an independent motor, and were so geared as to be capable of running at a speed of 45 miles an hour, standard railway car wheels being used.

The cost of this work for the 30 miles of track was as follows:

Electrically bonding existing track.....	\$ 5,022
Overhead trolley, including poles, etc.....	68,804
Six large double truck cars, seating capacity 54, with motors, etc., complete	51,606

* Read before the Canadian Electrical Association, Quebec, June, 1902.

One 600-kw. A. C. D. C. generator and water wheel, and one 200-kw. rotary transformer at St. Anne, including switch boards, etc. 43,943

Total\$169,375

Upon the completion of this work, in addition to the regular steam railway service, which was continued as before, cars were sent out between Quebec and Montmorency every hour between 6:30 a. m. and 9:30 p. m., and between Quebec and Ste. Anne de Beaupre about every three hours, and the following comparative statement shows the result of the year's operation in 1901, from which it will be noted that there was an increase of \$29,071.39, with an increased expenditure of only \$5,098.46. From June 30, 1901, to date (June 12, 1902), there has been a further increase of 86,392 passengers over the corresponding period last year.

Comparative statement of tickets sold at different stations.

	1899.		1901.	
	Passengers.	Amount.	Passengers.	Amount.
Quebec	108,103	\$20,107.20	259,364	\$33,976.70
Quebec pilgrims ..	41,329	7,687.35	106,280	13,922.34
Hedleyville	2,431	452.30	4,759	623.45
Beaupre	20,241	1,626.25	47,237	4,591.40
Montmorency	17,970	2,963.60	64,535	6,294.31
L'Ange Gardien....	11,062	1,427.10	15,669	2,048.25
Chateau Richer....	12,652	2,274.25	18,885	2,879.70
Ste. Anne	23,738	4,569.45	33,190	5,404.55
Beaupre	2,198	463.00	3,691	611.50
St. Joachim	2,920	563.00	10,557	1,596.62
Agencies	11,310	2,087.45	7,207	944.12
Totals	253,054	\$44,221.55	571,374	\$73,292.94

The operations for the year 1900 are omitted, as the work of electrifying the road was then only partially completed.

The omnibuses previously referred to have been run out of business, notwithstanding the inconvenience of passengers having to walk up the cliff to get to the public road and their houses, and traffic has now so much increased that it has been found necessary to run cars every half hour between Quebec and Montmorency and about every hour between Quebec and Ste. Anne; and in addition the steam trains are run as formerly. On Sundays and holidays the resources of the company are so fully taxed that it has been found necessary to increase the rolling stock with cars having a seating capacity for 120 passengers, and in addition to the regular cars, to run specials at from ten to fifteen minute intervals. It has also been found absolutely necessary to construct a double track between Quebec and Montmorency.

The writer, as an old steam railway engineer, would like very much to enlarge upon the subject of suburban railways and the desirability of steam railway managers studying and taking up the subject, but sufficient has however been said to show that it is advisable and in the interests of their companies to leave the old groove and not allow other and independent street railways to compete for suburban traffic. It might perhaps be as well to mention that notwithstanding the traffic above mentioned, steam freight and special pilgrimage trains are being constantly handled and that no collision or any other accident has so far occurred.

DISCUSSION.

After concluding the reading of the paper, Mr. Evans said: With reference to Montmorency, I think it is important to mention that in 1901 the Kent House and all the property that we saw yesterday was not in existence; that is, the building was there, but it was not open to the public and it had not been thought of as a place of resort for the citizens of Quebec, yet notwithstanding that, you see we carried 64,000 passengers last year and over 17,000 the year previous.

I might add, for the information of the members, there is an absolute necessity of having standard railway car-wheels M. C. B. standard. Of course they are not suitable, and you cannot run them over city tracks, the flange is too deep; but if you want a high-speed suburban service it is absolutely necessary you should have standard wheels, so that there is no danger of their running off the tracks at the different blocks and switches.

The President: You must have found it very much to your advantage to have put in the ballast you have there and the heavy rail?

Mr. Evans: Undoubtedly. That was one of the points I omitted to mention. Before we put in the double track we were operating on the old track, 56-lb. rails, with ordinary old fashioned single fish plates. The traffic increased to such an extent that we had positively to double the track the first six or seven miles, and in doing so we put in 70-lb. rails and a special fish plate, 3 ft. in length with double angle, an angle on both sides; the result of that has been very satisfactory. My electrical engineer has tested the power taken in running the cars on both tracks. On the old track it takes 10 h. p. more to operate our 46,000-lb. car than it does on the new track, showing the advantage of having the heavy rail and good joints, which, in my opinion, is more important than the heavy rail.

Mr. Reynolds: I would like to ask in regard to the distribution of power. Is there a sub-station on the road beyond the power plant, or is that all direct feed, and how many miles?

Mr. Evans: The power is taken from a 600-kw. A. C. D. C. generator at Montmorency, seven miles from Quebec; from there we distribute direct current seven miles to Quebec and seven miles from Montmorency, making seven miles each way. We send alternating current to Ste. Anne de Beaupre, 14 miles away, at 11,000 volts; there it passes through a 200-kw. rotary transformer and feeds back seven miles in this direction, to meet the direct current coming forward from Montmorency.

Mr. Thornton: Without wishing to stop any future discussion on this paper, I would like to move a very hearty vote of thanks to Mr. Evans for his interesting paper. The possibility of investments and profitable returns in suburban railroads and the results obtained with the enterprising management of Mr. Evans is a revelation to most of the members here present. There are many railroad men here and we would like very much to hear their opinions on the subject.

NEW ELECTRO-PNEUMATIC SYSTEM OF ELECTRIC RAILWAY CONSTRUCTION.*

BY BION J. ARNOLD.

During the past three years, as many of the members of the Institute know, I have advocated the use of the alternating current motor for certain classes of railway work somewhat earnestly, and have often been asked by my friends why I believed so thoroughly in the alternating current motor, and have been questioned rather closely at times for particulars regarding a certain system which I have been working upon.

I wish to state that long before I had any fixed ideas as to a system of my own, a study of the railway question from an engineering standpoint partially convinced me of the necessity of the ultimate abandonment of the direct current motor for heavy and long distance service, due to the low working voltage that it was necessarily limited to, the resulting heavy investment in transmission lines thereby required, and the many translations between the power station and the car when any great distance was taken into account.

An active connection with the development and construction of electric railways in this country impressed me with the correctness of my preconceived ideas to such an extent that they finally crystallized into a system of electric railway construction upon which I have been working for several years, and to which I have alluded from time to time without giving, to those not interested with me, any definite information regarding it, for reasons well known to those working upon new devices.

I have constructed 20 miles of road for this system, together with the necessary trucks and motor equipments, and as I feel reasonably sure of the interest you will take in this system, I feel warranted in presenting it to the Institute.

As I have previously stated before the Institute, I am particularly anxious that American engineers shall keep abreast with European engineers in the development of the alternating current electric railway, and while some of my brother engineers may not agree as to the practicability of my idea, there are others in the Institute who I think believe as thoroughly in the alternating current motor for railway work as I do, and whether my system proves the correct solution of the question or not, I firmly believe that the alternating current motor will finally prevail for heavy railway work.

*A paper presented at the 19th Annual Convention of the American Institute of Electrical Engineers, Great Barrington, Mass., June 19th, 1902.

The recent discussions that have been going on between engineers in Europe and the United States of this question have made the subject a live one at present, and this is my reason for presenting a brief description of one embodiment of my system at this meeting.

The principles underlying the system I advocate and which I call an "Electro Pneumatic System," are as follows:

1. A single-phase or multiphase motor, mounted directly upon the car, designed for the average power required by the car, and running continuously at a constant speed and a constant load, and, therefore, at maximum efficiency.

2. Instead of stopping and starting this motor and dissipating the energy through resistances, as is customary with all other systems known to me, I control the speed of the car by retarding or accelerating the parts usually known as the rotor and stator of the motor, by means of compressed air, in such a manner that I save a portion of the energy which is ordinarily dissipated through resistances, and store it to assist in starting the car, helping over grades, for use in switching purposes, and for the operation of the brakes.

3. By this method of control I secure an infinite number of speeds from zero to the maximum speed of the car, which may or may not be at the synchronous speed of the motor, for with the air controlling mechanism working compressing, the speeds below synchronism are maintained, and by reversing the direction of the air through the controller speeds above synchronism may be attained for reasonable distances. This feature gives to the alternating current motor the element absolutely essential for practical railway work, for it permits a car or train to ascend a grade at any speed with the motor working at its maximum efficiency, and imparting its full power to the car. When descending the grade the motor may utilize its full power drawn from the line in compressing air, or it may be used to compress air with the stored energy of the train, thereby acting as a brake.

4. By virtue of the air storage feature, each car becomes an independent unit and capable, in case of loss of current from the line, of running a reasonable distance without contact with the working conductor, and this without the aid of storage batteries. This feature will enable a car to work on a high tension trolley wire or active conductor over private right of way, and allow the active conductor to be stopped where the private right of way ceases, and the car to proceed through a city or town on any tracks whether electrically equipped or not, until it reaches the outskirts of the city or town where it can take up the working conductor again on a private right of way. This feature is also valuable in switching work, for each car being independent it can leave the main line track and operate over switches or sidings without complicating the yards with additional overhead or third rail conductors, thus necessitating through line conductors over main line track or tracks only.

5. Since a single phase motor can be used the motors can be supplied with current from a single overhead wire or third rail, and with a single rail return circuit, thus permitting the overhead construction, or third rail construction, to conform to the standard of to-day, except that a much higher working voltage can be used, provided the insulation is taken care of. Furthermore, in steam railway work this system, by virtue of its single phase feature, will only require the use of one of the track rails for the return circuit, thus leaving the other rail for the use of the signal system, which, up to the present time, does not seem to have been satisfactorily solved without the use of one of the track rails.

6. The current will be taken from the working conductor at any voltage up to the limit of the insulation, and in case this voltage is high (I am building my line for 15,000 volts), a static transformer will be carried upon each car and the pressure reduced from the line voltage to the voltage of the motor, which in the case under construction is designed for 200 volts. Where it is unnecessary to utilize so high a line pressure the motor may be designed for the working voltage, and the current fed directly from the working conductor into the motor, thus eliminating the static transformer. When a high voltage working conductor and static transformer is used, and it is thought advisable to use a working conductor through cities or towns, this working conductor will be supplied with energy through a stationary transformer at each city limit, thus making the working conductor through the cities or towns safe.

7. By virtue of the speed of the motor and its constant load, either when the car is in motion or when it is standing still, and

the motor is compressing air, the variable load now customary in electric railway power plants is eliminated, and the power station works at practically a constant load, thereby eliminating a large part of the investment at present requisite in power station and line construction. Furthermore, by virtue of the air storage feature, each car, in the particular apparatus I have designed, is capable at any time when current is on the working conductor, of delivering to the car wheels a much greater torque in proportion to the capacity of the motor than is possible with any electrical system known to-day.

I believe that by the adoption of this system the following results will be accomplished:

1. The entire elimination of the present standard system of rotary converter substation plant, together with the maintenance thereon, and the cost of the necessary attendants.

2. The absorbing and rendering available for useful work in starting, or otherwise, a large percentage of the energy stored in the moving mass which under the present methods of operation is dissipated at the brake shoes.

3. A large reduction in the first cost of electrically equipping long distance railroads, thereby making it feasible, from an engineering and business standpoint, to equip many roads which cannot now be shown to be advisable, thus opening up the steam railway field to the industry in which we are now engaged.

STREET RAILWAY INVESTMENTS AND EARNINGS.

ALTON D. ADAMS.

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Great earning capacity and large profits are often associated with electric railways in the popular mind. No doubt the notable expansion of street railway investments and incomes has done much to foster such views on the part of casual observers.

The purpose here is to inquire how far the change of street railways from horse to electric motive power, and their subsequent extensions, have opened a field of extraordinary returns on invested capital. Massachusetts offers an excellent opportunity for investigation along this line, because it stands third among all the states in the extent of street railway development, and because the stocks and bonds of these railways are issued, under the law, only for cash or property actually invested. In 1888, the last year in which the street railways of Massachusetts, except less than a mile of experimental road in Revere, were operated entirely with horses, the total length of their main tracks was 533.59 miles. By 1901 this length was multiplied by four and stood at 2,176.97 miles. Meantime the total investment in the street railways of the state has risen from \$17,237,100 in the earlier to \$99,611,185 in the latter year, having been multiplied by 5.7. This great expansion of investments in street railways was accompanied by the substitution of bonds and other forms of indebtedness for stock. As is well understood, an investment entirely represented by stock is managed by those who contribute the funds, and who may take as profits the entire difference between gross income and operating expenses, but are entitled to nothing more. Investors in bonds or other forms of indebtedness, on the other hand, have no voice in the management of the sums they have contributed, but are in a position to demand a fixed interest return on their money.

Year.	Stocks.	Net debt.	Per cent in stocks.
1888.	\$10,894,850	\$6,342,231	63.2
1889.	12,290,740	7,127,358	63.2
1890.	14,879,130	8,547,973	63.4
1891.	19,553,952	7,943,652	71.1
1892.	23,599,536	11,271,788	67.6
1893.	25,883,575	20,767,103	56.2
1894.	26,971,275	22,223,133	54.9
1895.	27,906,685	25,022,246	52.7
1896.	30,728,818	28,478,245	51.9
1897.	32,670,273	30,442,491	51.7
1898.	38,933,917	29,824,847	56.6
1899.	41,380,143	35,846,071	53.5
1900.	48,971,168	35,743,929	57.8
1901.	54,069,933	45,541,252	54.2

Such investors are naturally content with and are able to command a smaller annual return on their holdings than that necessary to interest capital in stocks which must take all the risks of business with no certain return. A consequence, therefore, of the larger introduction of bonds as a form of investment in street railways is that the public enjoy the use of capital at lower rates than would otherwise be possible. From 1888 to 1901 the stocks of street railways throughout the state rose from \$10,894,850 to \$54,069,933, or almost five times the earlier sum. In these same years the net debts of the railways stood at \$6,342,231 and \$45,541,252 respectively, the latter amount being more than seven times the former. Net debts here include bonds and other forms of obligations such as notes and mortgages not given to secure bonds, less cash and current assets of the companies. In 1901 the gross debt was \$49,528,109, and the cash and current assets \$3,980,857. Throughout the period under consideration bonds of the companies have largely exceeded their unfunded debt, and in 1901 this debt stood at \$15,215,609.

Interest on the unfunded debt is probably paid at a somewhat higher rate than that on the bonds, but at a less rate than would be necessary to induce investments in stocks. In 1888 the stocks of horse railway companies represented 63.2 per cent of the total investment in them, but by 1901 the per cent of these stocks to the sum of stocks and net debt had fallen to 54.2 for the electric roads. So far as stocks have been replaced by debts, electric railways are serving the public at a lower rate of return on the investments than that earned by the horse roads. But net earnings from the operation of electric railways in 1901 amounted to \$7,201,199, or 5.5 times the net sum of \$1,291,520 earned by the operation of horse lines in 1888, and the net earnings per passenger were 1.66 cents in the latter, compared with only 0.96 cent in the earlier year. It may, therefore, appear that stocks are paying larger dividends than formerly, but such is not the case. The fact is that the greater earning capacity and economy of operation of electric over horse railways has only been attained by a more than proportionate increase of investments. Between the net earnings from operations and the stockholder stands the bondholder, with a claim for interest that must be met. While the stocks of electric have gone up to five times the figures for the horse roads, net earnings from operations have increased to five and one-half times the sum for the horse railways in 1888. Meantime, however, bonds and debts have so increased that stocks receive a smaller rate of dividend than that at the beginning of the period. If all expenditures and depreciation charges against street railways, except interest and dividends, are deducted from their gross income of every sort, the remainder represents interest and net income. Of such remainders interest charges are taking an increasing part.

Net incomes and interest:

Year.	Interest and net income.	Interest.	Per cent interest.
1888.	\$1,096,853	\$311,845	28.4
1889.	1,372,690	346,032	25.2
1890.	1,813,043	383,827	21.1
1891.	1,778,820	479,676	26.9
1892.	2,349,775	444,095	18.9
1893.	2,880,270	886,871	30.7
1894.	2,925,228	1,112,560	38.0
1895.	3,425,970	1,168,621	34.1
1896.	3,601,080	1,320,304	36.6
1897.	4,083,138	1,489,991	36.4
1898.	4,102,046	1,568,044	38.2
1899.	4,125,630	1,622,688	39.3
1900.	4,820,299	1,782,797	36.9
1901.	5,291,851	1,893,668	35.7

Between 1888 and 1901 interest plus net incomes increased to almost exactly five times the initial amount, as did also capital stocks, but interest charges meantime grew to more than six times the amount against the horse railways. Before 1893 interest had claimed as little as 18.9 per cent, but not more than 28.4 per cent of net income plus interest in any one year. From 30.7 per cent in 1893, the interest charge has since taken in each year a larger share of the net income plus interest, and reached 39.3 per cent in 1899. These facts make it plain that the possible percentages of dividends on stocks have been reduced.

The actual dividends paid in any year are no certain measure of the real net income on capital stock, because such dividends may

be less or greater in amount than this income. An illustration of this facts exists in the street railways of Massachusetts, which paid as dividends on stock less than the net income above interest charges in each year from 1884 to 1900 inclusive, but in 1901 distributed as dividends slightly more than this net income. When a net income has been earned, but not paid out as dividends, it simply mingles with the assets of the company, and may be drawn out at a future time. Net incomes rather than dividends are thus the true measure of prosperity, and these incomes have declined in relation to capital stocks during the past decade.

Net income and percentages of capital stocks:

Year.	Net income.	Per cent of stocks.
1888.	\$785,008	7.2
1889.	1,025,758	8.3
1890.	1,430,116	9.6
1891.	1,200,153	6.6
1892.	1,005,680	8.0
1893.	1,003,399	7.7
1894.	1,812,668	6.7
1895.	2,257,355	8.0
1896.	2,289,776	7.4
1897.	2,593,147	7.9
1898.	2,534,002	6.5
1899.	2,502,942	6.0
1900.	3,037,502	6.2
1901.	3,398,183	6.2

Between 1888 and 1901 the net income of all street railways of the state has risen from \$785,008 to \$3,398,183, or 4.3 times the amount in the earlier year. Meantime, however, the total of capital stock has increased to five times its sum in 1888. The percentage of net earnings to capital stock, therefore, fell from 7.2 in 1888 to 6.2 in 1901. In intermediate years this percentage has been up to 9.6, the figure for 1890, and down to 6.0, the ratio in 1899. It can hardly be maintained that these rates of income are too high or even fair for stock investments that take the risks of the street railway business. Yet it should be remembered that Massachusetts not only stands third in the Union as to extent of development in street railways, but also that these railways as a group are probably second to none in prosperity. The low percentage of income on the stocks of railways in this state points to entirely unsatisfactory results for some less favored sections. In the notable expansion of street railway through the introduction of electric traction, the general public have been the first and greatest gainers, because of the improved transportation offered. This expansion has only been possible through great extension of investments, and on these investments as a body the average return thus far has been below the normal.

MAHONING VALLEY RAILROAD EXTENSION.

A franchise for an extension of the Trumbull division of the Mahoning Valley Ry. from Warren to Leavittsburg was granted some time ago and the extension was completed, with the exception of a railroad crossing, in December, 1901. Considerable difficulty was experienced in making a contract with the Erie Railroad Co., the track of which it was found necessary to cross at grade at a point about half a mile west of the city limits of Warren. The crossing was ordered and delivered on the grounds, but the Erie Railroad delayed its installation. At the next hearing of the case in court the decision was delayed and the crossing was installed by force, but was torn on the same night by employees of the Erie company. The case was again taken into court and a decision in favor of the Mahoning Valley Railway Co. was again rendered in the latter part of July. Owing to the crossing trouble the line, although complete in other details, has not been put in operation, but, according to the latest decision in its favor, the company expects to open the line at an early date.

The reasons for the Union cleared loop in Chicago may be compared with devices which have been aptly termed "fool catcher," consisting of small platforms to be erected at the end of stations slightly above the level of the tracks. They are to prevent persons who persist in trying to board moving trains from being dragged from the superstructure. It has been not infrequently the case,

BIRMINGHAM (ALA.) NOTES.

Sunday, June 29th, the first car was put in operation on the Tuxedo, Ensley & Wylam Division of the Birmingham Railway, Light & Power Co's. system. This line has been under process of construction for some length of time and a portion of the route has been used for some time. Wylam is a small inland town composed largely of a colony of Welch people, who had no communication with the outside world save by stage coach. The opening of this new line means a great deal to them and the cars have been very much crowded since the opening by the people, who will ride from one end of the line to the other for the novelty of the thing. The line is a little over two miles long, and only two cars are in service at present, though others will be added as the travel demands.

On July 2d the new Ensley-Bessemer branch road, seven miles in length, was completed. This is a new route to Ensley over a route which hasn't a single railroad crossing. The roadbed has 10 in. of slag ballast, with 6x8-in. sawed ties laid 2 ft. c. to c. The rails are 70-lb. A. S. C. E. standard with Weber joints and the trolley wire is the General Electric Co's. No. 000 grooved with spring frogs at the cross overs, making a practically continuous wire. With no railroad crossing the running time of the present line will be considerably reduced. With the new four motor cars recently put in service the schedule time on this line will be the seven miles in 30 minutes.

On the morning of June 24th the following bulletin appeared on the several bulletin boards at the barns of the company:

"At a meeting of the board of directors of the company held on the 10th inst. the subject of more pay for motormen and conductors was discussed, and authority was given to make the following changes of wages commencing with the second half of the fiscal year, July 1, 1902: First year of continuous service, 15 cents per hour; second year of continuous service, 17½ cents per hour; third year of continuous service, 18 cents per hour; fourth year of continuous service, 19 cents per hour; fifth year of continuous service, 20 cents per hour.

"This increase is made in consideration of the loyal and efficient work of the motormen and conductors who have been in the service of the company for the periods mentioned. The company believes that the value of a man's services is in proportion to his experience and education in the position he holds, and for this reason has made the greatest possible advance that it could afford with the desire of retaining the services of experienced motormen and conductors.

"All motormen and conductors should see the time keeper and see that he has the accurate date of their entering the services of the company recorded.

"Geo. H. Davis,

"General Manager.

J. B. McClary,

Mgr. Ry. Dept."

This came as a very pleasing surprise to the men, because it was purely voluntary on the part of the company and prompted by no suggestion or request from them. Quite a number of the men have been in the service for over five years, and a great many of them called at the office and expressed their thanks. This is the second voluntary raise in wages within the year. Last November a rate of 17½ cents was made for all men who had been in the service over a year and all appeared well pleased with that.

The company, always looking to the welfare of its men, has adopted the plan of supplying its drinking fountains at the different drinking stations on the different routes and at the shops with water from Avondale spring, a cool spring of crystal water which is alleged to be the best water in the district. This was done for the reason that the water supplied by the water company of the city is believed by some to contain impurities, and desiring to promote good health among the men as far as possible the use of this spring water was adopted.

The question of putting a stripe on the sleeve of the men for each year in the service is being discussed, and all the men who have been approached on the subject express themselves as well pleased with the idea. It is believed that should the plan be adopted that it will tend to increase the desire on the part of the men to remain in the service as long as possible.

A street car mail service has been inaugurated on the Rapid Railway Co's. line between Detroit and Port Huron.

IRWIN FULLERTON.

Mr. Irwin Fullerton, general auditor of the Detroit United Ry., has been connected with the street railway interests since 1890, when he started as bookkeeper for the Brooklyn & South Side Street Railway Co., of Cleveland, O. He remained with this company until 1893, when the property was consolidated with the East Cleveland Railway Co. and the Broadway & Newburg Street Railway Co., forming what is now the Cleveland Electric Railway Co. Mr. Fullerton was engaged with the new organization as assistant auditor and continued in that capacity until March, 1895, when he was appointed auditor of the Detroit Citizen's Street Railway Co., of Detroit. In December, 1900, the Detroit United



IRWIN FULLERTON.

Railway was organized, taking over all the street railway lines of Detroit, and during the past year this company has purchased eight different suburban street railways having in the aggregate nearly 500 miles and with rates of fare varying from 3½ cents to \$1.00, according to distance. This consolidation afforded Mr. Fullerton a very substantial experience in the merging of street railway properties.

In addition to the problems in accounting resulting from the consolidations mentioned, the work in Mr. Fullerton's department has been further increased during the last year by the inauguration of the extensive freight and express service on the Detroit system which was described in the "Review" for January, 1902.

CLARKSON MEMORIAL SCHOOL OF TECHNOLOGY.

The following list of graduating theses has been received through the courtesy of Prof. William S. Aldrich, director of the Clarkson Memorial School of Technology, and will serve to indicate the practical character of the work carried on in this institution:

Development of the Water Power of High Falls on Deer River; A Study of the Possibilities of the Development of Water Power on the Indian River; A Design for a Power Plant on the Indian River; Investigation of the Properties of Liquid Condensers; Influence of Chemical Composition on the Electrical Conductivity of Wrought Iron and Soft Steels; Performance of a Motor Generator Set Compared to a Rotary Converter of the Same Capacity; The Design, Construction and Performance of an Experimental Poly-phase Transmission Line; An Experimental Study of a Single-phase Induction Motor; Installation of, and Experiments on, a 15-h. p. Otto Gas Engine; Experiments on the Flow of Steam Through Rectangular Orifices; Design of a Compound Marine Engine.

The total valuation of franchises in Niagara Falls, N. Y., as determined by the state board of tax commissioners, is \$454,000, which amount is an increase of \$79,700 over last year's valuation. The increase is made principally on the street railway franchises which were assessed last year at a valuation of \$112,000 and are this year valued at \$155,000, an increase of \$43,000.

ANALYZING CONDUCTORS' REPORTS.

An Interesting Method of Computing Percentages and Its Application.

Editor "Review": For a number of years we have been trying to devise a method of easily computing the percentage that each kind of fare bears to the total for the day. After numerous attempts all of which required too much time we arrived at a plan which is now working admirably, and is in daily use at our office.

The result of our investigation led us to construct a table, bound in book form, with flexible leather back and thumb index, placing 50 numbers on each right hand page. Opposite each number we placed its reciprocal multiplied by 100, using but three decimal places.

50	200	525	190
1	200	6	190
2	199	7	190
3	199	8	189
4	198	9	189
505	198	530	189
6	198	1	188
7	197	2	188
8	197	3	188
9	196	4	187
510	196	535	187
1	196	6	187
2	195	7	186
3	195	8	186
4	195	9	186
515	194	540	185
6	194	1	185
7	193	2	185
8	193	3	184
9	193	4	184
520	192	545	183
1	192	6	183
2	192	7	183
3	191	8	183
4	191	9	182

TABLE 1—PAGE FROM "BOOK OF RECIPROCAL." (Note: The table image includes a thumb index on the right side with numbers 5, 50, 8, 50, 7, 50, 8, 50, 9, 50, 10, 50, 11, 50.)

The "5" in the thumb index is large and indicates 500 or from 500 to 549 inclusive. On the next page is only a small "50" indicating that page contains numbers from 550 to 599 inclusive. This table is carried out to 1200 total.

In using this table the clerk has counted all the full fare tickets, children's tickets, coupons, cash fares, and checked up the registers, he proceeds to enter up the earnings for the day in a book ruled as shown in Table 2.

In the first column is entered the number of the car on Run No. 1, in the next the registers as taken "out" and "in" with the subtraction, that being the fares collected on such car. In the third column is entered the run number. In the next column is placed the number of full fare tickets. The next column is left blank. Under the column headed "Children Tickets" is entered the number of children tickets turned in by the conductor on that run, and so on entering the number of coupons and cash fares in their respective columns. The total of all the fares turned in is entered in its column.

This total is not the amount shown by the register, the conductor having been relieved for dinner for which he received a check signed by the relief conductor showing number rung up while the regular was off, which is entered in the column headed "Relief." In the next column is entered the total fares turned by the regular and Relief Conductor, which should agree with the register.

In the column headed "cash" is entered the amount of money turned in by Regular. In the last column is entered the name of the conductor.

Now we will proceed to use the table:

The number of fares turned in by Conductor Rheinart is 742. We now open table by means of the thumb index at page marked with a large "7." On this page is the reciprocal multiplied by 100, to three decimal places of each number from 700 to 749 inclusive; opposite No. 742 we find the decimal fraction .135; this multiplied

Wednesday, June 4, 1902.

Weather—Fair and Warm.

Car No.	Register	Run No.	Full Fares	Per Cent	Children's	Per Cent	Coupons	Per Cent	Cash	Per Cent	Total Fares	Per Cent	Relief	Total	Cash	Conductor
42	294 1918 776	1	113	15	41	6	8	1	580	78	742	100	34	776	29 00	Rheinhart
40	1692 776 916	2	159	20	67	10	9	1	545	69	780	100	136	916	27 25	Heaberlin
62	1779 896 883	3	131	15	52	6	22	3	653	76	858	100	25	883	32 65	Brouley
60	1135 104 1031	4	112	14	76	9	10	1	630	76	828	100	203	1031	31 50	Nourse
27	1297 704 693	5	125	18	67	10	8	1	493	71	693	100	693	24 65	Bowser	
20	1470 627 843	6	114	16	37	5	4	1	553	78	708	100	135	843	27 65	Ellis
28	2532 1927 608	7	98	18	104	19	9	1	337	62	544	100	57	608	16 85	.....
29	958 482 476	8	88	18	23	5	7	2	358	75	476	100	476	17 90	Dever	
20	2050 1427 632	9	91	18	32	6	6	1	380	75	500	100	123	632	19 00	Mault
RELIEF			140	21	63	9	3	1	498	69	713	100	713	24 90	Gable	
			1180		62		86		5027		6855				251 55	
			4 1-6		24				5						49 17	
			549.17		\$14.05				\$251.35						14 05	
			Number of passengers carried 6855. Earnings \$814.57													

TABLE 2.

by the number of full fare tickets, 113 x .135, gives 15.255 per cent; the number of children's tickets multiplied by the same number, 41 x .135, gives 5.535 per cent; coupons, 8 x .135, gives 1.080 per cent; cash fares, 580 x .135, gives 78.300 per cent. We have by these operations found that Conductor Rheinhart turned in:

Full fares.....	\$5.255 per cent
Children's fares.....	5.535 per cent
Coupons.....	1.080 per cent
Cash fares.....	78.300 per cent

Total 100.170 per cent

But for convenience we enter in the book:

Full fares.....	15 per cent
Children's.....	6 per cent
Coupons.....	1 per cent
Cash fares.....	78 per cent

Total 100 per cent

We enter the per cent in red ink as being more easily seen.

If the table were carried to more decimal places, the per cents as found by multiplying would add up exactly 100. It will be noticed in the table that Nos. 531, 532 and 533 all have the same multiplier, but that it is as near as can be when using but three decimal places. If it is desirable to use four decimal places the multiplier would be for 531, .1883; for 532, .1879; for 533, .1876; but that is a refinement not necessary for the purpose for which we have constructed the table, as the percentage of each class varies slightly each day, and with different runs. Some runs catch many factory people using tickets exclusively, other runs regularly pass depot at train time in that case catching more cash fares, but under like circumstances the runs carry about the same percentage of each class of fare every day.

We will call attention to the report of Conductor on Run No. 7, whose percentages were as follows: Full fares, 18; Children's, 19; Coupons, 1; Cash fares, 62. When we compare this with the other runs, we are lead to believe that substitution was resorted to, that about 9 per cent of the cash fares were taken and the same number of children's tickets substituted instead. We might mention that the name of Mr. ——— does not appear on our records after June 4th.

The percentage for any single day should not cast suspicion on a conductor, as he may possibly have a school picnic or a crowd of children on the car for a round trip, but a careful watch kept on the percentages for a week or a month, especially if another conductor is on the same run any day during the time, will be time well spent.

THE PORTSMOUTH STREET RAILROAD & LIGHT CO.,
S. P. Baird, Genl. Mgr.
Assoc. Mem. Am. Soc. C. E.
Portsmouth, O.

NEW PLANT FOR THE HUDSON VALLEY RAILWAY.

The Hudson Valley Railway, an extended description of which was given in the "Review" for April, 1902, is about to make a change in its motive power with a view to ultimately operating the entire system from a central plant of the Hudson River near Waterford. It will be remembered that this company is a consolidation of the Stillwater & Mechanicsville; Greenwich & Schuylerville; Glens Falls, Sandy Hill & Fort Edward, and Warren County railroads and the Saratoga Traction Co. The company now operates over 100 miles of electric road running from Albany and Troy to Saratoga, Lake George and the Adirondacks.

For the operation of the road until the Hudson River power station is completed a somewhat unusual method is to be employed. The company has increased the capacity of the direct current power station at Glens Falls, by the addition of a 250-kw. direct current engine-type generator and has increased the capacity of the Caldwell station with a 270-kw. direct current belted generator. In the power station at Glens Falls there will be installed a 250-kw. rotary converter operating direct current to alternating current with raising transformers. Power will be transmitted by a three-phase 11,000 volt transmission line to Caldwell, where lowering transformers and a second 250-kw. rotary converter operating alternating current to direct current will be installed to supplement the power of the Caldwell direct current generating plant.

In the company's Saratoga station a 400-h. p. engine and a 250-kw., 2,200-volt generator with raising transformers are to be installed and from this station power will be transmitted by a three-phase, 11,000 volt transmission line to a sub-station at Round Lake, where transformers and a 250-kw. rotary converter are to be placed. This sub-station will supply power to the recently completed Saratoga division, which connects the main line at Mechanicsville with the Saratoga-Balston line at Balston Spa. When the alternating current generating plant on the Hudson is completed, which it is expected will be next year, all the generating and sub-station apparatus now installed will be displaced by eight 300 kw. 600-volt direct current rotary converters. All of the electrical apparatus for both the temporary installations and the new plant is of the Westinghouse make.

CHICAGO CITY RAILWAY'S NEW POWER HOUSE.

For about two years it has been understood that the Chicago City Railway Co. would undertake to remodel its power generating and distributing systems as soon as the franchise extension question should be settled. Recently deeds conveying lots 96x124.7 ft. at the northeast corner of Halsted and 39th Sts., 120x123.7 ft. at the north west corner of Emerald Ave. and 39th St., and 37x320 ft. at the southeast corner of Gage St. and 39th Place, were filed for record. About a year ago the Chicago City Ry. purchased other property lying just west of these lots, and, as was announced at the time of the former purchase, the company will erect a large power plant here, distributing alternating current to suitably located substations.

ADJUSTABLE SEAT FOR MOTORMEN.

We show herewith the working drawings and some half tone illustrations of a removable and adjustable seat for motormen which was suggested by Mr. T. E. Mitten, general manager of the International Railway Co., of Buffalo, and for which the details were worked out by Mr. Charles A. Coons, superintendent of transportation of this company. The necessity for such a seat was made apparent during the Pan American Exposition, when the

CONVERSION OF ST. PAUL BRANCH DISCUSSED.

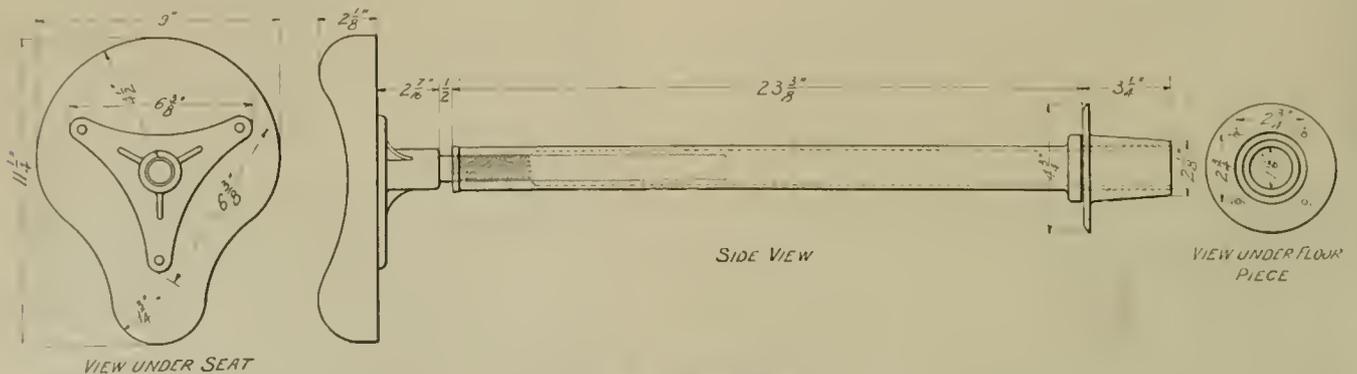
An ordinance providing for the conversion of the Evanston branch of the St. Paul road into an electric line from the northern suburbs of Chicago to the Union loop was discussed at a meeting of the council sub-committee June 25th, and the question of the fare to be charged in the event of a change of motive power created considerable dissension among the different delegations who



ADJUSTABLE SEAT FOR MOTORMEN AS USED BY INTERNATIONAL RAILWAY CO.

company lost a great many good motormen on account of their suffering from varicose veins and swollen limbs and feet because of standing in one position so continuously. The seat is used between cities only and is removed out of the motorman's way while the car is within the city limits. The general arrangement and principal dimensions of this seat are shown in the accompanying drawing. The standard is made of 1 1/4-in. iron pipe 26 in. long, on which a collar is fastened 3 in. from the bottom, and in the top of this standard is a plug having a 1-in. thread. The seat is made of hard wood and is of the same pattern as a bicycle seat. To this is screwed a triangular shaped casting as shown,

were present to represent the towns en route. Residents of Rogers Park and contiguous suburbs asked for a 5-cent fare to the city, while the delegation from Edgewater, which is south of Rogers Park, demanded a 10-cent fare in order that property values might not be jeopardized by the prospective incursion of the flat-hunter. The suburbanites were, however, unanimous in objecting when it was proposed by the representative of the road that a provision for a continuous ride to the Union loop be stricken from the ordinance. The company does not desire to run the tracks of the Northwestern elevated road to convey its passengers downtown, and amendments were asked which should obviate this objection.



SEAT STAND FOR MOTORMAN.

in the center of which is a socket, and to this socket is fastened a piece of 1-in. round iron threaded for 6 in., to fit the thread in the plug at the top of the pipe. By means of this thread the seat can be adjusted to any height desired. There are two iron sockets fastened in the car platform, one of which is used to hold the seat when in use and the other is placed to one side of the platform to hold the seat when not in use within the city limits. The half-tone illustrations show the positions of the seat both in and out of use.

American and Canadian capitalists are promoting an electric railway from Cornwall to Toronto, Ont., which, it is expected, will be one of the finest interurbans in the dominion. The promoters are reported to have capital at command to the amount of \$8,000,000.

The trolley line from York to Red Lion, and thence to Windsorville, has been completed. Capt. W. H. Lanjus and Judge W. F. Bay Stewart have about completed purchasing the right of way from York to York Haven, the seat of the electrical power plant, which is now being installed on the Susquehanna River to operate all of the street railways and trolley lines of York County, Dauphin County and Lancaster County, Pa.

J. J. Henry is promoting an electric railway to connect Baker City, Ore., and Eagle Creek.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

RIGHTS OF PASSENGER AT WHOSE REQUEST CAR HAS COMMENCED TO SLOW UP.

Crow v. Metropolitan Street Railway Co. (N. Y. Sup.), 75 N. Y. Supp. 377. Mar. 21, 1902.

After the car had commenced to slow down at a passenger's request, she had a right, the first appellate division of the supreme court of New York holds, to prepare to leave the car; and she also had a right to assume that the conditions existing at that time would be continued until the car had been stopped, and she had been afforded an opportunity to get off.

DUTY OF TRAVELER ON HIGHWAY CONTAINING TRACK AS TO LOOKING FOR CAR—MAY ASSUME MOTORMAN WILL MAKE SOME EFFORT TO PREVENT COLLISION.

Tunison v. Weadock (Mich.), 89 N. W. Rep. 703. Mar. 26, 1902.

One traveling on a public highway on which there is a street car track is bound, the supreme court of Michigan holds, to use some caution. If he is turning to drive across the track, he is bound to see whether a car is liable to come in collision with him. He is undoubtedly bound to look ahead for the same purpose. But the court is not prepared to hold that he is, as a matter of law, bound to be constantly looking backward when driving upon or in proximity to the track. He has a right to assume that some effort will be made by the motoneer to prevent a collision; that he is in a position to see in advance, and to note whether a collision is likely if he continues in the course. In this case there was evidence from which it might be found that for a considerable distance, at least, the vehicle in which the party suing was traveling was pursuing a course near the railway track,—so near as to make it reasonably certain that a collision would occur if the car was not brought under control. Under such circumstances it cannot be said, the court declares, that the motoneer had the right to pursue his course, and run this vehicle down.

INJURY TO CONDUCTOR RIGHTFULLY ON INSIDE RUNNING BOARD WHERE TRACKS ARE TOO CLOSE TOGETHER—NO CONTRIBUTORY NEGLIGENCE OR ASSUMPTION OF RISK.

True v. Niagara Gorge Railroad Co. (N. Y. Sup.), 75 N. Y. Supp. 216. Mar. 11, 1902.

Here a conductor who as such had been in the employ of the company for 30 days on a road about 7 miles in length was very seriously injured when at a place where the inside rails of the two tracks were but 3 ft. 10 in. apart, the close proximity of the tracks continuing for about 160 feet. The car was an open one, the seats of which extended entirely across it, and were so close together that it was inconvenient and even impracticable for the conductor to crowd in front of the passengers, between the seats, to collect the fares. The verdict of the jury, the fourth appellate division of the supreme court of New York says, showed that the conductor was riding on the running board of the car in the usual manner, engaged in the performance of his duties in accordance with the instructions given him. He was in the proper place to collect his fares, and was not aware that while he was on the running board he was in danger of being hit by a passing car. The tracks were dangerously close together at this point, not caused by any tapering to unite, for both north and south of the place of the accident the space widened; but the narrow space was probably due to some oversight, for they were removed farther apart after the accident, and apparently to avoid the recurrence of a like catastrophe. It may be added that jutting rocks along where the accident occurred rendered it impossible for him to perform his duties on the running board on the other side.

Under these circumstances the court affirms a judgment in his favor.

It was not important, the court says, whether, when struck by a car on the other track he was standing on the running board, or peering around one of the standard, as long as he was in the line of

his duty, performing it in the ordinary manner, and not cognizant of any danger to be apprehended from the passing car. It was the duty of the company to furnish a reasonably proper place for him to carry on his work. Nor could he be charged with want of care, as matter of law. He was insensible of the danger. It was not observable to him from the car. He had received no warning of it. He was in the discharge of his duties in the ordinary way, and his mind was engrossed in their performance. Again, the court says that this was not a risk which he assumed. It was not an incident to the business; was not manifest, but was due to the oversight of the company, which proper caution would have prevented. The employer must, to a reasonable degree, perform the obligation resting upon him to safeguard the interests of his employes, before the latter can be charged with assuming the risk with reference to the especial thing which should have been remedied. Assumption of risks must rest upon knowledge upon the part of the servant, or the means of acquiring it by the exercise of ordinary diligence.

ATTEMPTING TO CROSS TRACKS WITH CAR ON FARTHER TRACK CLOSER THAN ONE ON NEARER TRACK.

O'Callaghan v. Metropolitan Street Railway Co. (N. Y. Sup.), 75 N. Y. Supp. 171. Mar. 14, 1902.

The party suing was injured on the southerly crossing of Amsterdam Avenue, in Manhattan, at 104th St., being caught between an uptown and a downtown car. It was in the daytime, and she was crossing the avenue from the west. Before attempting to cross she looked up and down the avenue. From the south a car was coming up, and was then a little above 103d St. From the north a car was coming down, and was then at 106th St. When she had crossed to downtown track, the uptown car was so close to her that she could not cross that track with safety, and while she stood between the tracks waiting for that car to pass the downtown car came along quite fast, and without the warning of the gong, and the injury was occasioned. The question of the company's negligence was scarcely raised upon the trial. No witnesses were examined upon the trial, and the second appellate division of the supreme court of New York says that no discussion was necessary to establish the fact that a jury might find negligence from the circumstances presented by the record. Whether the woman was guilty of contributory negligence was a question of fact. She was not bound to assume that it would be dangerous to attempt to cross a street with a car on the nearer track two blocks away, or that that car would come upon her without warning before another car less than half the distance from her would pass upon the farther track; and whether, under such circumstances, she failed in the exercise of ordinary care, was clearly for the jury to determine. A judgment in favor of the party suing affirmed.

DUTY AS TO SELECTION OF SAFE PLACES FOR PASSENGERS TO ALIGHT.

Sweet v. Louisville Railway Co. (Ky.), 67 S. W. Rep. 4. Mar. 12, 1902.

It is stated, and it seems to be true, the court of appeals of Kentucky says, that a different duty attaches to street railway and to steam railway operators in respect to furnishing safe places for discharging their passengers. The latter must furnish such, while the former is under no such obligation, but discharges its passengers at convenient points along the streets it traverses. If the street at the place of discharging the passenger presents a dangerous condition to one alighting there, and such danger is obvious to the passenger, the carrier is not liable to him for injuries received from such defects. But where the danger is known, or is such as must have been known, to the carrier, and is unknown to the passenger,—as where, because of the darkness, he cannot see it,—the carrier is bound to warn the passenger of the danger, or to assist him in safely alighting, or stop the car at a point beyond or short of the dangerous point. Its failure to take one of these precautions renders it liable to the passenger sustaining injury because of such neglect. While the

street railway company is not bound to furnish safe places for depositing its passengers, it is bound to either select them or to warn the passenger of the conditions.

In this case it was dark when a car stopped at or near the usual street crossing, and a passenger severely injured her ankle in attempting to alight. The evidence disclosed that the street in question was a macadam road, which had become so worn at that particular point that a depression was formed two or three feet in length, and six inches deep. It was at the edge of the company's track, and so near it that one stepping from the car would be apt to step into it. It was easily to be seen in the light. Whether it was the cause of the passenger's injury, or was such a defective place for discharging passengers as to render it obviously unsafe, the court holds, were questions of fact that should have been submitted to the jury.

EFFECT ON LIABILITY FOR DEFECT IN PAVEMENT OF
TRANSFER BY CITY TO PAVING COMPANY OF
DUTY TO CARE FOR SAME.

Welch v. Syracuse Rapid Transit Railway Co. (N. Y. Sup.), 75 N. Y. Supp. 173. Mar. 11, 1902.

A passenger broke her ankle in stepping from the running board of an open car into an unobserved hole or depression in the asphalt pavement at the place the car stopped. This depression was 4 feet 6 inches long; its greatest width, 1 foot 5 inches; and its greatest depth, 3 inches. The edges were beveled and somewhat ragged. The inner edge was 1 foot 5 inches from the outer rail. The jury was instructed, among other things, that by statute (section 98 of the railroad law) the duty was imposed upon the railway company of maintaining the street "two feet in width outside of its tracks" in a reasonably safe condition, and if the place where the passenger stepped in alighting from the car, and which caused her to fall, was within that space and was dangerous, the company was chargeable with negligence for having neglected to repair the defect in the pavement. To meet this proposition, the company offered in evidence a resolution adopted by the common council of the city, and approved by the mayor, which gave a paving company permission to take up certain pavement, which included that which had been at the place of the accident, and at its own expense to lay a new pavement, and to keep the same in repair for five years, to be done in accordance with plans and specifications of the city engineer, and subject to the approval of the commissioner of public works of the city. The fourth appellate division of the supreme court of New York holds that the resolution should have been received in evidence, at least for the purpose of enabling the jury to say whether or not, in view of it and under all the circumstances, the railway company, through its agents, was negligent in not determining that the defect in the street was dangerous, and in not repairing it; and that the exclusion of the resolution was reversible error.

The purpose of the resolution was evidently to enable the new pavement to be tested, to ascertain its durability and wearing qualities; and it is apparent, the court says, that if the railway company or any other corporation could make repairs at will, such test would be useless. By the charter of the city the mayor and common council were given authority to lay out, make, open, regulate, repair, and improve highways and streets; and the council was given authority to order the construction and repair of pavements, and defray the expenses thereof by assessment upon the abutting property owners. Section 98 of the railroad law does not in any manner deprive the city authorities of any of the powers conferred upon them by the charter. The city had the right, acting through its officers or through any other agency, to do with the pavement in question precisely as it saw fit, provided it did not unnecessarily and improperly interfere with the rights of the railway company. It had the right to withdraw from the company the power to in any manner interfere with the pavement upon the street, or to relieve it from the duty imposed by statute, provided other means were adopted which would better or equally well protect the interests and rights of the public. By the action on the part of the city the company was relieved from the obligation during the period of five years of keeping in repair the portion of the street in question. Besides, the resolution was competent upon the question of the company's negligence, even if it was not relieved of its obligation to keep the street in repair by reason of the city's action

in the premises. The company had a right, in determining whether or not the defect was dangerous, to take into consideration the fact that the city authorities had taken control of the street, and to assume that they did not regard it as being in a dangerous condition, because of the fact that they had taken no steps to repair or cause the same to be repaired. The jury had a right to say not only whether the company was negligent in permitting the defect described to exist in the street, as an independent proposition, but also to say whether it was negligent in so doing, in view of the fact that by the resolution which was offered in evidence the city had contracted with the paving company that that company, and not the railway company should keep such street in repair, under the direction and supervision of the municipal officers.

INJURY OF BOY ATTEMPTING TO BOARD CAR AT
FRONT END WITH VESTIBULE DOOR CLOSED—
DUTY OF MOTORMAN—RUNNING BACKWARDS
WITHOUT CHANGING HEADLIGHT OR
FENDER.

Barlow v. Jersey City, Hoboken & Paterson Railway Co. (N. J. Sup.), 51 Atl. Rep. 463. Feb. 24, 1902.

On the return run of a large vestibuled electric car it went for a few blocks reversed from the outward run, and then, by means of a Y in the tracks, was turned around so that the front and rear would be as before. On this short backward run, while the conductor and motorman changed places, and the trolley pole was turned, the fender and headlight, when in use, were not disturbed. At about a quarter before 6 o'clock, one evening in November, just after the car had started on this return run, a boy who would be 12 years old in the following January, and who had been selling newspapers near the terminus, sprang on the step on the right-hand end of what was then temporarily the front platform, with the purpose, as testified, of paying fare as a passenger and riding to his home. He went to the front platform, he said, because it would be eventually the rear platform, and he expected to find it open, as it sometimes was at this terminus. He further testified that he rapped on the door, and that the motorman looked toward him, but did not open the door, or stop the car, or lessen its speed. Shortly afterward, the car collided with a wagon, and he was thrown off by the jar and injured.

Under these circumstances, the supreme court of New Jersey holds that the boy was properly nonsuited in an action brought to recover damages, because the company owed him no duty except to abstain from willful injury. It says that he was in no sense a passenger. He got upon the car at a place where he must have seen, if he had looked, that ingress was barred. That sometimes, in the company's cars, the door at that place was left open, and that passengers were allowed to enter there before the car started, did not excuse him from looking to see if an invitation by an open door was then extended to him to enter there. He knew that the rear platform was the proper place to enter a car, and his excuse that the platform he tried to get upon would eventually be the rear one only emphasized that knowledge. It should be noticed, too, that when the car would be turned, so as to make it the rear platform, the proper place of ingress would have been on the opposite side of the car from that on which the boy attempted to enter it.

If the motorman saw the boy on the step, he owed him no duty but to abstain from willful injury. He was not legally called on to open the door. His attention might be needed in the operation of the controller and brake and in keeping a lookout, especially as he was running without headlight or fender. If it was urged that he was negligent in running his car without those protections, or in not observing that the wagon with which he collided projected over the path of the car, it was sufficient answer to say that only passengers properly in or upon the car or persons lawfully using the highway could have had legal cause to complain of such negligence. The court says that it has never held that to one who jumps on a moving car at a place where he has no right to expect ingress to be afforded, either conductor or motorman owes a duty to stop the car or to lessen its speed, although it has held that where an attempted entrance was at a place where it need not have been looked for, yet, if it was seen, the conductor ought not to have started the car when he saw a passenger getting upon it with

precarious footing. In this case, if the motorman in fact saw the lad, common humanity should have prompted him to do one of these things in order that the danger of the situation might be averted; but legal duty chargeable to the master was a very different matter.

The youth of the boy, the court holds, gave him no extraordinary right of protection. It has, indeed, it says, been held that care may be due to children getting on street cars that is not due to persons sui juris, or under no legal disability. But this boy was of sufficient age and intelligence to be held to the general rules applicable to adults.

**JUMPING FROM CAR UNDER APPARENT NECESSITY
ONLY—NO DUTY TO FIRST INFORM DRIVER—
ADMISSIBILITY OF ORDINANCE REQUIRING
CARS TO STOP AT RAILROAD CROSSINGS.**

Selma Street & Suburban Railway Co. v. Owen (Ala.), 31 So. Rep. 598. Dec. 18, 1901. Rehearing denied Jan. 30, 1902.

This was an action brought by the latter-named party to recover damages for personal injuries. It was averred that as a street car upon which she was seated was driven onto a railway track, at a crossing, an engine came running forward on that track at a high and rapid rate of speed, and was about to run into the car; that the driver became terrified, and exclaimed to her: "We are going to be killed. The train is on us," that she thereupon, startled and frightened by hearing the frantic cries of the driver, jumped from her seat, and seeing the engine coming at a high rate of speed, and that it was about to collide with the car, and being thereby still more frightened, she attempted to jump off, and received the injuries of which she complained in jumping off or in being thrown off by a quickened movement of the mule drawing the car, while she was endeavoring to get off. The engine was stopped 20 or 25 feet from the car.

The passenger, the supreme court of Alabama holds, was under no duty, before jumping from a car about to be run over by a locomotive, to inform the driver that she wished to alight. It was immaterial whether the driver, when he caused the mule to quicken its pace, knew that she was about to jump from the moving car. The complaint made no claim on account of the driver having caused the mule to quicken its pace, the averment in that regard being descriptive of the occurrence.

The averments that the engine was coming toward the car at a high rate of speed, and was about to collide with or run into the car, the court says, were to be taken to mean that such collision was imminent; that the engine was near to colliding with the car; that it appeared to be on the point of collision. By such averments, and this construction or interpretation of them, a case was made of apparent necessity for the passenger to jump from the moving car. A reasonably apparent necessity for a passenger to leave a moving car, produced by the negligence of the carrier, stands upon the same footing as a real necessity so produced, and the rights and liabilities of the parties are to be adjudged accordingly. This necessity was a link in the unbroken chain of causation, beginning with the driver's negligence, and culminating in the injury. In legal effect, it was as if the links in the chain were discarded, as if the passenger had remained on the car, and received her hurts from actual collision between the engine and the car. The negligence, in contemplation of law, operated as directly to the infliction of the injury in the case alleged as in the case assumed. In both the injury was the proximate result of the negligence. It was manifestly no defense to such a complaint that the passenger was in no actual peril when she jumped from the car, and was therefore guilty of contributory negligence in leaving the moving car. But the court holds it was reversible error to refuse to give the jury an instruction that, if the passenger, on the occasion complained of, acted in a manner which an ordinarily prudent person would not have acted, and this conduct was the cause of, or contributed materially to, her injury, she could not recover. Of course, her conduct in respect of being prudent or negligent, was to be judged of by reference to all the circumstances surrounding her at the time, and these circumstances the court conceives to be fairly submitted to the jury in this instruction.

A city ordinance requiring all drivers of street cars to bring their cars to a complete stop before going on or driving over any railroad in the city the court holds was properly received in evidence.

**NOTE PAYABLE AFTER COMPLETION OF ROAD—
REASONABLE TIME FOR COMPLETION—PRERE-
QUISITE TO RECISSION OF CONTRACT—USE OF
OTHER TRACKS A SHORT DISTANCE—SINGLE
TRACK AT CORNER FOR DOUBLE-TRACK ROAD.**

Los Angeles Traction Co. v. Wilshire (Cal.), 67 Pac. Rep. 1086. Feb. 28, 1902.

A note dated July 19, 1895, was made payable to the traction company thirty days after the completion of its double track street railway to a certain point. On the faith of this and other similar promises of property owners, the company, in November, 1895, bid and paid the city \$1,505 for a franchise to construct the road. Before April 28, 1896, it commenced work upon said railway, though such work was not performed with the view of prosecuting the construction of the railway continuously and with diligence to completion, and the company did not so commence work upon the railway with said purpose until after July 1, 1897. On that date, the makers of the note mentioned served upon the company a written notice to the effect that they did not recognize any liability, for the reason that the road had not been completed within the time agreed upon. Soon after the service of this notice, the company actively engaged in the construction of the road, and completed it, and commenced operating the same to the point stipulated, before the expiration of the year 1897. Thereafter, and on May 17, 1898, it completed its railway to another point prescribed in the conditions on which the note was placed in escrow. Upon these facts the company obtained judgment on the note, which is affirmed by the supreme court of California.

It was contended that, even without any agreement as to the time for the completion of the road, it should have been completed within a reasonable time. Admitting, for the purpose of the case, that the question of reasonable time was properly before the court, still, the supreme court says, it was a question to be decided on the evidence presented, and the condition of the evidence in that respect was aptly illustrated by a quotation from the opinion of the trial court as follows: "Whether or not this road was completed within a reasonable time must certainly depend upon the character of the enterprise, the obstacles to be overcome, the length of time required by diligent and proper effort to do the work. This would include an inquiry into the topography of the country, the amount and kind of the work necessary to make the improvement. Courts do not take judicial notice, however, of topography or of the physical condition of the streets and the town. There is no testimony which would indicate the length of time reasonably required for this work; hence I am unable to say that the same was not completed within a reasonable time, even though we have this great lapse between the granting of the franchise and the completion of the road."

The contract at the date of its making, the supreme court says, was unilateral, or one-sided, a mere offer that if subsequently accepted and acted upon by the other party to it would ripen into a binding enforceable obligation. When the traction company purchased and paid upwards of \$1,500 for a franchise it had acted upon the contract, and it would be manifestly unjust thereafter to permit the offer that had been made to be withdrawn. The promised consideration had been partly performed, and the contract had taken on a bilateral, or two-sided, character, and if the makers of the note thereafter thought they discovered a ground for rescinding the contract, it was, as it always is, a necessary condition to the rescission that the other party should be made whole as to what he had parted with on the strength of the contract. The notice of withdrawal from the contract was ineffectual, therefore, for several reasons. In the first place, it was based on a wrong theory; the reason given for it was that the road was not constructed within the agreed time, when, as was determined subsequently by the court, there was no time agreed upon. Again, it came too late, after the obligations of the parties had become fixed.

The traction company purchased the right to and used the track of another street railway company, that had been previously built, for a distance of some 1,800 feet, and it was contended that this was not a compliance with the contract to "build the road." But the supreme court thinks that the contract must be held to have been entered into with full knowledge of the law contained in section 490 of the civil code, which provides that two lines of street railway, operated under different managements, may be permitted to use the same street, but not to use the same street or tracks for a distance

of more than five blocks consecutively. The contract, it holds, was complied with when this section was complied with, as to the portion of the line of railway affected by said section. Leaving out of consideration the foregoing statute, the court would say that the contract must receive a reasonable construction, and the company should be held only to a reasonable compliance therewith, and under this rule there was as little force in the contention based on the use of another company's track for a short distance as there was in the contention that the stipulation as to a double-track railway was not complied with for the reason that a single track only was constructed where the railroad turned a corner. The evidence was to the effect that this was the most practical and usual way to build a double-track street railway.

CONTRACT IN ORDINANCE FIXING FARES—EFFECT OF STATUTE GIVING MUNICIPAL AUTHORITIES POWER OF REGULATION—CITY ALONE CANNOT CHANGE FARE—WHAT ACT FOR FORMATION OF COMPANIES MAY COVER EXTENSION OF FRANCHISES BEYOND LIFE OF COMPANY—POWER OF CITY UNDER RESERVED RIGHT TO MAKE RULES AND REGULATIONS.

City of Detroit v. Detroit Citizens' Street Railway Co. (U. S. Sup. Mich.), 22 Sup. Ct. Rep. 410. Mar. 3, 1902.

The Supreme Court of the United States says that it may be conceded that clear authority from the legislature is needed to enable a city to make a contract or agreement such as an ordinance providing for the consent of the city to the laying of tracks and the running and operation of a railroad through its streets, and fixing the rates of fare. But there can be no question in this court as to the competency of a state legislature, unless prohibited by constitutional provisions, to authorize a municipal corporation to contract with a street railway company as to the rates of fare, and so to bind during the specified period any future common council from altering or in any way interfering with such contract. The contract once having been made, the power of the city over the subject, so far as altering the rates of fare or other matters properly involved in and being a part of the contract, is suspended for the period of the running of the contract.

Under section 34 of the tram railway act of Michigan, as it was enacted in 1861, a railway corporation organized under the act could not construct a railway through the streets of a city without the consent of the municipal authorities, "and under such regulations and upon such terms and conditions as said authorities may from time to time prescribe." The court, although it does not deem it necessary to conclusively determine the question in this case, thinks that a reasonable construction of the language would seem to be that it did not and was not intended to give the right to the common council to change at its pleasure from time to time those important and fundamental rights affecting the very existence and financial success of the company in the operation of its road, but that by the use of such language there was simply reserved to the city council the right from time to time to add to or alter those general regulations or rules for the proper, safe, and efficient running of the cars, the character of service, the speed and number of cars, and their hours of operation and matters of a like nature.

Section 20 of the street railway act of Michigan of 1867 provided that the rates of toll or fare which any street railway might charge for the transportation of persons or passengers over its road, should be established by agreement between the company and the corporate authorities of the city or village where the road was located, and should not be increased without the consent of such authorities. Section 20 provided that "all companies and corporations heretofore organized in this state for the purpose of building and operating street railways under the statutes then in force shall have the same powers, rights, protection, and privileges, and shall be subject to all the liabilities, as are hereby provided for companies and corporations organized under the provisions of this act." In 1879, while this act was in force, a city ordinance was passed, supplementary to one of 1862, which provided for extensions by the railway company of its tracks through various other streets of the city, and also provided, among other things, for a special tax on the gross receipts of the several lines of railway operated by the company, payable to the city, and to be in lieu of license or other taxes and charges under the existing ordinances, besides which it pro-

vided that the powers and privileges conferred and the obligations imposed on the railway company by the ordinance of 1862 and the amendments thereto should be thereby extended and limited to thirty years from that date. Under these statutory provisions, and by the adoption of this ordinance, the court holds, a binding agreement was made and entered into between the city on the one side and the company on the other relating to rates of fare, and such agreement could not be altered without the consent of both sides.

That is, the rate of fare having been fixed by positive agreement under the expressed legislative authority by the rate of fare provided in the ordinance of 1862 having been made a rate under the ordinance of 1879, the subject was not open to alteration thereafter by the common council alone, under the right to prescribe from time to time the rules and regulations for the running and operation of the road. It may very well be, the court says, that language used by a legislature in merely conferring authority upon a company to fix certain charges for fare might not be regarded as amounting to a contract, when the same language used by parties in fixing rates under a legislative authority and direction to agree upon them would be regarded as forming a contract because the statute provided specially for that mode of determining them.

Nor does the court consider that the language of the ordinance, which provides that the rate of fare for one passenger shall not be more than 5 cents, gives any right to the city to reduce it below the rate of 5 cents established by the company. It says that it is a contract which gives the company the right to charge a rate of fare up to the sum of 5 cents for a single passenger, and leaves no power with the city to reduce it without the consent of the company. The language of section 20 in the street railway act of 1867, which provides that the rate of fare agreed upon shall not be increased without the consent of the city authorities, does not mean that the rate may be reduced without the consent of the railway companies, nor does it show the parties did not suppose there was a contract between them as to rates. That provision does not seem to perform any material function, because without it, the parties having agreed upon the subject of rates, it would follow that the agreement could not be altered by either party without the consent of the other. It may be that it was meant that the company, while unable to increase the rates of fare without the consent of the city authorities, had the right to reduce the rates as it might please it without consulting the city. It was probably inserted from abundant caution, but in no event can it properly or fairly be regarded as an implied permission to the city authorities to reduce the rates of fare as agreed upon without the consent of the railway company.

Narrowly considered, under a constitutional provision that "no law shall embrace more than one subject which shall be expressed in its title," an act to provide for the formation of street railway companies should contain nothing but provisions relating to their formation and organization, but, the court says, it would be absurd to hold that the constitutional provision would prevent the introduction into such an act of various details in regard to the corporations after their formation and in regard to their government, operation, regulation, and other matters which might be fairly considered as germane to the particular object named in the title of the statute. Hence, it thinks that it would be a most narrow construction of the constitutional provision to hold that under such a title it was incompetent for the legislature to provide that the benefits and obligations conferred and provided for in the act should be made applicable to corporations of a like character already organized and in operation. It is germane and appropriate to the subject matter of the act, and to enact under such a title that all companies of the like nature should have the same privileges is fairly within the general object described in the title.

Again, the court sees no reason why the company should not take the extended term, as provided for in the supplemental ordinance of 1879, although the extension was beyond the then limit of its corporate life. It says that the extension formed a good consideration for the agreement on the part of the company to perform the obligations contained in the ordinance. If its life were not extended, the consent being assignable and transferable, particularly by statute, any company itself having corporate existence for that purpose could purchase the outstanding term and operate its road thereunder.

The reservation in an ordinance of the right from time to time to make such further rules, orders, or regulations as to the com-

mon council may seem proper, the court holds, cannot be held to extend to the alteration of a contract as to the rate of fare which shall be charged for the transportation of passengers,—does not include the right on the part of the city at its own pleasure to reduce the rates of fare agreed upon in the ordinance. What such a reservation permits is for the city to make further rules or regulations than those contained in the ordinance, in regard "to all matters incident to the construction and operation of the road, such as the location of the tracks in the streets, the placing of switches and turntables, the repair of the pavement between tracks, the removal or limitation of the number of tracks, in the interest of public travel, the frequency with which cars should be run for the public convenience, the stopping of cars at street crossings, the use of fenders, the rate of speed to be maintained, the sale of tickets, and generally to details of the conduct and operation of the railway, which experience might show to be necessary, in addition to or in amendment of those specified in the consent for the protection of life, the accommodation of the public, and the avoidance of injury to private property. Such regulations are not invasions of the contract rights of the company, and are just and reasonable."

SLOTTED FIELD MAGNET CONSTRUCTION.

The method of pole construction shown in the accompanying illustration has been adopted by the Phoenix Electric Manufacturing Co., of Mansfield, O., as a means for obtaining sparkless commutation without excessive weight of material or expenditure of power. The

ture reaction and allows the brushes to remain fixed for all loads. The slots in the pole face also connect the slots in the body of the pole with the armature chamber and supply abundant ventilation to the interior of the field coils whence the heat is usually unable to escape. This construction also permits the pole pieces to be cast in one piece with the frame and the field coils are slipped over the poles without removing pole shoes as is usually necessary.

In machines having solid magnet cores it is necessary to limit the reactive voltage of the armature coil under commutation to about six volts in order to avoid sparking, and many designers limit this reactive voltage to four or five volts. A 150-kw. slotted pole machine having a reactive voltage of 11½ volts is stated to run without showing the least signs of sparking, and this is an important consideration from the maker's standpoint, as it means a much smaller number of armature coils and commutator segments.

The makers of this machine report that after a five-hours run the field coils of a railway generator of this type were 5 deg. cooler on the inner side than on the outer surface, showing the value of this design for ventilating purposes.

STOP, LOOK AND LISTEN.

During the Elks' carnival held in Oakland, Cal., the Oakland Transit Co. issued a time card which in addition to giving the schedule of cars added some good advice which if generally heeded would diminish the number of street railway accidents to an insignificant figure. In regard to accidents the card states the following:

"Accidents will happen as long as cars run and people travel, but it can be demonstrated that a seat in a trolley car is the safest place on earth. The number of people injured in proportion to the number who ride is much less than in any other means of transportation, not excepting walking.

"Observance of three simple rules would avoid nine-tenths of the accidents which occur.

"Stop, look and listen before crossing a car track.

"Wait till the car stops before getting on or off.

"Face the front of the car when getting off."

NEW ORLEANS & SOUTHWESTERN RAILROAD.

One of the largest electric railway undertakings in the South is the road which is to be built from New Orleans to Montegut, a distance of 90 miles. It is expected by the promoters to have trains running on this road by Feb. 1, 1903, and as soon as this line shall have been equipped the company will at once begin the construction of another line from Thibodaux to Donaldsville, Napoleonville and Lockport, which will bring the total of the company's lines up to 175 miles. Mr. C. P. Young, who is general manager of the new company, states that the construction of the road is no longer in doubt. The first work will be begun during July and it will be pushed as rapidly as possible. The right of way has been secured, plans and specifications have been drawn and contracts for all supplies, machinery and construction let. The power is to be supplied from the power house at Thibodaux, which will be capable of generating 10,800 h. p. The road will be equipped with both passenger and freight cars, which will be drawn by locomotives equipped with four 160 h. p. motors. The locomotives will cost \$170,500 each. The passenger coaches are 50 ft. long and built with all modern appliances and the freight cars will be of from 60,000 to 90,000 lb. capacity. There will be no freight trains run, as these will be more in the nature of express trains, making a speed of from 35 to 40 miles an hour. All the passenger cars will have separate compartments for whites and negroes. The company also proposes to furnish electric power for sugar plantations, as the road will pass through the largest sugar producing section in the state. The officers of the company are C. P. Shever, president; C. P. Young, general manager; H. L. Lancaster, treasurer; Thomas A. Badaux, secretary.

The Elgin (Ill.) Aurora & Southern Traction Co. contemplate the erection of a new cement bridge over the Fox River at St. Charles. The bridge is estimated to cost \$20,000. It will be 60 ft wide with a 40 ft. roadway.



FIELD RING WITH SLOTTED POLES.

method consists of the use of slotted magnet poles, without pole shoes, the commutating tips being formed by hollowing out the core just above the pole face on either side of the magnets. A description of this type of construction was given recently in a paper on "Recent Refinements in Field Magnet Construction" read by Mr. S. L. Hoenesfeldt before the Ohio Society of Mechanical, Electrical and Steam Engineers.

The effect of sparking working in a direct current generator with a given armature winding may be varied considerably by varying the excitation in the air gap. The greater the magnetic density in the air gap and the armature teeth the less the liability to sparking. A higher magnetic density, however, means more power for excitation and greater hysteresis losses in the armature teeth.

Several advantages are claimed for the form of pole herewith illustrated. The hollowing of the magnet reduces the cross section of the magnet where they occur so that at no load the outer ribs are highly magnetized and consequently the magnetization of the pole tips varies very little from no load to full load. This in combination with slotting across the pole face prevents distortion of the field by arma-

COMPARATIVE ACCELERATION TESTS WITH STEAM LOCOMOTIVE AND ELECTRIC MOTOR CARS.

BY B. J. ARNOLD AND W. B. POTTER.

In connection with the preparation of a report on the use of electricity for the propulsion of trains of the New York Central & Hudson River Railroad Co. in the tunnel entrance and terminal in New York City, an invitation was extended by the General Electric Co. to Mr. W. J. Wilgus, chief engineer of the railroad company, to use its experimental track and apparatus at Schenectady, and a series of tests was accordingly carried out under the direction of the authors of this paper. The tests were principally for the purpose of determining the comparison between steam and electric traction on short haul suburban passenger service. Owing to the short curves in the connecting tracks, the General Electric Co's. track could not be used for the steam locomotive tests. The steam tests were, therefore, made on the New York Central main line tracks west of Schenectady.

The steam locomotive used was built from the specifications of Mr. A. M. Waite, superintendent of motive power and rolling stock of the New York Central, by the Schenectady Locomotive Works. It was designed specially for the rapid acceleration work required in suburban service, being provided with large grate area and heating surface and a very large proportion of weight on its driving wheels. The principal dimensions were as follows:

Weight on drivers, 128,000; total weight, 214,000; wheel base driving, 15 ft.; wheel base total, 35 ft. 9 in.; cylinder, diam. x stroke, 20 in. x 24 in.; driving wheels, 63 in.; boiler pressure, 200 lb.; fire box, 93 in. x 98 in.; number of tubes, 365; diameter of tubes, 2 in.; length of tubes, 12 ft.; heating surface of tubes, 2,285 sq. ft.; heating surface of fire box, 180 sq. ft.; grate surface, 63 sq. ft.; tractive power, 25,000; water capacity of tank, 3,500 gals.; tank fuel capacity, 4 tons.

The two electric motor cars were similar in form, 54 ft. over all, each weighing about 35 tons including the electrical equipment, which consisted of four G. E. 55 motors and type M. control. All axles being equipped with motors, the two cars together gave approximately the same weight upon the drivers as the steam locomotive. The acceleration was, therefore, directly comparable for trains of equal net weight and to secure this comparison the same trail cars arranged in the same order were used in both the steam and electric tests.

In the steam runs the draw-bar pull, speed and time were recorded by an Illinois Central dynamometer car, and the same car was used with the electric motor cars to determine the relation between current input and draw-bar pull. The dynamometer car had to be returned before the electric runs were completed, but not before a large number of readings were taken, from which curves were plotted showing the relation between amperes and draw-bar pull with different weights of train behind the motor cars. The draw-bar pull thus determined was plotted on the electric motor car curves, which were taken subsequent to the return of the Illinois Central car.

The order of the tests, both steam and electric, was as follows:

A train of six cars, including five standard passenger coaches loaned by the New York Central, and the dynamometer car, was started and run over a mile of track, acceleration being made as rapidly as possible. These same runs were repeated, dropping off one car at a time, until only the dynamometer car remained. Automatic records were kept of the draw-bar pull, speed, time, distance and the strength and direction of the wind. The condition of rail and temperature were also noted. The same runs were repeated, using the two motor cars in place of the steam locomotive, the dynamometer car being used in some of the runs and a box car loaded to equal weight in subsequent runs. In the electric runs, additional records were kept of voltage, ampere and wattmeter readings. The wattmeter was not carried on the car, but was placed stationary at the point of feeding the third rail, thus avoiding any inaccuracy due to jarring. The voltage leads of the wattmeter were connected to the extreme end of the third rail and track, thus receiving at all times the exact voltage at the train, so that the energy delivered to the motor cars represented the net input and did not include losses in the feeder system.

The cars used in this test and the weights are given below:

New York Central locomotive	No. 4107.	214,000 lb.
General Electric motor car	No. 4	73,000 lb.
General Electric motor car	No. 5	70,000 lb.
Illinois Central dynamometer car	No. 17	45,640 lb.
New York Central coach	No. 1885	48,200 lb.
New York Central coach	No. 545	60,250 lb.
New York Central coach	No. 1700	53,700 lb.
New York Central coach	No. 508	51,450 lb.
New York Central coach	No. 1798	54,600 lb.

During the tests many runs were made, but for the illustration of this paper, representative and average runs only are given.

ELECTRIC MOTOR CARS NO. 4 AND 5.

The electric runs were made upon the General Electric experimental track against a head wind of 15 m. p. h. The rail was dry, the temperature 8° C., and the grade practically level. In the middle of the run there was a curve having a minimum radius of 875 ft., equivalent to about 6½° curve, the effect of which may be assumed as approximately equivalent to the 1 per cent up grade of the steam runs.

No. of run	Character of load.	Weight of load, tons	Total weight train, tons	Maximum speed.	Average speed.	Watt hours per ton mile	
						From volt amperes.	From wattmeter.
1	6 Trailers	157.	228.5	36.4	27.2	75.9	79.4
3	5 "	130	201.5	37.9	28.6	78.4	82.0
5	4 "	104.	175.5	39.1	29.8	84.3	86.9
7	3 "	77.	148.5	41.0	30.6	84.7	93.4
9	2 "	47.	118.5	44.9	32.0	95.5	99.4
11	1 "	23.	94.5	44.7	33.1	115.0	114.0
13	No "		71.5	46.7	34.6	132.3	129.0

NEW YORK CENTRAL STEAM LOCOMOTIVE NO. 1407.

All steam locomotive runs were made upon the New York Central main line track west of Schenectady against an upgrade of 1 per cent and a head wind of 15 m. p. h. The temperature was 4° C., and the rail wet with a very light falling snow.

No. of run.	Character of load.	Weight of load, tons.	Total weight of train, tons.	Maximum speed, m.p.h.	Average speed, m.p.h.
2	6 Trailers	157.	264.	30.0	28.2
4	5 "	130.	237.	41.3	28.4
6	4 "	104.	211.	40.9	27.4
8	3 "	77.	184.	45.7	27.3
10	2 "	47.	154.	48.0	30.1
12	1 "	23.	130.	50.9	33.0

Although this locomotive was especially built for suburban or acceleration work, and was provided with a large fire box, giving it facilities for rapid steaming, the pressure dropped from 200 lb. to less than 185 lb., during the first part of acceleration. In starting, the throttle was opened wide and steam used full stroke, the engine being hooked up as acceleration proceeded.

While the electric runs had the advantage of dryer rails than the steam runs, the driving wheels were not slipped in either instance. Although the steam locomotive was able to give a maximum tractive effort at starting equal to that obtained electrically, this high tractive effort was not maintained, but immediately fell off with increased speed, even with the most expert handling.

As the acceleration curves produced by the steam locomotive and electric motor cars have different shapes, and as in the two tests there was about the same weight upon the drivers, it is interesting to note how well this driver weight was utilized. This is shown by the following tables giving the speed reached in ten, twenty and thirty seconds with equal trailing load for both electric and steam trains.

MILES PER HOUR ATTAINED IN 10 SECONDS.

No. of Trailers.....	1	2	3	4	5	6
Motor Cars No. 4 and 5	22.5	20.7	17.3	14.4	12.5	11.
Locomotive No. 1407	14.	13.	12.5	12.	10.	9.7

MILES PER HOUR ATTAINED IN 20 SECONDS.

No. of Trailers.....	1	2	3	4	5	6
Motor Cars No. 4 and 5	34.	32.3	29.4	27.4	24.5	21.2
Locomotive No. 1407	25.	21.2	21.5	29.5	17.	16.3

MILES PER HOUR ATTAINED IN 30 SECONDS.

No. of Trailers	1	2	3	4	5	6
Motor Cars No. 4 and 5	38.2	36.4	34.2	32.	30.3	28.1
Locomotive No. 1407	31.7	26.2	27.	24.7	23.2	20.8

An inspection of the tables brings out clearly the fact that the electric motors during acceleration can more effectively utilize the weight upon their drivers than a steam locomotive. As rapid acceleration is especially important when stops are a mile or so apart, the electric motor has an advantage in being able to cover the same distance in the same time with less energy expended and

of passengers carried (each car seating 64 people) and the energy, which for convenience we have given in watt hours, required per passenger for both steam and electric runs.

Number of Cars.	Number of Passengers.	Watt Hours per Passenger.	
		Steam.	Electricity.
6.....	384	43.9	29.7
5.....	320	52.2	32.1
4.....	256	57.5	33.5
3.....	192	77.4	37.5
2.....	128	103.0	45.2
1.....	64	187.8	45.2

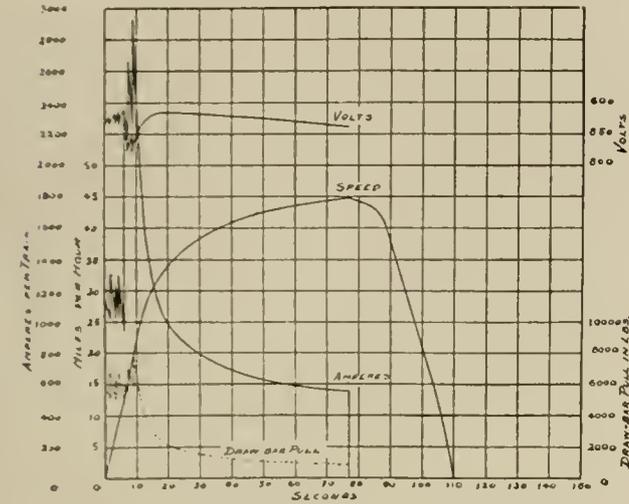
This table is based upon the actual net energy delivered to the wheels of the train and does not include the losses inherent to any system of operation. The results tabulated may, therefore, be considered as fundamental, and typical of the two systems of operation—the steam locomotive and the electric motor car.

The following table gives the efficiencies for the seven electric runs, the efficiency being the ratio between net energy output to the wheels and total volt ampere input:

Trailers.	Average m. p. h.	Watt hours per ton mile. Output.	Watt hours per ton mile. Input.	Per cent Efficiency of run.
0.....	27.2	59.1	79.8	74.0
5.....	28.6	61.0	82.0	74.3
4.....	29.8	63.8	84.9	75.3
3.....	30.6	68.0	90.2	75.3
2.....	32.0	69.6	99.6	69.9
1.....	33.1	75.3	112.8	66.7
0.....	34.6	79.8	130.0	61.5

An accurate comparison of the relative efficiency or coal consumption of steam and electric power for similar service would require an extensive series of tests with indicator and dynamometer on the performance of the steam locomotive.

As a matter of interest we have secured an approximate com-



Electric Run No. 11. 1 Trail Car—Weight 23 tons, including Motor Cars 94.5 tons. Power on 4060 ft. Distance Run 5350 Ft. Watt hours per ton-mile 114.

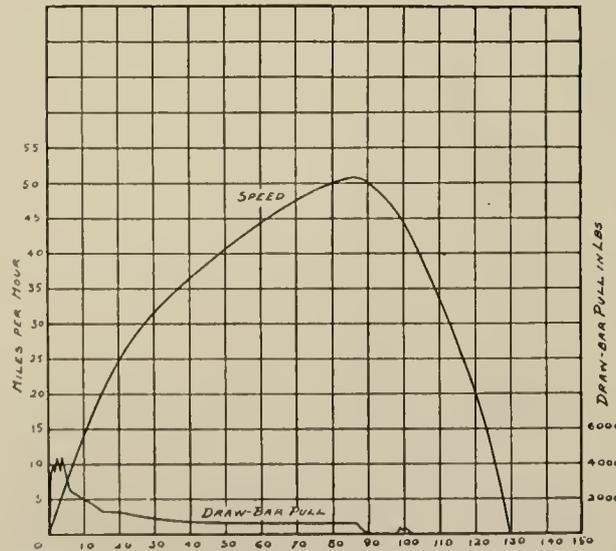
at less maximum speed than with the steam locomotive, owing to its being able to maintain its maximum accelerating rate for a longer period.

The average speed given in both steam and electric tables is the average speed of the train while it is in motion and does not include time of any stop at the end of the run. Starting from rest, the power was kept full on to the three-quarter mile post where the power was shut off and the brakes applied in such a manner as to bring the train to rest as near the mile post as practicable. In the tests the steam train ran from 5 to 15 per cent over a mile before the train was brought to rest and the electric trains from 2 to 4 per cent, but even with the longer distance the average speed of the steam runs only approaches that attained in the electric runs made over a shorter distance. A comparison of the two sets of runs on the basis of average speed is, therefore, not quite fair to the electric motor car, as its average speed would have been considerably higher if the length of the run had been the same as that made with the steam locomotive. An inspection of the tables will show, however, that even with the shorter distance run, the electric motor cars were able to make higher average speeds than the steam locomotive over its longer distance, and these higher average speeds were obtained also with a lesser maximum speed.

The maximum speed of a train making a given run in a given time serves as an indication of its energy consumption. A train, therefore, which is so handled as to make a given run in a given time, with lowest maximum speed, will consume less energy for the run. The electric runs tabulated all show a lower maximum speed and a higher average speed than those runs made with the steam locomotive, and the energy consumption of the electric runs should, therefore, be less for the same service performed than with the steam locomotive.

The motors of an electrically equipped train may be placed upon the trucks of ordinary passenger coaches, each carrying its full complement of passengers, and thus lessen the gross weight by elimination of the locomotive. The true measure of comparison between steam and electrically propelled trains should be the energy per seat mile rather than per ton mile, as the latter value is based upon the total train weight and includes a considerable proportion of dead weight embodied in locomotive and tender. The weight of the electric motors is much less than the weight of a steam locomotive capable of performing the same service, as the latter, in addition to its tender, must be heavy enough upon its drivers to provide a draw-bar pull sufficient to accelerate the train.

As an illustration, the following table has been prepared from these tests showing the number of cars in the train, the number



Steam Run No. 12. 1 Trail Car—Weight 23 tons, including Locomotive 130 tons. Power on 4460 ft. Distance Run—6260 ft.

parison from a single test by weighing the coal and water taken by steam locomotive No. 1407 for a period of 24 hours, covering four trips between North White Plains and Grand Central Station, a distance of 24.75 miles, on the Harlem Division of the New York Central Railroad. The trips occupied about 4 hours, the yard movements about 1 hour, and the locomotive was idle for 19 hours.

The results showed:

Total effective h. p. hours, hauling coaches.....	1861
Coal consumed.....	13,412 lb.
Coal per effective h. p. hour.....	15.6 lb.

The effective h. p. given is the energy required for movement of the cars only, exclusive of the locomotive, and was determined from the draw-bar pull taken by dynamometer car in previous tests over the same route.

The coal consumption covers all coal burned during the period of 24 hours, not only for movement of cars but also movement in the yard and the banking of fires during lay-overs.

The effective h. p. h. to move the cars serves as the basis of comparison with electric service, the coal consumed by the locomotive for whatever purpose being properly chargeable to the net work done by the locomotive during the period.

The efficiency of an electrical system, as an average under variable load, may reasonably be assumed as follows:

	Efficiency, per cent.
Engine	90.
Alternator	92.
High potential transmission	98.
Transformers	97.
Converters	92.
Third rail	95.
Motors, including control	75.
Combined efficiency	51.3

This percentage of effective horse-power output of motors to i.h.p. of engine will vary somewhat, depending on the load factor. As an even figure we will assume an efficiency of 50 per cent.

Coal consumption per indicated h.p.h. from actual records of electric power stations, is in some cases less than 2 lb., the average being about 2½ lb. At the latter figure, the coal per effective h.p.h. output of electric motors would be 5 lb. Assuming the head end air resistance as 10 per cent and as the electrical equipment would increase the weight of the cars about 20 per cent, the actual comparison of coal consumption would be approximately in the ratio of 6.6 for electric and 15.6 for steam.

Assuming that coal for a power station can be purchased for 80 per cent of the cost per ton of that used in the locomotives and that the cost of coal for electrical power is about one-third of the total cost, including maintenance and interest on investment, it is probable that the actual gross cost of electrical power would closely approximate the coal consumption of a steam locomotive in this class of service, the maintenance of the electrical equipment and attendance required being, however, considerably in favor of the electric power.

We wish to express our thanks to Mr. E. C. Schmidt, Professor of Railway and Mechanical Engineering, University of Illinois, for his able management of the dynamometer car, assisted by Messrs. J. F. Snodgrass and R. W. Lohmann; also to Messrs. A. H. Armstrong and E. F. Gould of the General Electric Co. for their careful supervision and calculations of the electric test.

ELECTRICAL EXPERIMENTS AND ESTIMATES FOR THE NEW YORK CENTRAL TERMINAL.

A paper on this subject was read by Mr. Bion J. Arnold at the annual meeting of the American Society of Electrical Engineers at Great Barrington, Mass., June 10th, 1902, in which he described the method used for ascertaining the power to operate the trains of the New York Central & Hudson River Railroad between Mott Haven Junction and the Grand Central Station, and the relative cost of operation by steam and electricity. In August, 1901, Mr. Arnold was commissioned by this railroad company to study the conditions governing the operations of its trains upon the division mentioned and to report upon the feasibility of operating them by electricity. This division consists of 5.3 miles of four-track road, forming the main artery over which the trains of the three divisions of the New York Central and the main line of the New York, New Haven & Hartford Railroads enter the city of New York. For 2.58 miles from Mott Haven Junction the tracks are carried on an elevated stone and steel structure, then for 2.04 miles through a tunnel underneath the street, emerging into an open cut .68 of a mile long, and then terminating at the Grand Central Station in an intricate stub-end yard having about eight miles of switching tracks. Over this division are made nearly 600 train movements per day, as almost all trains entering the yard or station must be returned to Mott Haven Junction, owing to the lack of sufficient storage tracks at the Grand Central terminus.

The annoyance of passengers due to the use of steam locomotives

in the tunnel caused the company to examine into the advisability of adopting electricity. All money values relating to the total cost of installation, real estate, etc., and many other elements upon which the final recommendations of the report were based, together with many of the general recommendations and conclusions, were necessarily omitted from the paper, and only sufficient data given to check the technical conclusion arrived at.

Soon after taking up the work it became evident, on account of the number and weights of the trains to be handled and the numerous variable elements entering into the operating system which would not adapt themselves conveniently to formulae, that the most practical and satisfactory way to ascertain the power required to propel the trains was to measure by means of a dynamometer car the draw-bar pull of a sufficient number of trains of various weights to determine the average power required per train, and from this compute the general load diagram. A dynamometer car was accordingly secured and this was coupled between the engine and the train in each case, and operated on trains running over the different divisions of the road so that not less than two runs in each direction were made for each class of train. From the dynamometer records the horse power required at the draw-bar was obtained in the following manner:

The average draw-bar pull of the various trains over the various lines was determined and proper allowance made for increased train weight due to motor equipment and finally a reduction of the draw-bar pull thus obtained to horse power, and eventually to kilowatts. Owing to the fact that the maximum speed on this division seldom exceeds 35 miles per hour and that the trains are never less than three cars in length—often reaching 11 cars in length—no correction was made for head end air resistance. The dynamometer records were made by a pen tracing a line upon the strip of paper passing under it and the average draw-bar pull for any given period was determined by measuring the entire area between the dynamometer pen record and the base line by means of a planimeter and dividing by the length of the base line, the result being the average draw-bar pull.

Passenger records were taken during the dynamometer tests from which the ratio of the weight of the live loads to the light weight of the train was determined. Dividing the average pull in pounds by the total weight of the train the average pound per ton draw-bar pull over the line under consideration was obtained.

The question of grade was eliminated as the average values were obtained from two runs on the same trains, one in each direction. The weight of every train arriving or leaving the Grand Central Station on a given day and its average speed between stops was determined. Knowing therefore, the average draw-bar pull in pounds required to haul the train and the average speed at which this draw-bar pull was exerted, the horse power at the draw-bar becomes:

$$\begin{aligned} \text{H. P.} &= \text{foot pounds per minute} / 33,000 \\ &= \text{draw-bar pull} \times \text{miles per hour} \times 5,280 / 33,000 \times 60 \\ &= \text{draw-bar pull} \times \text{miles per hour} / 375. \end{aligned}$$

The horse power required for each scheduled train over each run was obtained in this manner and from these figures the daily load diagram was made out. The average horse power obtained was converted into kilowatts by means of the following formula:

$$\begin{aligned} \text{kw.} &= \text{h. p.} \times 746 / .70 \times 1,000 \\ \text{where } 1,000 \text{ watts} &= 1 \text{ kw.} \\ 746 \text{ watts} &= 1 \text{ electrical h. p.} \\ \text{and } 70 \text{ per cent} &= \text{efficiency of locomotives,} \end{aligned}$$

which gives the average kilowatt input required at contact shoes of electric locomotives. It was found that the daily average input required would be at the rate of 1,800 kw., and therefore the total annual input required at the contact shoes of locomotives for propulsion alone would be $1,800 \times 24 \times 365 = 15,768,000$ kw. hours. From the total number of tons hauled yearly over this division, passenger, shop trains and switching service, the ton miles per year were found to be 250,285,710. Hence the electrical energy required to haul a ton one mile over this division under the existing conditions would be $15,768,000,000 / 250,285,710 = 63$ watt hours per ton mile.

With this figure as a basis, and the load factor as determined from the load diagram, the problem of determining the best method of producing, distributing and applying the power was considered.

CHOICE OF SYSTEMS.

While it is the author's opinion that the alternating current railway motor will yet prove to be the most efficient all things considered, for long distance railway work, it has not yet in his opinion demonstrated its ability to start under load as efficiently or to accelerate a train as rapidly as the direct current motor. The line under immediate consideration was short, the trains numerous and rapid acceleration desirable, all of which are conditions favorable to the direct current motor.

Furthermore, direct current motors with their necessary auxiliaries have become fairly well standardized and it is the only class of electric railway apparatus available from the manufacturers of the United States without involving experimental work and large development expense.

In view of these facts and the probable necessity for rapid construction, the author refrained from advising anything of an experimental nature and, therefore, recommended the direct current system in combination with the third rail for the main line, and overhead construction for the yards, all of which have demonstrated fully their ability to meet the conditions imposed by railway operation so far as motive power is concerned, although there has not yet been an electric installation on any existing terminal that is as complex, or into which anywhere near the number of heavy trains enter as on this section of road.

Had the length of road under consideration been considerably

Column 6, which is Column 4 plus Column 5, represents the total cost per electric locomotive mile.

While the results in Column 6 indicated that Plan No. 1 was the most advisable one to adopt, it was not seriously considered for the reason that it necessitated locating the power station in a part of the city where its erection would probably have been prohibited by the city authorities, but it was here introduced for comparison as indicative of the economy to be gained by placing the power station at the theoretical center of distribution. The same objection applied to Plans 2 and 3.

Plans 4 and 5 bring out quite clearly the difference in the cost of operation between two sub-stations and one, both plans permitting the location of the power station on the river front.

The difference in favor of Plan 5 is entirely due to the saving in labor of one sub-station.

Plans 6, 7 and 8 were studied with the object of ascertaining whether the purchase, instead of the generation, of power would offer a satisfactory solution of the problem.

The purchase of both direct current and alternating current energy was considered on the lowest basis that it was thought possible for any existing company to furnish it, and it was found that the direct current energy, in consequence of the interest, depreciation, maintenance, etc., of the transmission lines, rotary converters and other sub-station apparatus which would have to be furnished by the energy producing company.

TABLE OF ESTIMATES OF PLANS FOR PROPOSED ELECTRICAL EQUIPMENT OF THE N. Y. C. & H. R. R. TERMINAL.

PLAN.	CHARACTER OF STATIONS, ETC.	1	2	3	4	5	6
1.	Direct current power station at center of line and contiguous to tracks. 600 volt working conductor, no batteries	.417c	.60c	1.06c	14.02c	6.58c	20.60c
2.	Same as No. 1, with batteries in power house	.472	.66	1.137	14.65	6.71	21.36
3.	Same as No. 1, with battery substation near Grand Central Station and Mott Haven Junction	.475	.668	1.20	14.7	7.25	21.95
4.	Alternating current power station on river front near center of line, with rotary converter substations near each end of line. 11,000 volt A. C. and 600 volt D. C.	.572	.715	1.287	15.2	7.58	22.78
5.	Combined D. C. and A. C. Power station at Harlem River near one end of line and one rotary converter substation near the other end of line. 11,000 volt A. C., 600 volt D. C., no batteries	.570	.666	1.19	14.7	7.18	21.88
6.	Direct current feeders from Manhattan Railway substation located near center of line. Transmission from substation to working conductor, 600 volts D. C. energy to be purchased.	2.5	2.650	2.748	34.64	2.80	37.53
7.	Rotary converter substation at center of line. A. C. energy to be purchased from Manhattan Substation and transmitted at 11,000 volts. Energy to cost 1 cent less per k. w. hour than D. C. energy delivered.	2.5	2.336	2.508	31.50	4.23	35.73
8.	Two rotary converter substations, one near each end of line. A. C. current to be purchased from Manhattan substation near center of line.	2.1	2.336	2.504	31.50	3.93	35.43
9.	Combined A. C. and D. C. power station near Harlem River at end of line. One substation near other end, and batteries carried on locomotives charged from working conductor	.519	.629	1.122	16.58	7.76	24.31
10.	One rotary converter substation near center of line, A. C. current purchased from Manhattan substation No. 7, batteries on locomotives charged from working conductor	2.12	2.4	2.502	34.40	4.08	38.48
11.	Direct current feeders from Manhattan substation No. 7, near center of line. Batteries on locomotives charged from working conductors.	2.5	2.738	2.742	37.81	2.51	40.32
12.	Combined A. C. and D. C. power station at Harlem River near outer end of line. One substation near other end. Batteries in power station and substation. A. C. transmission 11,000 volts, D. C. conductors 600 volts.	.55	.775	1.335	15.80	7.83	23.63

greater, and had it been thought possible to secure sufficient time to conduct experiments or invite demonstrations by manufacturers of alternating current motor equipments, this class of apparatus would have been more seriously considered.

In the preparation of estimates 12 distinct plans of generation and distribution were considered, and the results tabulated as shown in the accompanying table. All the estimates were computed upon the same basis as far as cost of fuel, labor and losses in transmission were concerned.

In the accompanying table, column 1 represents the operating expense per kilowatt hour at the power house switchboard.

Column 2 represents the operating expenses per kilowatt-hour at contact shoe.

Column 3 represents the total cost per kilowatt-hour delivered to motor terminals exclusive of fixed and operating charges on electric locomotives.

Column 4 represents the operating expenses per electric locomotive mile. The values in this column are directly comparable with values now obtained in the present team locomotive service, except that the operating expense shown by the performance sheets of the motive power department do not include any charges for water. From the best information available, the cost of water on the present service of this division is about 987 cents per locomotive mile, which amount was added to the present cost given on the performance sheets.

Column 5 represents the fixed charges per electric locomotive mile,

The prohibitive annual cost of these purchasing plans is at once observed by reference to Columns 6 and 2, the plans only meriting consideration as representing a temporary arrangement that might be effected in order to allow rapid installation.

Owing to the more or less complex system of overhead or third rail yard construction made necessary by the nature of the case, and the averages to be obtained by their elimination in the substitution of locomotives which could, for switching service, be self contained, though normally supplied with energy from the working conductors, a study was made of electric locomotives carrying batteries.

The results of these studies, made under several different assumptions, are shown under Plans 9, 10 and 11. From Column 6 and 3 it is evident that whatever may be gained by the elimination of the overhead construction is largely offset by the additional cost of operation, although it will be observed that the cost per locomotive mile of Plan 9 compares favorably with the cost of Plan 12.

Plan 12 differed only from Plan 5 in a slight reduction in the capacity of the converting apparatus in the power house and substations and the substitution thereof of two storage batteries (one located in or near the power house and one in the sub-station) each of such capacity that it, together with only a portion of the main station and sub station machinery, would be capable of taking over the entire load of the line for a short period of time in cases of emergency.

The additional first cost and the slight increase in annual expense (as compared with Plan 5) represented by a reserve station capacity

of this nature, was thought to be of secondary importance only, in view of the increased reliability of operation thereby obtained. The increased cost of operation in this plan over that of Plan 5 is due to the fact that the battery maintenance was figured at 10 per cent per annum, which is considerably higher than is ordinarily assumed, and will probably be considered excessive by some.

A battery of this kind would not only serve as a reserve, but would prove of considerable value as a regulator of potential along the line, and in addition it would, notwithstanding its inherent losses, tend to reduce the power house operating costs by taking up the excessive load fluctuations of the system and permitting the load upon the engines to be maintained at or near their most efficient working capacity.

It was considered of the utmost importance in an installation of this magnitude that the number of interruptions of power supply be reduced to a minimum, that no device which could increase the safety and reliability of the plant should be omitted, and that the probability of future extensions of the electrical system should be considered. As best fulfilling the above conditions, therefore, Plan 12 was the one specifically recommended for adoption.

OPERATING EXPENSES.

A careful compilation of all the expenses entering into the operation of the present steam service was made and the following comparative table of relative costs is believed to be correct, assuming that the present locomotives running between Mott Haven Junction and Grand Central Station should be abandoned and the service now performed by them duplicated by electric locomotives operated in accordance with Plan 12. It is assumed that the electric locomotives will be operated by the same class of men as those who now operate the steam locomotives, and that they would receive the same rate of pay that they now receive.

This condition is not favorable to electric traction as it is not ordinarily necessary to have two men to operate an electric motor, but in the writer's judgment, it is not advisable to operate a service of this class under such exacting conditions without two men on each locomotive.

If the motor car system should be adopted, as it probably would be were the electrical equipment extended beyond Mott Haven Junction, or if the forward guard or brakeman were allowed to take the place of the second man while passing through the tunnel and yards, a saving equivalent to his wages could thereby be effected.

With two men of the same skill as at present employed on the locomotives, the figures are as follows:

	Steam.	Elec- tricity.
Operating expenses per locomotive mile exclusive of fixed charges but including water, labor, cost of cleaning and repairing tunnel, and all other expenses of locomotive operation.....	23.05	15.80
Fixed charges per locomotive mile assuming that it now requires 40 locomotives to perform the present service and that 33 electric locomotives could perform the same service.....	1.13	7.83
Total in cents.....	24.18	23.63

From these figures it appears that while there would be a slight annual saving in operating expenses in favor of electricity, it is not sufficient to warrant its adoption on the grounds of economy in operation alone, although its adoption can be justified on other grounds.

These figures could be made more favorable to electricity were an optimistic view of many of its advantages taken, and the probability is that practical operation will show a somewhat greater gain than here indicated, but it has been deemed best by the writer to maintain a conservative view throughout the entire investigation.

It is, however, safe to conclude that the saving in operation expenses of the electric system would be sufficient to offset the increased fixed charges due to the additional investment made necessary by its adoption.

The new Huntington line between Los Angeles, Cal., and Long Beach was opened to general traffic July 4th. The first car was run over the line on the preceding day, carrying officers of the company and their guests.

ELECTRICAL INDUSTRIES OF PITTSBURG.

At a meeting of the American Association for the Advancement of Science recently held in Pittsburg, a paper was read by Mr. G. H. Gibson, on the "Electrical Industries of Pittsburg and their Economic Influence." Mr. Gibson spoke particularly of the extent of the Westinghouse Electric & Manufacturing Co.'s plant which is shortly to be duplicated. He stated that the modern industrial age began with the advent of the steam engine, but in order to utilize its power some means of transmission was necessary, and electricity is especially qualified for power distribution; it has also furnished a most useful means of lighting, and electro-chemistry has opened up a new and rapidly developing branch of the industry. Mr. Gibson spoke of electricity as an important factor in developing cities, building up suburban districts, redistributing populations and affording convenient transportation to farming communities. The use of electricity in modern factories was also considered as well as its applicability to mining. Electro-chemistry has not only made aluminum a rival of copper as an electric conductor, but nearly all the copper in use is now electrically refined. Mr. Gibson stated that the engineering development of a country was a measure of its civilization and pointed out that the United States produces 69 per cent of all the electricity available in the world, 76 per cent of all the portion available for traction, 76½ per cent of all the electric railway mileage and 83½ per cent of all the trolley cars.

LARGER POWER PLANT FOR STEPHENSON CO.

Some months ago we announced that the John Stephenson Co. intended to enlarge its power plant and published some particulars in regard to the company's plans. The first week of July ground was broken at the works in Elizabeth, N. J., for the foundation of the new engine, which will be a horizontal tandem compound with automatic cut-off and will be direct connected to a 400-kw. generator. The top of the copper covered dome of the engine house has been removed and the flat skylight replaced by a large clear story of iron. This is arranged to give light and ventilation on four sides while it excludes direct sunshine.

The company is also putting in an additional 150-h. p. boiler. When this is in place it will bring the boiler capacity up to the requirements of the establishment when the new engine is put in operation. A new 700-h. p. feed water heater of the latest and most approved type is ordered and work has been begun in the piping for its connection.

PENSION SYSTEM IN NEW YORK.

The new system of pensioning superannuated employes which was recently adopted by the Metropolitan Street Railway Co. of New York, became operative on July 1st. Notices were posted in the power houses and barns June 18th directing eligible employes to make application to the proper officer for their pension allowance. The system provides for voluntary and involuntary retirement of all employes of the Metropolitan and constituent companies whose wages have not exceeded \$1,200 per annum, and who have reached a certain age after 25 years or a longer time in the service of the company. The details of the system and the ratio of allowance were given in the Street Railway Review for March, 1902, page 183.

MEDALS FOR AMERICAN STEEL & WIRE CO.

At the South Carolina Inter State and West Indian Exposition, Charleston, S. C., which closed May 31st, the American Steel & Wire Co. was awarded 10 gold, 4 silver and 4 bronze medals and one diploma of merit. The gold medals were for: Merchants Iron and Steel; cold drawn steel shafting. Horse and Mule Shoes. Wire Nails. Rail Bonds. Wire Rope. Machinery and appliances for drawing wire. Springs and Spring Wire. Copper. Iron and Steel. Aluminum Wire. The exhibits awarded silver medals were: Bicycles and Automobile Spokes. Rolled wagon skeins. Underground and Overhead Wires and Cables. Metallurgy of Zinc. Bronze medals were for: Music Wire. Coal and Coke. Bale Ties. Chemicals and Colors. The installation in the Commerce Building was given a diploma of merit.

Some Street Railway Parks.

Birmingham, Ala.—Pittsburg—Youngstown, O.—Clyffside Park.

As with the transfer system, the practicability of creating travel over street railways by establishing pleasure resorts en route, or at the termini of roads was at first problematical, but they proved so successful that such means of inducing pleasure traffic have been almost unanimously adopted by leading street railway companies. Not only has the park been a money-earning project, but it has, as well, made the relations more intimate between the street railways and the public, and thus in almost every instance furthered the interests of the road. People in general have a friendly feeling for those who furnish them amusement, and the patrons of street railway parks are largely of a class to whom extended summer outings are impossible. To this class the park manager performs what has become an indispensable office. He furnishes cheap and

do so may sit and smoke or partake of refreshments while the performance is going on. On a 3½-ft. elevation above the box floor is another space on which tables are arranged, around which parties may sit and be relieved of the conventional seats in the parquet. All the way around the theater is a promenade 7½ ft. wide. On the end opposite the stage is a high lattice, and in each corner of the front is a refreshment stand in which refreshing drinks are served. The entrance to the theater is over a 25-ft. approach from the bank. A graceful arch surmounts the entrance gates and this is lighted by a string of incandescent lights.

The stage is surmounted by a well proportioned proscenium arch 30 ft. wide at its base, with a radius of 63 ft. The stage itself is 41 ft. long by 21 ft. broad, and is provided with the usual drops



"AQUATIC THEATER" AT EAST LAKE PARK, BIRMINGHAM, ALA.

rapid transportation from the most crowded commercial centers to some modern Eden where the natural beauties of forest and water course are enhanced and improved upon (in the taste of many) by the innovation of merry-go-rounds, dancing pavilions, bowling alleys and out-door theaters. And the public has come to feel at home in such pleasure grounds as the street railways have provided, and in a measure to take a personal pride in them, so that in mentioning his city a man is inclined to boast of its street railway parks much as he boasts of its claims to commercial superiority—such as its exports, its iron works or the beer that made it famous. Every city pretends to peculiar advantages in respect to the location of its parks, which either command a surpassing view from some mountain height or are located on a spot of great historical interest, or have some special attraction not to be found elsewhere. Such good natural rivalry has been a stimulus to the development of park systems with the result that the artificial attractions are more varied and abundant.

EAST LAKE THEATER, BIRMINGHAM, ALA.

East Lake, the popular pleasure resort controlled by the Birmingham Railway, Light & Power Co., was leased this season with a five-year option to the Webster Amusement Syndicate of Chicago, and everything on the grounds has undergone a thorough overhauling and many new and attractive features have been added. Not least among these is the new "Aquatic Theater," which was built and opened on June 17th.

The theater derives its name from the fact that it is built out into the lake. The building is 138 ft. long by 108 ft. wide and is without cover, as may be seen from the accompanying engraving. It is splendidly equipped and possesses all the conveniences of a modern theater. The parquet has a 6 per cent slope to the stage and has a seating capacity of 1,400. Arranged on a 3½ ft. elevation above the parquet are four boxes on either side and back of the boxes are arranged tables where those who care to

and wings. There are two large and spacious dressing rooms on each side of the stage, which afford ample space for the making up of a large opera company, if necessary.

The lighting of the theater is by means of five rows of lights strung from the stage to the front of the building and aggregating something over three hundred in number. Besides these are the usual foot lights and other stage lights controlled by switches behind the scenes. The lighting question up to the present season at East Lake has been a rather awkward one, for the reason that the park is seven miles from Birmingham and the lighting heretofore has been by means of current obtained by tapping the trolley wire, and as East Lake is at the extreme end of the line, when many cars were being operated on the line the lights were necessarily dim. This method was, moreover, not desirable on account of the fluctuations in the pressure, so this season a direct line from the alternating current circuit in Birmingham was run to the park, a transformer installed, and now the lighting of the grounds is one of the marked attractions.

Vaudeville has been the offering since the opening night, and judging from the box office receipts has been highly acceptable to patrons. Only the very best people on the vaudeville stage have been engaged and the performance is in every way refined. From four to six "teans" are employed for the bill each week. As an auxiliary to the vaudeville turns a moving picture machine has been obtained for the season and the performance closes with a roll of moving pictures every night. This feature in itself has proven a drawing card, as a great many people take their children out to see this alone. The performance opens at 9:00 and lasts about one and one-half hours. Through trains to the city are in waiting after the performance and those who care to do so may get home promptly, as the run over the new track is now made in twenty minutes. No stops being made except at railroad crossings.

The price of admission to the parquet is 25 cents, to the boxes 50 cents and in the extreme rear of the building are several rows

of benches admission to which is only ten cents, thus providing for all classes. So pleased do the people seem with the show that frequently the late comer is greeted at the box office with the familiar words "Standing room only." It was contemplated to run vaudeville for a while and then secure an opera company, but as vaudeville is producing such satisfaction it will be kept on indefinitely.

At an outlay of something over \$1,000 a "Shoot the Chute" has been erected. It stands 45 ft. high and the slope is 125 ft. long. It has only been provided with two tracks, one for the ascent and one for the descent of boats. It has been found that three boats are all that are necessary to handle the crowds, or rather all that can be conveniently and expeditiously handled. The boats are drawn up by electric power on a steel rail track and the descent is made on a roller track which gives the boats sufficient speed to send them 100 yards or more out in the lake. A steel track, with iron runners on the boats was tried at first, but after a few hours steady running the track would get so hot that the boats would not run. It was then that the roller track was substituted and found to be the proper thing.

The boats used are built with a seating capacity of six and are gondola shaped. Ten cents is charged for a ride on the chute and the capacity is taxed to the utmost quite often, as frequently a party will ride more than once. The top of the chute is gained by several flights of stairs leading up from the old pavilion.

The old theater and dancing hall has been remodeled and converted into a fashionable restaurant with all the appointments of a downtown restaurant. All the delicacies of the season are served at moderate prices, and it has come to be quite the thing for couples and parties to go out early in the evening, take supper, ride the

For those who care to indulge in boat riding are some twenty row boats which may be engaged by the hour, and for those who are more indolent there is the naphtha launch, which takes patrons on a ride around the lake for 5 cents each. Scattered through the grounds are the peanut, popcorn and candy vendors, whose voices may be heard, each crying out the virtues of their wares, each trying to silence the other.

With the beautiful "Aquatic Theater," whose equal is not to be found in the South, the "Chutes" and the numerous other attrac-

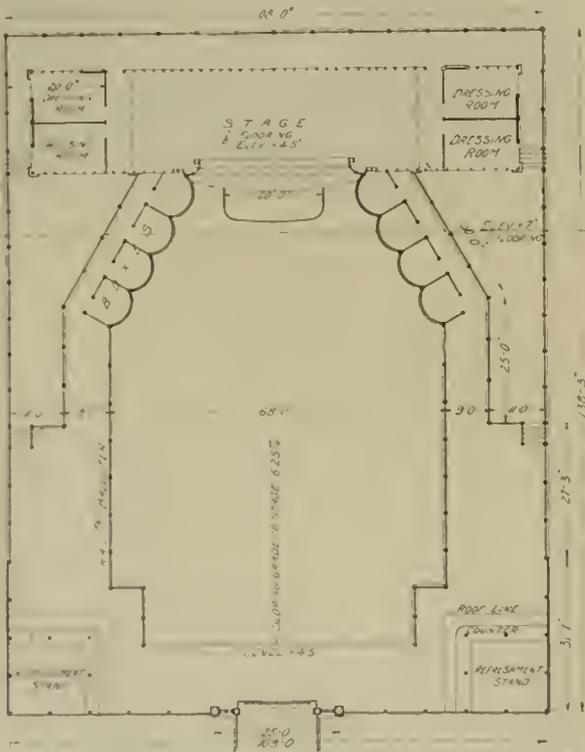


"CHUTE" AT EAST LAKE PARK.

tions, East Lake has grown to be one of the most popular pleasure resorts to be found anywhere. With its many attractions, its never dying breezes, its excellent car service all tend to fill it nightly with gay throngs seeking relief from the hot pavements of the city.

THE PARKS AT PITTSBURG.

By reason of the consolidation of the street railways in Pittsburg and vicinity, the four popular parks of that city, Kennywood, Calhoun, Oakwood and Southern Avenue, are now under one management, and the lines of the Pittsburg Railways Co., extending out of Pittsburg in every direction and touching nearly every suburban town within a radius of 20 miles, afford direct and rapid service to all the parks. Under this arrangement, churches, schools and societies, bound on an outing, can charter special cars to carry any number of persons to any one of the four parks without the inconvenience of transferring, which is a new and important feature of the Pittsburg service. Kennywood, under the management of the Pittsburg Railways Co., has become distinguished. It is served by the McKeesport branch of the company's system, and is situated on the banks of the historic Monongahela River, opposite the thriving city of Braddock. The new street railway line over the steel bridge at Wilkinsburg Junction makes Kennywood easily accessible, eliminates all grade crossings and reduces the distance from Pittsburg, Allegheny, the "East End" and the Wilkinsburg district. Kennywood is kept free to the public on all occasions. The company has expended large sums of money in preserving the natural scenery, in perfecting the sanitary conditions of the park and in installing attractions of the most approved kind. The casino is one of the finest buildings of its class in the country. It is 115x175 ft. in dimensions, two stories high and encircled by a spacious verandah. Here an expert caterer has made his headquarters, and it is one of the boasts of Kennywood that its facilities for feeding the multitude are unexcelled. The auditorium pavilion is also a handsome and modernly equipped structure, and has a dancing floor which is the special delight of devotees of Terpsichore. The theater is carefully planned in regard to acoustics and to the comfort of its patrons, and the highest class musical and vaudeville entertainments are provided. Throughout the park there are pavilions assigned for private picnics, and there are inexhaustible springs and artesian wells. One of the special features on the grounds is a ladies' cottage as secluded and charmingly furnished



THEATER AT EAST LAKE.

boat and go to the theater. The season's business has been better than the most sanguine hoped for.

In one end of this building is a handsome soda fountain where ices and drinks are served and this in itself is proving a drawing card.

Just to the right of the entrance of the park a new double bowling alley has been erected, where the devotees of this sport may try their skill. Along the drive way leading from the entrance are situated several side shows, such as snake dens, human freaks, ball throwing, tin type galleries and others of this ilk.

A large merry-go-round is being put in and from time to time some new side show is added to the already large and noisy lot.

as the famous retreat of Rosamond, and here, with a matron to look after their necessities, the favored sex when fatigued are entertained. We reproduce herewith engravings of the toboggan which is one of the most popular features at the park, and which, moreover, while thrilling enough to gratify the most audacious, is entirely safe. There are band concerts at Kennywood in the afternoons and evenings which draw many thousands of people to the park from Pittsburg and her suburban cities. The music is furnished by the most famous bands and orchestras in the country,



FIGURE 8 TOBOGGAN, KENNYWOOD.

among which may be mentioned the "Royal Italians," Phinney's United States Band, of Chicago, and many other celebrated organizations. The music pavilion is a massive, imposing structure, artistic in appearance and perfect in acoustic properties.

Calhoun Park, situated on the Dravosburg and McKeesport branch of the Pittsburg Rys., eight miles from Pittsburg, is noted for its splendid forest trees and pure spring water. We illustrate a car on the Pittsburg lines at the entrance of Calhoun Park,

sion at the gates of Calhoun Park, can arrange with the management to do so, all privileges being clearly defined in the contract.

Oakwood Park, on the West End lines of the Pittsburg Rys., is a grove of magnificent oaks, situated on a sloping plane which forms one of the shores of a charmingly picturesque lake. The park commands a view of the beautiful scenery of the old Mansfield Valley, and, being located on an eminence, is always swept by a refreshing breeze. Here also are pavilions, merry-go-rounds, shooting galleries, etc. While Oakwood Park is in every sense a popular resort, the management is conducted on lines of uncompromising propriety, and the comfort of those who seek the luxury of quiet and repose in the shade of the oaks is the first consideration. It may be mentioned that the boating facilities of Oakwood are exceptionally good, a large number of boats being at the disposal of those who wish to rent them, and a spacious and handsome boat house affording ample accommodations.

Southern Avenue Park, on the Suburban branch of the company's line, is but 30 minutes' ride from the heart of the city. It comprises all the appointments of Kennywood, Calhoun and Oakwood parks, and, like them, is abundantly supplied with shade and pure water. Concerts are given at Southern Avenue Park on Sunday afternoons and evenings, and other forms of amusement on week days are provided during the park season.

In closing, it may be said of the parks of Pittsburg that the management has spared no pains to provide all modern conveniences and amusement features, and has succeeded in making these resorts particularly attractive by keeping on the grounds a large number of trained employes, whose especial business it is to direct or assist visitors in any possible manner. Patrons are assured courteous treatment at all times and the most careful attention when occasion demands it.

PLEASURE RESORTS NEAR YOUNGSTOWN.

Idora Park and Mill Creek Park are situated at the terminus of the Youngstown Park & Falls Street Ry., four miles (only 15 minutes' ride) from the center of Youngstown, O., at which point



ADVERTISING TRAIN AT THE ENTRANCE OF CALHOUN PARK, PITTSBURG.

decked with flags and electric signs appropriate to some holiday celebration. At this resort the natural features predominate, but there are still a great number of attractions in the dancing and music pavilion, the shooting gallery, baseball field, roller coaster, bowling alley and carnival to afford a variety of entertainment for those who are bent on the more lively forms of amusement. Churches, schools and societies, desiring to sell tickets for admis-

the street railway connects with the Pennsylvania, the Pittsburg & Western, the Erie, the Pittsburg & Lake Erie, and the Lake Shore & Michigan Southern Railroads. Thus it is that both these pleasant resorts are patronized to a great extent by travelers who have a few hours to wait in Youngstown, as well as very generously by residents of that city. The parks contain nearly 450 acres, and the scenery is most picturesque. Mill Creek runs through the

length of Mill Creek Park, and a number of smaller streams empty into the creek within the park boundaries. The remains of an old Indian village border the creek, and near at hand are Lake Cohasset, with its complement of row boats and launches, the old Idora Mill, abandoned and silent in the heart of the woods, bringing to mind the scene of Zola's most spirited romance, and there are the Umbrella Rocks and the Haunted Pool. The company has built a very handsome and comfortable open air theater at Idora Park, and recently an elaborate summer toboggan at a cost of \$15,000. There is an electric merry go round which is always in



A BALLOON ASCENSION AT CLYFFESIDE.

favor with the children, but perhaps none of the attractions excel as a drawing card the deer paddock and the summer quarters of the trained bears, the badgers and the wild cats. Idora Park and Mill Creek Park have the best of sanitary conditions and are liberally equipped with toilet rooms, spring houses, rustic seats, etc. Throughout the season excursionists from Cleveland, Pittsburg, Allegheny, Butler, Canton, Akron, Beaver Falls, New Brighton, Sharon and many other places take advantage of the opportunities offered for an outing at this resort, and the patronage, while steadily increasing, is uniformly of a superior class.

A souvenir booklet illustrating Idora and Mill Creek parks has been issued by the Youngstown Park & Falls Street Railway Co. In addition to many half-tone engravings, showing the popular features and natural attractions here enumerated, the book con-



VIEW IN CLYFFESIDE PARK

tains interesting pictures of the city of Youngstown, and has, apropos of the summer scenes, a good collection of verse from well known authors.

CLYFFESIDE PARK, IN KENTUCKY.

Clyffeside Park, midway between Ashland and Catlettsburg, Ky., is directly accessible from these cities and from Ironton, O., seven miles distant, and Huntington, W. Va., 12½ miles distant, by the lines of the Camden Interstate Railway Co. Clyffeside comprises 10 acres of as finely wooded land as can be found in the Blue Grass state, and a lake of 15 acres' area on which a large number of boats are always in use. A commodious boat house and a casino,

the cost of which was \$10,000, have recently been erected, and in addition to these there are dancing pavilions, band stand, restaurant, and a depot where passengers may wait for the interurban cars. The park and its buildings are illuminated by 30 enclosed arc lamps of General Electric manufacture, and by 600 incandescent lamps, the current for which is furnished from the sub-station which has recently been completed to increase the efficiency of the interurban service. Vaudeville attractions are billed at the Casino during the entire season, and an orchestra of nine pieces provides music each afternoon and evening. The grounds are well policed and competent employes are in attendance to assist patrons of the park in any possible way. Through the courtesy of Mr. H. P. Wellman, superintendent of the Camden Interstate Railway Co., we reproduce photographs of Clyffeside Park which illustrate some of its points of interest.

CLUB HOUSES FOR BROOKLYN.

President Greatsinger, of the Brooklyn Rapid Transit Co., has secured options on building sites advantageously located in various parts of the borough on which it is proposed to erect club houses for the use of employes, which will be equipped in a manner similar to the branch stations of the Y. M. C. A. The plan of furnishing the men's quarters in the car houses in club-room style has proved so prolific of good results that the development of the system along advanced lines was decided to be highly practicable, and the success of the project of establishing club houses for the exclusive use of the men seems assured. Beside the usual reading rooms, baths and gymnasiums there will be a number of special attractions and every effort will be made to secure the advantages of a fraternal organization.

THE SEOUL ELECTRIC CO.

A report was recently published in a Japanese newspaper in regard to the plant of the Seoul Electric Co., extracts from which have been forwarded to the Department of State by Minister Allen, of Seoul. The plant in question is the largest single electric plant in Asia. It was built for a Korean company by an American firm, Collbran & Bostwick, who held the property under mortgage. The company operates an overhead trolley road of about 12 miles and also furnishes power for incandescent and arc lights for the city. The generating machinery is of the Westinghouse type and the boilers Babcock & Wilcox. The generators are direct current alternating current machines producing direct current at 550 volts for the use of the railway and alternating current at 385 volts for the electric lighting. There are over 1,400 incandescent lights supplied in addition to the arc lighting. The consulting engineer for the company is a Japanese graduate of the Massachusetts Institute of Technology.

NEW FACTORY FOR THE STANDARD ROLLER BEARING CO.

The Standard Roller Bearing Co., of Philadelphia, Pa., has purchased property in the center of the city on the main line of the Pennsylvania Railroad, where it will build a large factory for the manufacture of its well-known roller bearings. The principal buildings will consist of two factories 200 ft. long and 60 ft. wide, and in addition will be office buildings, etc. The plant will be equipped with every convenience for the rapid and economical handling of the business. Work has already been commenced on these buildings.

The Ball Bearing Co., also of Philadelphia, which recently removed from Boston, will occupy a portion of the new plant. The Standard Roller Bearing Co. has purchased the complete plant and equipment of the Roller Bearing & Equipment Co., of Keene, N. H., and as soon as practicable will remove the machinery and business of this company to the factory now in course of erection. The purchase of this business, together with that of the Grant Roller Bearing Axle & Wheel Co., of Cleveland, O., which was recently noted, will give the Standard Roller Bearing Co. a large proportion of this line of business in the United States. The company's products include ball, roller and all kinds of anti-friction bearings for high-grade machine construction.

INTERCHANGE OF FREIGHT BETWEEN STEAM AND ELECTRIC ROADS.

An Important Decision by the New York Court of Appeals—The Right of Electric Railways to Compel Steam Railroads to Make Connections Between Roads and to Interchange Freight.

The decision of the New York Court of Appeals rendered June 27, 1902, is one of the most important to electric interurban railways that has been made in this country and we here publish the text of the opinion which was by Judge Haight.

In the matter of the application of the Stillwater & Mechanicville Street Railway Co. for the appointment of commissioners under Section 12 of the Railroad Law, appellant, v. The Boston & Maine Railroad Co., respondent.

Appeal from an order of the Appellate Division, Third Department, reversing an order confirming the report of commissioners, and an order adjudging that an intersection and connection of the Stillwater & Mechanicville Street Railway Co. be made with the Boston & Maine Railroad.

David B. Hill and Thomas O'Connor for appellant.

Lewis E. Carr and T. F. Hamilton for respondent.

Haight, J.: This proceeding was instituted by the Stillwater & Mechanicville Street Railway Co. to obtain an order permitting it to unite and connect the tracks of its railroad with those of the Boston & Maine Railroad Co. in order to facilitate the free interchanging of cars between the two roads.

The Stillwater & Mechanicville Street Railway Co. was organized under the general railroad law of this state (New York), with the right to transport both passengers and freight, and is operated as an electric railroad by the trolley system.

The Boston & Maine Railroad Co. is a foreign corporation, organized under the laws of Massachusetts, and is operating a steam railroad. It is contended upon its behalf that the statute does not authorize the court to compel a connection of the tracks of the two roads. The question, therefore, raised for our review is, as to the proper construction of the statute.

The Railroad Law of 1890 (Chapter 565, section 12) provides as follows: "Every railroad corporation, whose road is or shall be intersected by any new railroad, shall unite with the corporation owning such new railroad in forming the necessary intersections and connections, and grant the requisite facilities therefor; and if the two corporations cannot agree upon the amount of compensation to be made therefor or upon the line or lines, grade or grades, points or manner of such intersections and connections, the same shall be ascertained and determined by commissioners, one of whom must be a practical civil engineer and surveyor, to be appointed by the court, as is provided in the condemnation law; and such commissioners may determine whether the crossing or crossings of any railroad before constructed shall be beneath, at, or above the existing grade of such railroad, and upon the route designated upon the map of the corporation seeking the crossing or otherwise. All railroad corporations whose roads are or shall hereafter be so crossed, intersected or joined, shall receive from each other and forward to their destination all goods, merchandise and other property intended for points on their respective roads, with the same dispatch as, and at a rate of freight, not exceeding the local tariff rate charged for similar goods, merchandise and other property, received at and forwarded from the same point for individuals and other corporations."

It will be observed that this statute contains two provisions, one for the crossing of the tracks of another railroad at, above or beneath grade; and the other provides for the intersection of the tracks of such railroads, and upon the making of such connections the roads shall receive from each other and forward to their destination all goods, merchandise and other property intended for points on their respective lines.

The court below seems to have been of the opinion that this statute had reference to steam railroads, and did not pertain to roads operated by electricity. In determining this question it became necessary to examine more fully the Railroad Law for the purpose of ascertaining the legislative intent. By referring to section 2 of the act, we find provisions for the incorporation of railroads which is to be accomplished by the execution of a certificate by fifteen or more persons which shall contain the name of the corporation, the number of years it is to continue and the kind of road to be built or operated. The section contains other provisions,

among which is subdivision 11, which provides that "if a street surface railroad, the names and description of the streets, avenues and highways in which the road is to be constructed."

It is thus apparent that the articles of incorporation provided for have reference to all kinds of railroads for public use, including steam railroads, street, surface and electric roads.

Again, passing to section 4, subdivision 5, of the act, we find that every railroad corporation, in addition to the power given by the general stock corporation law, shall have power "to cross, intersect, join or unite its railroad with any other railroad before constructed, at any point on its route and upon the ground of such other railroad corporation, with the necessary turnouts, sidings, switches and other conveniences in furtherance of the objects of its connection."

Section 34. "Every railroad corporation shall start and run its cars for the transportation of passengers and property at regular times, to be fixed by public notice, and shall furnish sufficient accommodations for the transportation of all passengers and property which shall be offered for transportation at the place of starting, within a reasonable time previously thereto, and at the junctions of other railroads, and at the usual stopping places established for receiving and discharging way passengers and freight for that train; and shall take, transport and discharge such passengers and property at, from and to, such places, on due payment of the fare or freight legally authorized therefor."

Section 35. "Every railroad corporation whose road, at or near the same place, connects with or is intersected by two or more railroads competing for its business, shall fairly and impartially afford to each of such connecting or intersecting roads equal terms of accommodation, privileges and facilities in the transportation of cars, passengers, baggage and freight over and upon its roads, and over and upon their roads and equal facilities in the interchange and use of passenger, baggage, freight and other cars required to accommodate the business of each road, and in furnishing passage tickets to passengers who may desire to make a continuous trip over any part of its roads and either of such connecting roads. The board of railroad commissioners may, upon application of the corporation owning or operating either of the connecting or intersecting roads, and upon fourteen days' notice to the corporation owning or operating the other road, prescribe such regulations as will secure, in their judgment, the enjoyment of equal privileges, accommodations and facilities to such connecting or intersecting roads as may be acquired to accommodate the business of each road, and the terms and conditions upon which the same shall be afforded to each road. The decision of the commissioners shall be binding on the parties for two years, and the Supreme Court shall have power to compel the performance thereof by attachment, mandamus, or otherwise."

It will be observed that each of these provisions of the statute, of which reference has been made, expressly refers to every railroad corporation, and thereby includes every railroad incorporated under the provisions of section 2 of the act.

The contention is now made that to compel a track connection with steam railroads by electric, or street surface railroads for the interchanging of traffic, would be a burden and a hardship to steam railroads that was not contemplated when the statute was passed; that to permit connections with steam railroads by the large number of electric railroads which have been, or are being constructed, would result in confusion to the steam railroads and make their operation difficult.

The learned Appellate Division appears to have been impressed with this argument, for it states in its opinion that the proceeding and purpose is new, and obviously opens a field of inquiry of the greatest importance, not alone to railroad corporations, but to the general public, which has an interest in the streets and highways of towns, villages and cities of the state; that if the street surface railways are to be recognized as an integral part of the great system of steam railroads, that the purpose should be made clear by the legislature. We readily concede that the legislative intent should clearly appear, but we are not much impressed with the contention that burden and hardship will result to the steam railroads, or that

confusion will follow in their operation. The provisions of the statute authorizing the courts to compel connections or intersections of tracks between railroads, to our minds was intended to promote the public interests, independent of that of the railroad companies. Travelers and the shippers of merchandise and freight have the right to make use of all the facilities provided for in the articles of incorporation, and the provisions of the statute pertaining thereto, in the conduct of their business. This, we think, is made clear by the provisions of the statute which requires that all railroad corporations whose roads are, or shall be intersected shall receive from each other and forward to their destination all goods, merchandise and other property intended for points on their respective roads, with the same dispatch and at the rate of freight not exceeding the local tariff rate, etc. Bearing this purpose in mind, we pass to a consideration of the meaning of the law. As we have seen, by the statute authorizing the incorporation of railroads, the legislature contemplated making provisions for all kinds of railroads, street surface, as well as steam railroads. By section 4, subdivision 7, all roads organized under the provisions of the act were empowered "to take and convey persons and property on its railroad by the power or force of steam, or animals, or by any mechanical power." It is true that the statute contains numerous provisions which apply alone to steam railroads and other provisions which apply alone to electric or street surface roads; but in most of these provisions there is specific reference to either steam or street surface roads. The great body of the statute was intended to apply to all railroads incorporated under its provisions, especially so far as those provisions were applicable. The revision of the Railroad Law of 1850 is of recent date and after the street surface railroads in our cities and villages had become very numerous. The legislature in undertaking a revision of the railroad laws attempted so far as possible to establish a complete system under which all kinds of railroads could be operated and the public interests subserved. In construing these statutes it does not become us to shut our eyes to the purposes sought to be accomplished, or the discoveries that have been made and the improvements accomplished in the transportations of the country in recent years. The great steam roads have extended across the continent from ocean to ocean, and from the far north down to the tropics. These roads have become great arteries over which is transported the greater part of the commerce of the continent. It has not been considered profitable or practical for steam roads to be constructed to every village, hamlet or productive district in the country. This, however, is rapidly being accomplished by the numerous electric roads that are in process of construction, or are contemplated. By their means the farmer, the mill owner and the merchandise vendor in distant places may be able to reach the steam railroads, and through them the great markets of our cities, with their merchandise and products, and in this way one road may become a feeder and distributor of the other.

If one electric road were seeking a connection with another road operated by the same power, it would hardly be claimed that the provisions of section 12 did not apply. It is practically conceded that electric roads may be united with other roads of the same character and operated by the same power. But the statute has not limited the courts to the requiring of intersections and connections between roads of the same character. Very likely, electric roads tendering cars to steam roads for transportation should only offer those properly equipped with brakes and couplers, so that they may be taken and transported readily and safely. It may be that additional regulations will become necessary in order that equal privileges, accommodations and facilities may be afforded in connecting and intersecting roads, but all this may be controlled by the board of railroad commissioners, which, under the provisions of section 35, to which we have referred, is given full authority in the premises.

It is said that the rights of the public in the streets and highways of our cities, towns and villages should be protected and that cars loaded with merchandise and freight should not be permitted to be run over street surface railroads. It may be that additional regulations should be provided either by statute or by ordinance, limiting the time in which cars of this character should be permitted to run over street surface railroads, especially in cities and large villages; but that the power exists to run such cars is no longer an open question in this court.

This question was elaborately considered in the case of *DeGrauw v. Long Island Electric Railway Company* (43 App. Div. 502),

which case was affirmed in this court on the opinion below (103 N. Y. 597).

Again, bearing in mind the legislative purpose, its intent to our minds appear reasonably clear, in the use made of the provision to cross, intersect, join or unite its railroad with any other railroad. The word "cross" is used in connection with the word "connect" and the Legislature could hardly have intended that one word should mean one kind of a railroad, and the other another kind. One of the most important rights which the Legislature undertook to provide for and to protect was that of the right of one railroad to cross the tracks of another which had previously been constructed. Were it not for this, one road running north and south through the state could absolutely prevent the constructing of another extending east and west. The Legislature was careful to make ample provisions for crossings in the same section in which intersections were provided for, and these provisions with reference to crossings have been held to apply to electric and street surface roads crossing steam roads, or of steam roads crossing electric or street surface roads. (*Buffalo, B. & L. R. R. Co. v. N. Y., L. E. & W. R. R. Co.*, 72 Hun, 583; *Port Richmond & P. P. El. R. R. Co. v. Staten Island R. T. R. R. Co.*, 71 Hun, 179; *aff'd.*, 144 N. Y. 445.)

It appears to us that the Legislature has clearly empowered the court to order connections such as is sought by the petitioner in these proceedings. The order of the Appellate Division should, therefore, be reversed, and that of the Special Term affirmed, with costs.

Parker, C. J., and Gray, O'Brien, Vann Cullen and Werner, JJ., concur.

NOTES FROM WHEELING, W. VA.

The extension of the Wheeling & Elm Grove Railroad to West Alexander, Pa., will be completed this season. The line has already been extended to Roney's Point at the state line and material is already on the ground for the completion of the road to Alexander. This is generally considered as a start in the project to link all the towns together between Wheeling and Pittsburg. The surveys have already been made for a line to Washington and the remaining link, between Washington and West Alexander, it is believed, will soon be projected.

A consignment of five new cars for the Wheeling Traction Co. has been received. These are 10-bench open cars and they are being equipped with trucks and motors as rapidly as possible. This consignment is the first of an order of 15 cars, all of which are expected to be delivered within a few days. The 42d St. power station of this company has been enlarged by an addition which is practically completed, and part of the new battery of boilers is already on the ground. Excavations have been made for the foundations for a new generating unit which is to be installed.

ELECTRIC RAILWAY FROM ROME TO NAPLES.

The construction of an electric railway between Rome and Naples which has been under consideration for a long time has been approved by the special commission which was appointed to pass upon the project by the Italian minister of public works. The engineering features of this road have been elaborated by M. Serafius Tarentini.

The two terminal stations have been located in the cities of Rome and Naples and the total length of the line will be 197 km. which will be made by the cars in two hours. The route will touch the cities of Cisterna, Terracina, Formia Mondragone, where the power house will be located, and Quaglino. The principal substation will be at Fondi. The road will have a double track throughout, and both electricity and steam will be used for motive powers. It will carry passengers, mail matter and certain classes of merchandise only.

A new electric line between Augusta, Ga., and Clearwater was opened June 28th, since which time the company has met with a steadily increasing patronage over the extension. The round trip between the cities is made in two hours. The route lies through one of the most picturesque portions of Georgia.

ST. LOUIS CARS FOR MEXICO.

An order of 10 cars for the City of Mexico has recently been completed by the St. Louis Car Co. These cars are for use as second class cars, six of them being closed trailers and four having baggage compartments. The length of the car bodies over corner posts is 25 ft. 4 in. and over the platform crown piers 34 ft. 4 in. The doors are of the double automatic pattern and the car has nine windows on each side. The platforms are 12 ft. 6 in. long with entrance step on both sides of the dasher. The platform flooring is made in the most substantial manner. There is a brake shaft on each platform and four folding gates are used, one at each entrance. The draw bars are radial with double acting springs and each car has

in Pittsburg and Allegheny is vested in this department of the Philadelphia Co.

The fuel gas department of the company, over its own lines and those of a number of companies controlled by it, supplies nearly all the fuel gas consumed in Pittsburg and Allegheny and a large number of manufacturing towns lying along the Monongahela and Allegheny Rivers. This territory is well covered by distributing mains and is connected by large mains of ample capacity with the natural gas wells in West Virginia, and elsewhere. The company estimates that it has a supply of gas in sight for the next 25 or 30 years.

For the first five months of 1902 the company reported gross earnings of \$5,773,615; operating expenses and taxes, \$2,807,781; im-



CAR FOR MEXICO, BUILT BY ST. LOUIS CAR CO.

two signal bells. All of the appliances are of the St. Louis Car Co's. pattern. The outside trimmings of the car are of malleable or wrought iron and the inside is finished in ash. The seats are longitudinal and arranged back to back, the backs being made of ash slats. There are four iron rods for window gratings, and wire screen life guards are placed between the trucks. The accompanying illustration shows one of the baggage cars of this order. The baggage compartment is 8 ft. long and is divided by a hard wood partition in which is a sliding door; the door slides on the baggage compartment side of the partition and is protected by slatting. This compartment is provided with hinged seats which fold up against the sides of the car and there is a single sliding door in the end of the compartment leading to the platform besides a 3 ft. 6 in. sliding door on each side of the compartment.

THE PHILADELPHIA CO.

In reply to numerous inquiries which have reached the Philadelphia Co., of Pittsburg, from stockholders and others as to the nature of its business and its source of income, the company has issued a circular explaining the diversified character of the interests which it controls. The Philadelphia Co. was organized in 1884 and operates under a special act of the Legislature of Pennsylvania in favor of the Empire Co., its predecessor. Under this act which conveyed many valuable privileges, the company has grown from an organization supplying fuel gas alone, to one which supplies a population in Pittsburg and its vicinity, of about 600,000 people, almost exclusively with fuel gas, illuminating gas and electric light as well as serving this territory with electrical transportation. These properties are subdivided into: (1) street railways, (2) electric lighting and illuminating gas, (3) fuel gas. The street railway property comprises about 404 miles and to conduce to greater convenience and economy of operation the railways are operated under agreement by the Pittsburg Railway Co. whose stock, both common and preferred, is owned by the Philadelphia Co. The gross earnings of the railway department of the company increased from \$5,728,186 in 1899 to \$7,081,472 in 1901, and for the same period the net earnings have increased from \$2,632,184 to \$3,200,178.

The electric lighting and illuminating gas department include the same organization furnishing electric current for heat, light and power in the cities of Pittsburg and Allegheny and the surrounding territory, while the exclusive right to manufacture illuminating gas

improvements, etc., \$163,044; net earnings, \$2,802,780; other income, \$748,357; total net earnings, \$3,551,140. Deducting fixed charges, etc., leaves the net income \$2,015,855.

SALE OF THE CAMDEN INTERSTATE RY.

The Camden Interstate Railway Co., of Huntington, W. Va., sold on June 30th all of its electric lines in Huntington, Central City, Ceredo and Kenova, W. Va., Catlettsburg and Ashland, Ky., and Ironton, O., to a syndicate of which John Graham, of Newville, is the head; other prominent members of the syndicate are Edmund McCandish, of Newville; John J. Henry and William North, of Philadelphia. The sale includes the electric light plants and parks in Ironton and Ashland, and the deal is said to have involved about \$2,000,000. It is stated that this syndicate has in view the purchase of several electric railways in other Ohio cities, its ultimate aim being to secure a continuous line between Cincinnati and Pittsburg.

TROLLEY TRIPS THROUGH NEW ENGLAND.

White & Warner, publishers, of Hartford, Conn., have recently published a well illustrated booklet describing the numerous trolley trips which it is now possible to make over southern New England, covering the distance between New York and Boston, via Bridgeport, New Haven, Hartford, Springfield, Worcester and other well known New England towns. The book contains 112 pages and is of convenient size for the pocket. It describes all the points of historic interest along the route from New York to Boston, and gives the running time of this trip as 22 hours and 55 minutes. A double page table shows the distances, fare and running time between local points, and also the total distance, fares and running time between New York and Boston. A number of interesting side trips which may be made by the traveler are given in detail and each place of any importance through which the lines pass is the subject of a page or more of description.

At a meeting of the stockholders of the United Railroads of San Francisco June 5th, the plan of the directors to issue bonds to the amount of \$20,000,000 was approved. The proceeds will be used to reimburse Brown Bros., of New York, for their original outlay in purchasing the San Francisco lines.

NEW CARS FOR THE TOLEDO RAILWAY & LIGHT CO.

The accompanying illustration shows one car of an order just filled by the John Stephenson Co. for the Toledo Railways & Light Co. The order was for 13 bench open cars without seats on platforms. The length over the buffers is practically 43 ft. with platforms 3 ft. 9 in. long. The height from track is 11 ft. 4 in. The posts, letter board and drip rails are of ash, while the plates and rails are of yellow pine, not spled. All the cross and end sills are of white oak, and the seats are of ash slats.

The openings are fitted with spring roller curtains coming all the way to the floor. The interior is neatly finished with the

rights and franchises of any existing street railway companies in Ottawa or adjacent thereto.

During the last session of the Dominion Parliament the following electrical railway bills were adopted: An act respecting the Port Dover, Brantford, Berlin & Goderich Railway Co. and to change its name to "The Grand Valley Railway Co." An act respecting the Niagara, St. Catharines & Toronto Ry. Co. An act respecting the Essex Terminal Ry. Co. An act respecting the Montreal & Southern Counties Ry. Co., and an act to incorporate the North Shore Power and Navigation Co.

The Kingston (Ont.) Street Ry. has purchased the rails, cars and equipment of the Belleville Street Ry., and will have them removed to Kingston and used on that system.



NEW OPEN CARS FOR TOLEDO RAILWAY & LIGHT CO.—JOHN STEPHENSON CO.

usual linings, panels, etc., and the steps are hung on an improved form of bracket. The end of the car is furnished with a vestibule having three drop sash and a steel dasher.

It will be noticed that there are no seats on the platforms and that passengers are excluded from them, so that there is no opportunity to talk with the motorman.

The dasher is fitted with the Wason signal box, which is a very convenient type of illuminated sign. The guard rail is of unusual length, extending as it does from dasher to dasher, closing not only the entrance to the seats but the platform as well. The trim is of bronze with steel arms and hickory handles, and a great deal of consideration has been given to those trifles which go to make up a practical car.

CANADIAN NOTES.

The Cape Breton Electric Co. has sold the Dominion Coal Co. all the rights and franchises held by it in the County of Cape Breton, Nova Scotia.

The Shawinigan Falls Electric Ry. proposes extending its line through the town of Shawinigan Falls by adding several miles of railway to the present line.

The buildings of the Kingston (Ont.) Street Ry. were recently damaged by fire to the extent of \$10,000.

The Montreal Street Ry. has secured the necessary legislation to permit it to extend the line from the present terminus at Viauville along the river front as far as Longue Pointe, a distance of about five miles. This line will parallel the Montreal Terminal Co's. tracks and is expected to be in operation by the end of July.

The Montreal Terminal Co., which has been fighting for an entrance into the city for the past two years, has finally succeeded in obtaining a ten year franchise. The officers of the Terminal Ry. have signed the ordinance granting the franchise, and work on the new line will be commenced at once and it is the intention to have the new road ready for operation by September 1st.

The Montreal Street Ry. which acquired the lines of the Montreal Park & Island Ry. has practically reconstructed the latter road, and has now on this suburban line a number of new cars which are models of comfort and elegance.

The city council of Ottawa is seriously considering the advisability of making application to the Ontario Legislature at its next session for power to build, equip, maintain and operate a street railway on the streets of that city and for authority to acquire the

The British Columbia Railway Co. intends issuing bonds to the amount of one million dollars. A large portion of this sum will be expended in developing the water power at Coquitlam Lake, and some \$200,000 will be spent for improvements to rolling stock and plant. It is the intention to construct large car shops at New Westminster.

The Toronto Street Railway Co. suffers heavily by a judgment given by the Court of Appeals in the company's appeal against the assessment on its cars. The court holds that the cars are assessable and that the assessment of \$450,000 is reasonable.

A meeting of the shareholders of the Sao Paulo Tramway, Light & Power Co., of Sao Paulo, Brazil, was held at the offices of the Toronto Railway Co. recently, and it was decided to increase the capital stock of the company from six million to seven millions of dollars, the shareholders to be allotted the majority of the new stock at par, and the remainder to be held as treasury stock. A dividend of 5 per cent was declared for the year.

The demand of the employes of the Ottawa Electric Ry. for an increase in wages has been refused by the company on the ground that the receipts will not justify the additional expenditure, and a strike is threatened.

The officials of the Montreal Street Ry. recently decided to grant employes a 10 per cent increase in wages. This was entirely unsolicited, and the men greatly appreciate the action of the company.

SIMPLEX ELECTRIC HEATING CO.

On July 15th the Simplex Electric Heating Co. took over the electric heating and rheostat business which has been developed by the "Heating Department" of the Simplex Electrical Co. This change separates the electric heating business from the manufacture of insulated wires and cables and is intended to furnish opportunity for carrying out a broader policy in the conduct of the business. Additional factory buildings are now under construction to provide more than three times the present capacity, and this will permit of more prompt service than has been possible in the past.

The management will remain the same as heretofore. The principal office of the company will be at No. 77 Cornhill, Boston, Mass., where all correspondence about money matters should be addressed, but correspondence relating to orders may be sent to 116 Franklin St., Cambridgeport, Mass. The Chicago office will remain in charge of Mr. H. R. Ilixson, 1137 Monadnock Block.

AUTOMATIC SIGNAL FOR BLOCK SYSTEM AND CAR SPACING DEVICE.

Believing that the time is approaching when the double track roads operating high speed cars require a block system answering the same purpose as the block system on steam roads, as the cost of one bad rear end collision will equip an entire road with a block system, the American Electric Switch Company, Pittsburgh, Pa., has developed and is placing on the market an automatic signaling device to be used on both single track roads between turnouts and on double track roads. The following description of this system will be of interest to our readers.

There is always a light burning at each turnout, incandescent lamps being used, and the lamps are arranged so that sunlight will not strike them and confuse the motorman. All wiring is done with No. 12 B. & S. gage insulated iron wire or cable as desired. No trolley wire is cut or separate section required, and there is no trigger or any obstruction for the trolley wheel or pole to strike to operate signal, the current being taken directly through trolley wheel, so that signal will operate whether motorman uses power or not. Thus the car crew have nothing to do with setting the signals; the signal is operated by the trolley wheel making contact between the trolley wire and an independent circuit.

For a single track road with turnouts the system is arranged as in Fig. 1. Suppose a car is about to leave a turnout. If a white light signal is set the car proceeds, and when it reaches a certain point the trolley wheel makes contact with an independent circuit operating the signal setting a red light on the next turnout, No. 2, and a green light on the near turnout, No. 1. The motorman seeing this green light knows that the signal is set at danger at turnout No. 2, and any car proceeding in the opposite direction at No. 2 turnout is signalled to stop. When the car reaches turnout No. 2 the trolley wheel again makes contact between the trolley wire and an independent circuit, throws out the red light at turnout No. 2, and the green light at turnout No. 1, lighting white lights at both turnouts. A car may now enter at either end with a clear track.

The system will allow of any number of cars, going in the same direction, to enter a section between turnouts. The first car, seeing a white light, has thrown up a red light at turnout No. 2, and a green light at turnout No. 1. The second car, coming to turnout No. 1, finds a green light, and the motorman knows that there is a car going in the same direction in the section ahead, and therefore he may enter, but must proceed with the car under control. Three, four and five cars or more can run in the section likewise, and the white signal will not be set at turnout No. 2 until the last car has left the single track section. This is done automatically as follows: As number one car passes over the point of trolley wire at turnout No. 1, the trolley wheel makes connection with independent circuit energizing a magnet at turnout No. 2, which operates a drum or disc (made up of separate segments) throwing the drum forward one space so that the brush rests on a red light segment, lighting a red light at turnout No. 2 and a green light at turnout No. 1. Number two car, going in same direction, finding a green light at turnout No. 1, runs ahead and throws the drum one space farther ahead, making the white segment two spaces from the brush. When number one car passes into the second turnout it throws the brush, revolving in the same direction as drum, but operated by a separate magnet, ahead one space, leaving the light still set at danger. And so on until the last car passes into turnout No. 2, when it throws the brush one space ahead onto the white light segment, and safety signals are set at each end.

For a double track road the arrangement is as shown in Fig. 2. As one car on a double track system as per plan No. 2 as one car passes a given point, B, it sets a red light signal at B and a green light signal at the block A behind it. As the car runs off block B onto block C it will extinguish the red light at B and the green light at A, setting a red light at C, a green light at B, and a white light at A. Thus any car following, approaching block A and finding a white light, can proceed at full or schedule speed; on reaching block B, where a green light is set, the car crew know that their leader is one block ahead. At block C, where a red light is set, the car comes to a dead stop or proceeds slowly with car under control, as the management of road desires. Any number of cars can enter a block without disarranging signals.

It is also evident that this system can be used as a car spacer, allowing only one car in a block at the same time.

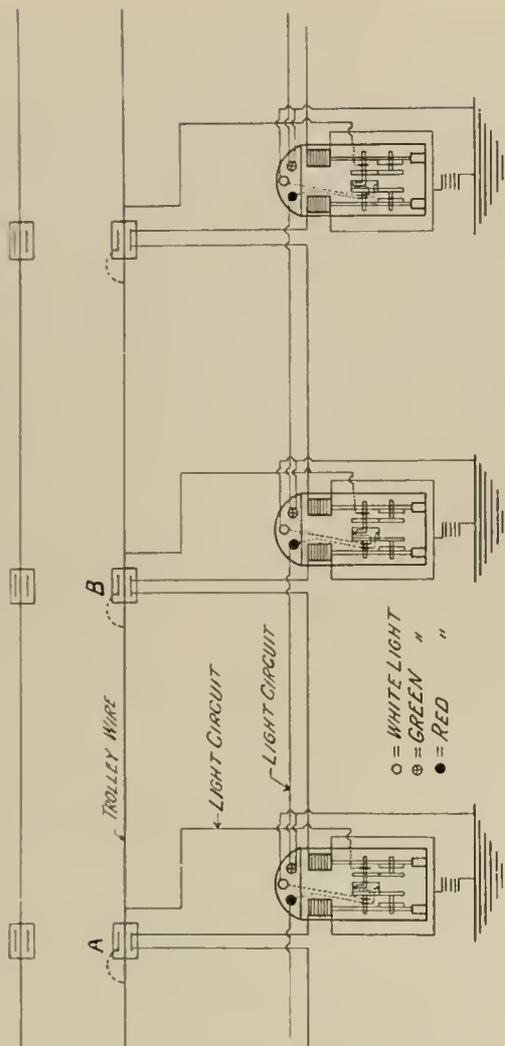


FIG. 2—WIRING FOR DOUBLE TRACK ROAD.

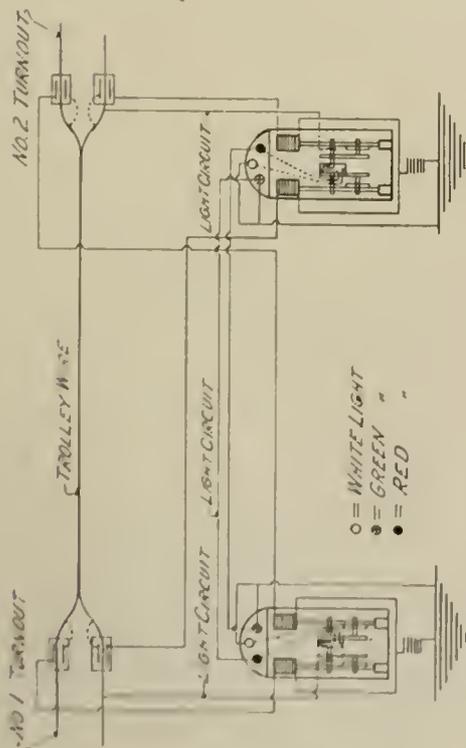


FIG. 1 WIRING FOR SINGLE TRACK ROAD.

OIL AS FUEL.

In the article on "Oil as Fuel" on page 322 et seq. of the "Review" for June the price of Texas oil in New Orleans was given as 45 cents per barrel. Mr. H. A. Davis advises us that this was the price obtaining earlier in the year and that at present no contracts are being made in New Orleans at less than 55 cents per barrel.

The following letter from the Mobile (Ala.) Light & Railroad Co. is self explanatory:

Editor "Review" The writer of the article "Oil as Fuel" in your issue of June 20th was misinformed as far as it relates to burning oil at the power house of the Mobile Light & Railroad Co.; instead of burning oil since last fall, we have only tried it one or two days to arrive at a comparative test. The method of feeding oil to the boilers as shown by the cut on page 324 is not allowed by the insurance underwriters, and was used by us only during the short test. We expect to burn oil, and intend to investigate further as to the means of burning.

Yours truly,

J. H. WILSON,
Pres. and Gen. Mgr.

ELECTRIC RAIL WELDING.

The Lorain Steel Co. is now engaged in electrically welding some street railway track at Columbus, O., by its improved process. From a pamphlet recently issued by the company we take the following resume of the work done since 1897:

The first track welded by our present method was a mile of 6-in. rail, at Johnstown, Pa., welded for the Johnstown Passenger Ry., in 1897. This track is in excellent condition today, having been in constant use since welded.

In 1898 about ten miles of track was welded for the Nassau Electric Railway Co., at Brooklyn, N. Y. This was 9-in. rail on Marcy Ave. and on Fifth Ave. Any inquiries respecting this welding should specify these streets, as considerable welding on this road has been done before, and no comparisons should be made with electric welding done prior to the year 1897. During 1899, about 11,500 joints were welded for the Buffalo Railway Co., at Buffalo, N. Y., and 17,500 during 1900. This, with the welding done during 1901, makes a total mileage of electrically-welded track at Buffalo of about 105 miles. A mile of track was also welded in Lockport, N. Y., in 1900. All special work at Buffalo was bonded around by means of 500,000-c. m. cables, electrically welded to the rails.

The breakage on all welding done by the company's improved process and comprising that mentioned is reported at less than 1 per cent.

In addition to controlling the rights to the use of the Thomson electric welding patents, for purposes of rail welding, the company has been granted patents on its improved process. These patents cover the style of bars used and the joint in general. Its process of electrically welding cables to rail is also covered by patents.

NEW CHASE-SHAWMUT FACTORY.

Since the recent fire in its factory the Chase-Shawmut Co., of Boston, maker of electrical specialties, has entirely reconstructed its factory on a greatly enlarged scale and it now employs over double the number of men it did when in the old plant. A prominent feature of the new installation is a De Laval steam turbine for the generation of current for both power and light for the factory. This turbine, for which the company is New England agent, has recently received a great deal of attention on the part of those interested in the economic question of power and lighting. These turbines have been in successful operation in Europe, and it is only recently that the De Laval company has entered the field in this country. Its extensive works at Trenton, N. J., are already overtaxed in filling orders. The turbine at the Chase-Shawmut factory is in constant and efficient operation and the company invites its inspection at 300 Atlantic Ave., Boston.

The Rochester (N. Y.) Railway Co. on July 1st assumed control of the Rochester & Sodus Bay Ry.

EXTENSION OF PITTSFIELD (MASS.) ROAD.

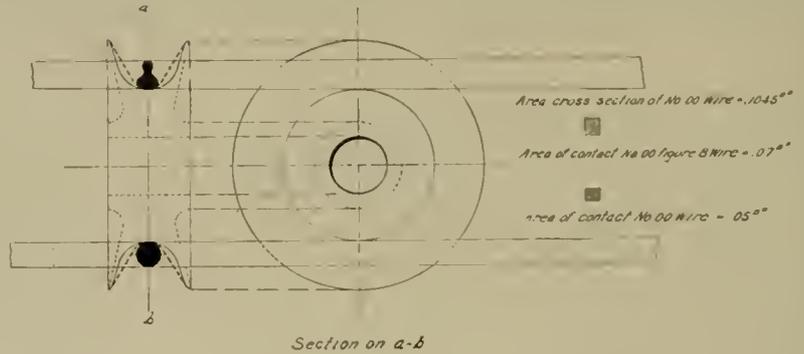
The Pittsfield Electric Street Railroad Co. has completed a one-mile line to Cheshire, where connection is made with the Hoosac Valley Street Ry., thus giving a line to Williamstown through North Adams. Control of the Hoosac Valley company has been purchased by capitalists owning the Pittsfield road and Mr. P. C. Dolan, manager of that company, has assumed the management of the Hoosac Valley. Mr. W. F. Nary of the Hoosac Valley will be superintendent of that division.

It is understood that the Hoosac Valley Ry. will be double tracked between Adams and North Adams, and double truck cars are to be ordered of the Wason company. The Pittsfield power station is to be increased in capacity by a 500-h. p. cross compound engine to be direct connected to a Stanley generator.

FIGURE 8 VS. ROUND TROLLEY WIRE.

Although the power equipment of electric cars continues to steadily increase, yet very little attention is given to providing a proportionate increase in the area of contact of the device which is used to collect the current. Large cars frequently require 300 or 400 amperes in starting and on grades, and the area of contact between the trolley wheel and wire is usually too small to properly carry this current.

Recently I made a few measurements to find the relative merits of round and figure 8 wire in connection with the area of surface



exposed to the trolley wheel, and found that the average contact area between the various styles of wheels and the two types of wire was considerably greater for figure 8 wire.

With a 4 1/4-in. wheel having a groove which was comparatively narrow at the bottom, the contact with a No. 00 round trolley wire was .05 sq. in. and with a figure 8 wire .07 sq. in. The cross sectional area of a No. 00 wire is .1045 sq. in.

This shows that the figure 8 wire gives about 40 per cent more area in contact with the wheel than the round wire. In using a wheel with a U-shaped groove results even more favorable to the figure 8 wire are obtained. Of course, there is some contact at the sides of the wire, but only at curves and where the wire is not over the center of the track, and this must not be depended upon.

The reason for this superiority of figure 8 wire over round wire is, as is readily seen, on account of the long radius of the curve which forms the bottom part of the lower lobe, as compared with the radius of a section of round wire.

R. A. Pratt.

THE CHICAGO TRIBUNE'S CAR

The Chicago City Railway Co. has put a trolley car in operation on its southside lines especially for the early delivery of the Chicago Tribune, the arrangement being somewhat similar to that which the Tribune effected last year with the Union Traction Co. for the distribution of papers on the north side, and which was described in the "Review" for February, 1901, page 135. The start is made from Clark and Washington Sts. at 3:45 a. m. Papers are delivered at the stock yards and in Englewood, Woodlawn, Hyde Park and South Chicago, the run being made in 40 minutes. The car supplies the Tribune wagons at the stops en route with papers which are distributed by them to carriers, newsboys and news dealers in the vicinity.

ELECTRIC TRACTION IN GREAT BRITAIN.

London Letter.

Electric traction in Great Britain has just emerged from a period of fervid excitement and has now reached a stage in which progress is no longer by leaps and bounds.

Lord Windsor's Committee concluded its labors on June 5th and all the London electric railway bills promoted this session or standing over from last year have now been disposed of and most of them after the final adjustment of clauses have passed the third reading. The following table will show how matters stand:

Charing Cross, Hammersmith & District Ry.....	Rejected
City & Northeastern Suburban Ry. (Morgan).....	Withdrawn
*†North East London Ry. (Morgan).....	Passed
*†London United Electric Ry.—Hammersmith to Piccadilly (Morgan).....	Passed
*London United Electric Ry.—Marble Arch-Clapham Junction (Morgan).....	Passed
*†Piccadilly City Ry. (Morgan).....	Passed
Kings Road	Rejected
Kings Road Putney Extension.....	Rejected
West & South London Junction Ry.....	Withdrawn
†Brompton & Piccadilly Circus Ry.—sanctioned 1897, term extension asked (Yerkes).....	Granted
Brompton & Piccadilly Circus Ry.—Charing Cross extension (Yerkes).....	Rejected
†Brompton & Piccadilly Circus Ry.—Holborn extension (Yerkes).....	Passed
Brompton & Piccadilly Circus Ry.—Parson's Green extension (Yerkes).....	Rejected
Central London (Shepherds Bush-Hammersmith-City)....	Rejected
†Charing Cross, Euston & Hampstead (Bills 1, 2 and 3 Golder's Green extension) (Yerkes).....	Passed
*Edgware & Hampstead Ry.....	Passed
City & South London Ry.—Euston extension.....	Rejected
City & Crystal Palace.....	Rejected
†Great Northern & City Ry.—Lothbury extension.....	Passed
†Northwest London Ry.—Sanctioned 1899—Time extension asked	Granted
†Great Northern & Strand—Sanctioned 1899—Time extension asked (Yerkes).....	Granted
†Baker Street & Waterloo—Sanctioned 1893—Time extension asked (Yerkes).....	Granted
District Deep Level—Earls Court to Mansion House—Time extension asked (Yerkes).....	Granted
London, Tillbury & Southend (Power to use electricity)....	Granted

*New railways authorized this session.

†Bills passed through third reading.

Londoners will in time obtain a magnificent network of electric line, though there are disadvantages resulting from the want of uniformity in the system as a whole. As the joint committee of last year and the Board of Trade both vetoed the intercommunication of tube railways by means of confluent junctions the patchwork nature of part of the network assumes less importance.

In the Yerkes lines the return conductors will be fixed inside the running rails, the positive conductor being the third rail. Mr. Yerkes disagrees from the Board of Trade recommendation to use 13 ft. 6 in. tube; he prefers 11 ft. 6 in. and urges that with his system of conductor passengers can with perfect safety walk along the permanent way in case of a breakdown.

The Morgan system is also worked at a pressure of 500 volts and has a completely insulated return, but in this case the two conductors are placed one above the other on the tube wall, protected by one of the platforms to be constructed on each side of the train for passengers in case of accident. The multiple unit system has been universally adopted and the general practice in all lines will be to generate alternating current at high pressure and to convert it to direct current low pressure before feeding it to the conductors.

Mr. Yerkes has made an agreement with the Hampstead-Edgware line whereby the Charing Cross, Euston & Hampstead Railway Co. shall control the line as far as Edgware with an end on junction at Golder's Green, the six miles between the latter two stations being run in the open

As matters stand at present, the relative positions of the Yerkes and Morgan interests may be thus defined. Mr. Yerkes controls the following lines, which will be supplied with power from the central station at Lots Road, Chelsea: The District Railway, including the Whitechapel & Bow extensions; the Brompton & Piccadilly Railway; the Hampstead, Euston & Charing Cross Railway; and the District Deep Level Line; all intercommunicating by means of exchange stations. Mr. Morgan's combination only controls the Northeast London and Piccadilly-City lines, with a part interest in those of the London United Electric Railway—Hammersmith to Hyde Park Corner. There will be two power stations which will also supply current to the Marble Arch-Clapham Junction Railway.

A special compensation clause has been drawn up for insertion in all Tube Railway bills, providing that all claims shall be made within two years from the opening of the railway by owners, lessees or occupiers. Cases of disputed compensation to be settled by arbitration according to the Act of 1889.

The endeavor of the London County Council to constitute itself sole controlling authority over the tube railways was firmly frustrated by the committee and its application for jurisdiction in the City of London was also refused.

The House of Lords has given the London County Council and its supporters a severe shock and a disagreeable surprise by defeating that part of the council's Subways & Tramways Bill which dealt with the Embankment Tramways.

Lord Newton moved an instruction to the committee to strike out of Clause V. the power to construct any tramway south of the Strand. He mentioned that the Westminster Borough Council and other bodies strongly opposed this particular clause in the bill. The London County Council had itself, moreover, passed a resolution in favor of underground tramways and if it really desired to have a tramway connection between North and South London, it could effect this by constructing a subway under the Thames. The Earl of Morley opposed the instruction in the interests of procedure, declaring that instructions to the Private Bill Committee were excessively inconvenient and almost unknown. The Lord Chancellor powerfully supported Lord Newton's instruction urging that there would be no use in having two Houses of Parliament if they were not to take an independent view of legislative matters. The House divided and the instruction was carried by 77 votes against 32.

The Parliamentary Committee's Report was received at Spring Gardens with dignified indignation by the London County Council, which decided to ask those members who were also members of Parliament to move to disagree with the Lords' instructions.

The deputation to the president of the Board of Trade from the Institution of Electrical Engineers on June 18th was received with courtesy by Mr. Gerald Balfour. Mr. James Swinburne, as leader of the deputation, made out a good case in favor of the urgency for improvement in the electrical legislation of the country. Mr. Balfour frankly admitted the need of a modification in the laws relating to electric lighting and power and stated that the Government had drafted two bills to remedy the situation, but there was little hope of either being proceeded with this year. He could not see his way to recommend the cabinet to appoint a Royal Commission to consider the subject of electrical legislation, but would be glad to receive from the Institution suggestions for modifications and improvements.

D. N. D.

WORLD'S FAIR TRANSPORTATION DEPARTMENT.

The transportation exhibits at the Louisiana Purchase Exposition will be contained in one of the largest of the structures devised up to the present time for the Fair. The general plan of this building is rectangular, and its distinguishing feature will be the massing of the three entrances so that they will form an arcade. The building covers an area of 525x1,300 ft., or over 15 acres. It will contain about four miles of standard gage railroad track and in addition to this space, two long bents of the building are left free of rails and afford an exhibiting space of 270,000 sq. ft. All the exhibits in this department will be on the ground floor, and in the main building, and the classification of this department covers all manner of transportation on land and sea and through the air. No charge will be made for exhibit space and applications for exhibits for machinery and mechanical appliances shown in operation must be filed by Oct. 1st, 1903.

"NARRAGANSETT" TYPE OF CARS FOR COLORADO SPRINGS.

The J. G. Brill Company, of Philadelphia, have recently shipped to the Colorado Springs & Suburban Railway Co. fifteen 14-bench open cars of the Brill patented "Narragansett" type. This type of car is a successful adaptation of the narrow bodied open car to high speed trucks. It is simply a double step car of no greater width over all than the standard single step car and therefore may be used in city streets and will go into barns having limited space between the tracks. The car loads and unloads as rapidly as a single step car because of the greater ease with which it is accomplished. The accompanying illustrations show the simplicity of the arrangement and its neat appearance, and those who are familiar with structural details will be impressed with the great strength added to the framing by the Z iron sill. The brackets on which the seat-end panels rest, form sockets for the posts, which, together with the fact

The cars are fitted with the following Brill patented specialties: folding gates, round-corner seat-end panels, angle-iron bumpers and "Dedenda" gongs. The trucks are Brill 27-F with 33 in. wheels.

STRIKES OF THE MONTH.

TORONTO.

At a mass meeting of the employees of the Toronto Railway Co., held June 20th, the ultimatum of the company regarding the desired increase in wages was rejected by the men, and a ballot being taken, it was decided by a vote of 918 to 19 to strike. This decision was carried out, and for three days the tie-up was complete. On the first day the company made no attempt to move cars, but on Sunday, June 22d, four cars were started under police protection. These were completely wrecked by a mob of strikers and their sympathizers, and the men roughly handled. Rioting Sunday night as-



BRILL CAR FOR COLORADO SPRINGS & SUBURBAN RY.

that the panels enclose them, gives the posts unusual vertical strength and rigidity.

To obtain a double step within the proscribed limits, the builders have not detracted in any way from the useful features of the standard open car—the seats are just as long, the curtains can be drawn to the floor, and the space occupied by the intermediate step instead of encroaching on the floor area really utilizes space that is more often wasted. Guard rails, sliding behind the grab handles, are generally used in these cars for protection when the speed is high.

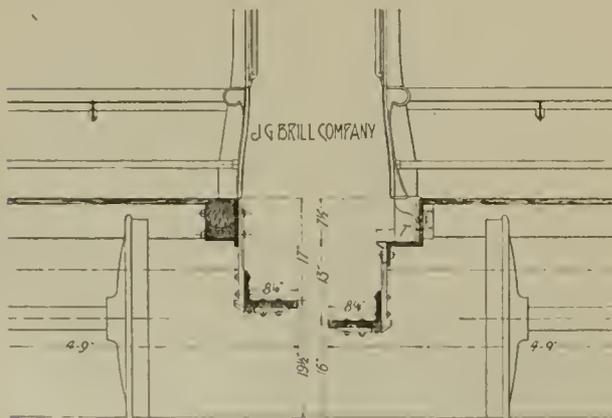
An excellent feature of the Colorado Springs cars is the motor-man's cab, which is a completely enclosed narrow platform at the

sumed such serious proportions as to necessitate the calling out of militia, and some 700 cavalry and 800 infantry were soon disposed at various points of vantage throughout the affected districts, which effectually put a stop to further destruction of property and violence.

After being out three days, the committee appointed by the Board of Trade and the city effected a settlement, and the men returned to work, but trouble is again threatened, the men claiming that the leaders in the strike are being discriminated against, and a renewal of the trouble is possible.

PROVIDENCE.

At Providence and Pawtucket, R. I., where a strike was inaugurated June 4th, there was much rioting and disorder, particularly in Pawtucket, as a result of the attitude of the mayor and police. On June 11th Governor Kimball called upon the adjutant-general for militia to enable the company to continue its service, and on the following day six companies of infantry and two of cavalry were assembled in that city. A riot proclamation was issued by the governor demanding that the mobs disperse and residents remain in their homes. These measures were, however, ineffective. Cars were stoned and the men hired for the occasion to operate them were subjected to murderous assault. The car service in Pawtucket, in Central Falls, Albion and Cumberland was temporarily abandoned until the next week, when the military guard was re-enforced and machine guns were so placed that they could sweep the places where the mobs were most likely to congregate. Several of the most important routes were again put in operation, the cars being escorted by a heavy guard, and though hostile demonstrations were of frequent occurrence no organized effort was made by the strikers to stop the cars. The mayor then made an effort to have the troops withdrawn, which was done on June 20th. The company subsequently maintained an irregular service, relying upon the local police for protection. Two accidents were the result of mob violence June 29th. On the Mineral Springs line a large bowlder was placed upon the track, the car was derailed and the crew subjected to a bombardment from the mob, escaping with cuts and bruises. The car, when it was eventually replaced on the track and towed back to the power house, looked as if it had been struck by lightning. On another line the motorman was struck over the heart by



SINGLE AND DOUBLE STEPS COMPARED.

front end affording protection in stormy weather and thereby increasing the efficiency of the operator. The cars can be operated from either end. The length from the rear crown-piece over the front vestibule is 41 ft. 5 3/8 in. The width over the posts is 7 ft. 9 1/2 in.; and over the steps when down 9 ft. 2 in.; and when raised, 8 ft. 3 in. The inside finish is of quartered oak, with ceilings of oak veneer decorated. The sash in the bulkheads and vestibule drop into pockets.

a stone which rendered him helpless. The car, with no one to guide it, continued at furious speed, jumped the track, and was partially wrecked. On July 1st an organized attack was made by the strikers in the streets of Pawtucket and Central Falls, with the result that a number of substitutes on the cars were injured and the service abandoned at 10 p. m. The police had much difficulty in clearing the streets and nearly a dozen arrests were made. By a decision of the District Court July 2d the right of operatives of cars during a strike to protect not only themselves but also passengers and the property of their employers by the use of firearms was recognized. Five motormen and conductors of the Pawtucket line, who had been under arrest on the charge of carrying concealed weapons, were thereupon discharged.

July 6th the strikers voted to withdraw their demands and return to work; the company announced its intention of re-employing only so many of the strikers as it had places for, and on July 7th about 150 men were reinstated, the others, some 200 or 300, being put on the waiting list.

RICHMOND, VA.

A general strike of all the street railway employes of Richmond, Va., was declared July 16th. A committee of employes held two conferences that day with President Sitterding, of the Consolidated Passenger Power Co., and at both demanded a nine-hour day and a uniform rate of 20 cents an hour for the men. The men were offered an increase of from 15 and 17 cents an hour to 16 and 18 cents, but the proposition was rejected. The following day the men returned to work, pending arbitration.

A NEW INTERURBAN IN TEXAS.

On June 18th the Northern Texas Traction Co. formally opened its new interurban between Fort Worth and Dallas, a technical description of which was published in the Street Railway Review for August, 1901, page 506. A special car left Fort Worth at 5 p. m. on the initial trip, carrying the officers of the company, municipal officers and prominent business men to Handley and Dallas. A barbecue was given at Handley to celebrate the completion of the interurban. A regular schedule between Fort Worth and Dallas could not be permanently established until a week later, owing to the fire on June 16th, which had destroyed the company's transformers at the Handley power house while they were being tested, but the damages were soon repaired and a regular service auspiciously inaugurated.

The cost of construction and equipment of this road approximates \$1,500,000. The company was incorporated in Texas with a capital stock of \$2,000,000, and an authorized bonded indebtedness of \$2,000,000, but only a portion of either has been issued, the surplus remaining for projected improvements and extensions of the system. The rolling stock at present in use comprises eight 45-ft. motor cars with smoking compartments; two motor cars with baggage compartment; one special car and four trailers. The motor cars are equipped with four 60-h. p. motors and air brakes, and have a speed of 50 miles per hour. The company has built at Handley, in addition to its power house, car house and office building, a large artificial lake, and will install park conveniences for the encouragement of traffic from both cities to Handley, which is 10 miles distant from Fort Worth.

The interurban passes through Handley, Arlington, Grand Prairie and Oak Cliff, its total length being 35 miles. The maximum grade of the roadbed is 2 per cent, and the track construction and bridge work are of the heaviest description.

The Northern Texas Traction Co. also operates 22 miles of city lines in Fort Worth. The officers of the company are: George T. Bishop, of Cleveland, O., president; John Sherwin, of Cleveland, first vice president; E. M. Haines, of Fort Worth, second vice president and general manager; George F. McKay, of Cleveland, secretary and treasurer, and C. A. Taylor, of Fort Worth, assistant secretary and treasurer.

The dispatching of cars and intercommunication is by means of a telephone system which was furnished by the Garl Electric Co., of Akron, O. The principal station is in the office of the dispatcher, who is provided with a desk set bridging telephone. A separate line is also run from the dispatcher's office to the power house, car house and superintendent's room, this line having the regular bridging 2,000 ohm wall telephones, and being provided with a

switch for connecting to the main line when desired. An extension bell is provided in the boiler room at the power house, three bridging instruments are connected for use in the offices at Fort Worth, and five telephones are placed at intervals along the line. All the cars have portable car telephones, which are furnished with jointed rods for connecting direct to the line wires.

MILWAUKEE COMPANY PROJECTS NEW PLANT.

The Milwaukee Electric Railway & Light Co. recently awarded a contract for a storage battery which will be installed in the company's present power house at a cost of \$250,000 pending the erection of the proposed new building. The storage battery is one of the largest ever installed in a lighting plant in this country and comprises several unique features. The batteries will be of the "Chloride" accumulator type, furnished by the Electric Storage Battery Co., of Philadelphia.

Contracts for the new power house which will be erected in a year or two to replace the present plant will not be awarded until experience shall determine whether it is more practicable to install steam engines or steam turbines. If the steam turbine is to replace the steam engine, a great saving of space in the plant will result. It is the company's intention to begin the building of the projected power house on the river at Biddle St. and to build in a southerly direction, tearing away all the present plant, even removing the recent additions to the power house.

WIGAN (ENG.) BOROUGH TRAMWAYS.

The first annual report of the Borough of Wigan Tramways has been issued by the borough engineer, Mr. H. Collins Bishop, for the year ending March 31, 1902. The three sections of tramways now open to traffic include the Martland Mill Bridge section with a length of 2,619 yd. Boar's Head section, 3,080 yd., and Scholes section, 1,713 yd. In addition to the length of track already opened for traffic there are now about 2,800 yd. of track which is practically completed and about to be opened. The total passengers carried for the year numbered 1,997,244; the total revenue from fares was 8,771 pounds, and the total car mileage was 195,970. The average car miles per car were 1,887, and the number of cars in service 18. The passengers carried per car were 105,958, which is equal to carrying the whole population of the borough 31 times over.

THE EVERETT-MOORE SYNDICATE.

The affairs of the Everett-Moore syndicate have now been so nearly cleared up that the syndicate is again in position to resume some of the enterprises that were under way when the embarrassment of last January occurred. The syndicate will reorganize and finance the Lake Shore Electric Ry. connecting Cleveland and Toledo, which is now in the hands of A. E. Laug, as receiver. The syndicate will also reorganize the Detroit & Toledo Shore Line Co., which was not completed or financed when the trouble was precipitated last winter. It is said that Cleveland capital will back the syndicate in these matters, which will be carried out as soon as the legal formalities can be complied with. Large blocks of securities belonging to the syndicate are now tied up to secure its floating debts, but all of these will be released when these companies are organized and financed. Enough capital has already been secured to underwrite the securities that both companies will issue.

A CHANCE TO SAVE TIME.

Since "time is money," a train that saves time must, of necessity, make money, and the new "Twentieth Century Limited," on the New York Central and Lake Shore railroads, therefore, becomes a great commercial economist. A run from New York to Chicago in twenty hours, a saving of four hours over the fastest time of any competing train, since June 15th, has become an every-day event, and has brought the two great cities two hundred miles nearer together. This is a superbly equipped train, consisting of a combined buffet, smoking, library and baggage car, two sleeping cars, one stateroom and observation car, and one dining car, made up with special reference to meeting the demands of busy men. From Four Track News for July.

PERSONAL.

MR. FRED H. FITCH, general manager of the Denison & Sherman (Tex.) Ry., recently visited Chicago.

MR. W. P. COOPER, who for nearly nine years has been the Chicago representative of the Consolidated Car Heating Co., is now representing the railway department of Fairbanks, Morse & Co., Chicago.

MR. R. K. HOWARD, superintendent of the Knoxville (Tenn.) Traction Co., resigned July 1st and on July 19th sailed for England, where he will make his home.

HON. CHARLES M. FLOYD has been chosen a director of the Manchester (N. H.) Traction, Light & Power Co., succeeding Hon. Chas. T. Means, deceased.

MR. DAVID YOUNG, JR., has been elected president of the Orange Mountain Traction Co. of Orange, N. J. Mr. Young is the son of the president of the North Jersey Street Railway Co.

MR. WILLIAM G. WOODFOLK has been appointed superintendent of the Knoxville (Tenn.) Traction Co., succeeding Mr. R. K. Howard, resigned. Mr. Woodfolk took charge July 1st.

MR. GEORGE L. EDWARDS has been chosen a director of the St. Louis Transit Co., succeeding W. H. Thompson, resigned.

MR. JOSEPH P. ECCLES, of the firm of Eccles & Smith, of San Francisco, left for Seattle early in July for the purpose of establishing a branch of the railway and electric supply business of the firm in that city.

MR. JAMES ROWLAND BIBBINS has resigned as assistant electrical engineer of the Detroit United Railway Co. to accept a position in the Westinghouse Companies' Publishing Department, Pittsburg and New York.

MR. S. A. FRESHNEY has been appointed superintendent of the Muskegon Traction & Lighting Co., succeeding Mr. F. S. Richmond, who tendered his resignation some time since, to take effect when his successor should be chosen.

MR. J. P. LOVE, who for some years has been claim agent for the Calumet Electric Street Railway Co., Chicago, resigned on June 30th and went to Philadelphia to take charge of the claim department of the Philadelphia Casualty Co.

MR. H. A. DAVIS, superintendent of equipment of the New Orleans & Carrollton Railroad, Light & Power Co., has been appointed acting manager of the railroad department, on the withdrawal of Mr. A. H. Ford as manager.

MR. FRANK J. DUFFY, formerly superintendent of transportation of the Richmond (Va.) Traction Co., has been appointed to a similar position with the Savannah (Ga.) Electric Co., which operates all the street railways at Savannah.

MR. W. R. MASON on July 1st resigned his position with the Sprague Electric Co. and is now western manager for Coe, Smith & Co., selling agents for the Mechanical Boiler Cleaner Co. Mr. Mason's headquarters are at No. 413 Western Union Building.

MR. EDWARD M'DONNELL has been appointed assistant general manager of the International Railway Co., at Buffalo, N. Y. Mr. McDonnell has served for several years as superintendent for the Buffalo & Niagara Falls branch of the International system.

MR. S. L. TONE, formerly assistant to president J. D. Callery of the Pittsburg United Railways Co., has been appointed second vice-president of the company. Mr. Tone was chief engineer of the United and Southern Traction Companies prior to the recent consolidation.

MR. MARSDEN J. PERRY has been chosen president of the Rhode Island Co., which on June 24 assumed control of the Union Railroad, Pawtucket Street Railway and Rhode Island Suburban Railway companies. The new company leases these properties for 999 years.

MR. C. N. DUFFY, who has been auditor of the Chicago City Railway Co. since Sept. 1, 1899, was last month elected secretary of

the company succeeding Mr. Frank R. Greene, resigned. Mr. Duffy assumed the duties of secretary June 20th; he will continue to act as auditor.

MR. THOMAS L. HACKETT has been appointed soliciting freight and passenger agent of the Grand Rapids, Grand Haven & Muskegon Railway Co. The appointment was effective July 1st, and Mr. Hackett has made his headquarters at the company's offices in Grand Rapids, Mich.

MR. F. N. BUSHNELL, chief mechanical engineer of the Union Railroad and the Narragansett Electric Lighting Co. of Providence, R. I., succeeds Mr. George B. Francis as chief engineer of the Union Railroad, the Rhode Island Suburban Ry., the Interstate Consolidated Street Ry. and the Pawtucket Street Ry.

MR. JAMES MACK, of Sharon, Pa., resigned as superintendent of construction of the Youngstown (O.) & Sharon Railway & Light Co., to take effect July 5th. Mr. Mack has had many years' experience in the street railway business, and during his connection with the company has had entire charge of new construction for the street railway and lighting systems at Sharon.

MR. F. J. GREEN, manager of the Dayton, Springfield (O.) & Urbana Electric Ry., has been appointed manager of all the lines now controlled by the Appleyard syndicate, including the Columbus, London & Springfield; Columbus, Grove City & Southwestern; Central Market Street, Columbus; Dayton, Springfield & Urbana, Bellefontaine & Northern, Springfield & Western, and Dayton, Lebanon & Cincinnati.

MR. H. P. QUICK has severed his connection with the Boston Elevated Railway Co. and on July 15th removed to Kansas City where he will represent Ford, Bacon & Davis who are operating the Metropolitan Street Ry. and the Kansas City Electric Light Co. Mr. Quick will be the steam engineer in charge of design and construction of power plants and will have his headquarters at No. 1500 Grand Ave., Kansas City.

COL. ALLAN C. BAKEWELL, second vice-president and general manager of the Sprague Electric Co., was recently elected department commander at the New York State Encampment of the G. A. R., held at Saratoga Springs. There was a strong opposition ticket in the field, but Colonel Bakewell, in recognition of his services in both the state and national work of the organization, was elected by a handsome majority.

MR. M. E. DEMPSEY, secretary of the American Frog & Switch Co., Hamilton, O., called at the "Review" office when in Chicago recently. He reports that his company, which was organized about a year ago, has had a most satisfactory season with prospects for further increased business during the summer and fall. Mr. Dempsey has an extensive acquaintance in the railroad field, having been for 13 years with the Weir Frog Co., of Cincinnati.

MR. B. F. WYLY, JR., of Atlanta, Ga., has been appointed traffic manager of the Lackawanna & Wyoming Valley Rapid Transit Co. and removed from Atlanta to Scranton to assume his new duties June 20th. The Lackawanna Wyoming Valley system is under construction between Scranton, Carbondale, Pittston and Wilkesbarre, Pa., and when completed will include the old Scranton & Northeastern and the Central Valley lines. For the past 14 years Mr. Wyly has been connected with the Atlanta & West Point R. R., for the last five years being general passenger and ticket agent of that road.

MR. A. H. FORD, who has long been connected with the Newman interests at New Orleans, and for the past several years has been general manager of the New Orleans & Carrollton Railroad Co., has resigned this position to enter the office of Isidore Newman & Sons, bankers, of New Orleans. We understand that Mr. Ford will take the place of Mr. J. K. Newman, who will go to New York to manage a branch of the banking house. Mr. J. K. Newman has been president of the New Orleans & Carrollton company since the Newman interests reorganized the system. During the time of Mr. Ford's service with the railway company he has of course been intimately associated with the Messrs. Newman and the fact that they wish him to enter their business is very substantial evidence of the high esteem in which Mr. Ford's character and ability are held.

MR. FRANK R. GREENE, who has for the past 11 years filled the office of secretary of the Chicago City Railway Co. with marked ability and success, has resigned that position to become president and general manager of the Chicago Street Car Advertising Co. Mr. Greene was born at Newport, O., June 8, 1859. He served in the various capacities of bank clerk, bookkeeper and cashier in some of the leading establishments of Marietta, O., Indianapolis, St. Paul and Chicago, until elected secretary of the Chicago City Railway Co. in January, 1891. Mr. Greene is secretary of the Union League Club of Chicago.

MR. CLIFFORD J. ELLIS was on July 1st appointed sales agent for the Pennsylvania Steel Co. and the northwestern office of that company will henceforth be located in the Western Union Bldg., Chicago. Mr. Ellis has heretofore represented the Cambria Steel Co. as sales agent and will now serve both companies in that capacity. Mr. R. E. Belknap, who was formerly at Steelton, Pa., will be assistant sales agent for the Pennsylvania company. The Cambria company announces that there has been no changes in its representation as a result of this consolidation of offices and Mr. Allan F. McIntyre will continue as assistant sales agent for that company.

MR. D. S. SMITH, formerly superintendent of the Twin City Rapid Transit Co., of Minneapolis and St. Paul, has been appointed general superintendent of the Brooklyn Heights Railroad Co. of Brooklyn, N. Y., in which capacity he will have charge of both the elevated and surface lines, having entire control of the Brooklyn system with the exception of the power stations and track work. Mr. Smith who became connected with the Twin City company about eight years ago will be remembered for his excellent work in organizing the operating department of the St. Paul road which system has been brought to its present state of mechanical perfection through his efforts.

MR. W. S. DIMMOCK, general manager of the Richmond (Va.) Passenger & Power Co., resigned that position early in July to become connected with Stone & Webster, of Boston. Mr. Dimmock will have charge of that firm's properties at Tacoma, Wash., which is now his address. Mr. Dimmock has had an extensive experience in electric railway work, having been general manager of the Omaha & Council Bluffs Railway & Bridge Co., before going to Richmond. Before entering the electric railway field he had been engaged in steam railroading. Mr. Dimmock's position at Tacoma is a most desirable one, as the Stone & Webster company is extending the railway lines and greatly improving its properties.

MR. ROBERT I. TODD, second vice-president of the Cincinnati Traction Co., has tendered his resignation to accept a position with the United Gas Improvement Co., in Philadelphia, the work which he will have in charge being in connection with the traction interests of that company. Mr. Todd is a native of New Jersey, having been born near Lakewood, Nov. 29, 1869, and was graduated from Johns Hopkins University in 1893. His first connection with street railway work was as assistant superintendent of the Eckington & Soldiers' Home and Belt Railway companies, Washington, D. C. Later, when these lines and others were merged into the City & Suburban Railway Co., Mr. Todd was made general superintendent and electrical engineer. He resigned in the spring of 1899 to take charge of the experimental work of the Congressed Air Co. in New York City. Mr. Todd left this position in July, 1900, to become mechanical engineer of the Consolidated Traction

Co., of Pittsburg, which position he held until February, 1901, when he became general manager of the Cincinnati Traction Co., after that property was acquired by the Elkins-Widener-Dolan-Morgan syndicate. In January, 1902, he was made second vice-president of that company. Mr. Todd's work has given him experience with all the various methods of street car propulsion, horse, storage battery, air, underground electric, single and double trolley, and his wide experience in the traction field has peculiarly well fitted him for the work which he now assumes.

OBITUARY.

MR. CHARLES T. CHILD, technical editor of the Electrical Review, of New York, died at Gleasondale, Mass., June 23d, of typhoid fever, after a protracted illness. Mr. Child was a native of Richmond, Va., and was 35 years of age. He assisted Frank J. Sprague in 1887 in building the first successful electric railway in the United States in Richmond. Mr. Child was widely known in this country and in Europe as a writer on scientific subjects, electricity in particular.

PROF. JOHN BUTLER JOHNSON, dean of the college of engineering of the University of Wisconsin, at Madison, Wis., met with a tragic death near Fennville, Mich., June 23d, by falling from a wagon which was conveying his household goods to his summer home at Pier Grove. Professor Johnson fell under the wheels, which passed over his head, completely crushing it. The deceased was a graduate from the University of Michigan of the class of 1878, receiving the degree of civil engineer. After graduating he became United States assistant engineer on the Lake Surveys and the Mississippi River Surveys, and filled this position until 1883 when he accepted the professorship of civil engineering at Washington University, St. Louis, Mo. Professor Johnson had been dean of the college of engineering at Madison since January, 1899, at which time the position was created. He was the author of many well known works on engineering subjects and a frequent contributor to the technical press. He was formerly president of the Engineers' Club, of St. Louis; and at the time of his death was fellow and past vice president of the American Association for the Advancement of Science; and a member of the Society for the Promotion of Engineering Education; the American Society of Civil Engineers and the American Society of Mechanical Engineers.

EDWARD H. JENKINS, president of the Southwestern Gas, Electric and Street Railway Association, and lately president of the San Antonio Traction Co. and the San Antonio Gas & Electric Co., died at San Antonio, June 25, 1902. His demise was caused by blood poisoning following a surgical operation performed about ten days previous. The announcement of his death came as a severe shock to his friends as well as the entire city where he was very widely known and universally beloved.



E. H. JENKINS.

He was born at Indianapolis, Ind., in 1853, and owing to business reverses which befell his father, he was compelled to earn his living when he was but twelve years of age. His first employment was in a stove factory where he remained for four years, and was next employed with the Indianapolis Gas Co. as time-keeper. Here he arose, through intermediate positions in which he learned every detail of the business, to the position of assistant superintendent. In 1897 he was elected superintendent of the Elkhart (Ind.) Gas Co., where he remained for four years; he was then called to Cedar Rapids, Ia., to design a new gas plant, and following this he became superintendent of the Columbus (Ga.) Gas Co., where he remained for 12 years. He was next connected with the Covington (Ky.) Gas Co. where he remained until 1898, when he entered the service of the Emerson-McMillan Co., one of the largest owners of gas companies in the United States. He was made superintendent of the three plants at Buffalo, N. Y., and in 1899 was trans-

ferred to San Antonio to assume charge of both the traction and electric interests which had been purchased by his company. He was given full charge of the reconstruction of this plant and in three years evolved out of almost chaos one of the best street railway systems in the South.

Mr. Jenkins was universally respected and admired in San Antonio and his relations with the working classes were at all times harmonious and sympathetic, while in club circles he was equally popular. He was appointed a member of the Texas World's Fair Commission to the Louisiana Purchase Exposition, was second vice-president of the Texas Associated Commercial Clubs, a director of the International Fair, associated with the Business Men's Club and San Antonio Club; he was a member of the Knights of Pythias and the Masons. In 1875 Mr. Jenkins married Anna E. Burton of Indianapolis, he is survived by his widow, a son and a daughter.

LEGISLATION IN MASSACHUSETTS.

For the past two years there have been attempts in Massachusetts to secure legislation that would make the street railway companies pay a part of the expense of abolishing grade crossings where they have locations involved, but every time it has been put over until the time when a new grade crossing was to be negotiated. The loan bill came up at this session, the money authorized to be borrowed ten years ago having been exhausted.

The old question of bringing in the street railway companies was promptly brought into the discussion, but the trouble was that each party wanted the contribution of the street railways taken from its share. In the old apportionment the steam railroad company paid 65 per cent, the state 25 per cent, and the city or town the remaining 10 per cent. The governor recommended that the street railway's share be taken from the state allowance, and what he said had the most weight, as he had power to veto the bill. An important amendment was made, however.

The process of abolishing a grade crossing is for either the railroad or the city or town authorities to petition the court for the appointment of a special commission to do the work. An amendment was brought in which provided that in cases where abolishments had already been petitioned for, and where the special commission had been appointed, this new apportionment where 15 per cent was put on the street railway company should not apply. The argument in support of this was that the street railway companies in these cases had had no part in the proceedings and no voice in the appointment of the special commissions where in some cases they might have objected to the persons appointed by the court.

This amendment was adopted and the result is that as special commissions have been appointed in Worcester, New Bedford, Haverhill, Attleborough, Canton and several other minor places, the \$5,000,000 loan authorized will all be used up in carrying through these changes alone and there is no chance that the street railway companies will be called upon to pay an assessment for ten years to come.

In financial matters concerning street railway companies the legislature enacted a bill that will allow savings banks to invest in the bonds of street railway companies. The only restriction is that the investment shall be made only in such stocks as have paid dividends of at least 5 per cent for the past five years. By this the legislature has put itself on record as believing that street railway locations are as permanent as those of railroads.

The legislature has also defined for what purposes the railroad commissioners can approve an issue of bonds of street railway companies. There was some contention on this bill, but the railroad commissioners explained that there were grave doubts as to what were considered legitimate expenditures by street railway companies for which bond issues could be authorized. The purposes named in this bill are as follows: For the purpose of building a branch or extension, or of acquiring land for pleasure resorts, or of building power houses or car houses or park buildings, or of acquiring or equipping additional rolling stock, or of changing its motive power, or of abolishing grade crossings, or of paying betterment assessments for widening or otherwise altering streets, or of complying with any requirements lawfully imposed under delegated legislative authority, or of making permanent investments or improvements, or of acquiring any additional real or personal property necessary or

convenient for its corporate objects, or of refunding its funded debt, or for the payment of money borrowed for any of the foregoing purposes, or for other similarly necessary and lawful purposes.

One bill authorized an electric light and power company with a plant just over the line in New Hampshire to furnish electricity to street railway companies near the border but within the state.

The most liberal charter granted this year is the one granted to the New York & Berkshire Company, a prospective line among the steep hills of the western part of the state. No one is very sanguine that the line will ever be built, but it offers a field for investors who are willing to take some chances. The charter allows the hauling of freight cars with physical connections with connecting railroads, and the line is undoubtedly through a very picturesque region, the edges of which, where transportation facilities are ample, have been developed by the summer resort element from New York and other places.

The provisions of the present law regarding the transportation of roadmaking materials by street railway companies have been extended. Up to this time the companies could transport for cities or towns over their own lines, but allowed no transferring over connecting lines. This defect is now remedied.

From now on all locations granted street railway companies by local authorities must be approved by the railroad commissioners before the companies can commence construction. This was recommended by the governor and is brought about by the fight between two companies for locations in his own section of the state. Both companies were opposed by the summer people who look askance at trolley lines. Under the old law if ten real estate owners along a proposed line felt enough aggrieved they could make a formal protest and the same approval as now was necessary. In the governor's section this appeal was made in each case, so it is not clear just what advantage this new law is.

The railroad commissioners were given permission to employ experts to investigate the value of street railway property when the company is asking for the board's approval of the issue of bonds.

The bill authorizing street railway companies to sell electricity for lighting purposes to cities and towns where no lighting company is in operation was passed. It is restricted to lighting and the sale of the current. All the wires, poles, etc., beyond where the physical connection is made with the trolley must be put up and owned by the municipality. At the first of the session there was a dozen petitions from as many different companies asking for authority to do this. These were lines running through the more rural districts and in every case they wanted to sell current for power purposes also.

At the very end of the session a bill was passed requiring street railways to pay a portion of the cost of building or repairing bridges on which they have locations. It was endeavored to secure an amendment limiting the street railway share to 15 per cent, but this was defeated by a narrow margin.

Two accident insurance charters have been granted that are based on petitions of street railway men and are to insure street railway companies against claims for damages for personal injuries. They are patterned after the charter granted in 1895 and now owned by the Massachusetts Electric Companies, and under which those companies are insured.

In the closing days of the session the Boston subway bill was enacted. The House tacked on a labor section to provide for the employing of citizens of the United States only at a rate of \$2.00 or more per day. The Senate struck this out, claiming it would make the work cost \$1,200,000 more. The Boston Elevated road is to have a 25-year lease at a rental of 4½ per cent of the cost estimated at \$4,000,000. There is a referendum clause in the act so that nothing will be done until approved by the voters of Boston next December.

Rob.

It was reported on July 11th that all the property of the New York & Queens County Railway Co. of Long Island City, which virtually controls all the electric lines in the borough of Queens on Long Island, had been purchased by Mr. August Belmont, and that the Interurban Street Railway Co., which controls all the trolley lines on Manhattan Island, was associated with Mr. Belmont in the purchase. Among the franchises included in the acquisition is one for a tunnel under the East River, and it is stated that it is now the project to bring the Queens Borough cars into New York through a tunnel from Long Island City to 42d St., Manhattan.

UNION INTERNATIONALE PERMANENTE DE TRAMWAYS.

The meeting of the Union Internationale Permanente de Tramways which was held in London, England, in conjunction with the International Tramways and Light Railways Exposition, was opened July 1st by an address by the Right Hon. Gerald Balfour. In the afternoon the members of the congress were entertained by a visit to the city, and in the evening they were tendered a reception at the Institution of Mechanical Engineers. On July 2d the business meeting of the union was opened with Sir Charles R. Wilson in the chair. The reports which were prepared by committees of the union were then considered. These reports were based on replies received from members of the Union in answer to series of questions addressed to them, and they therefore summarize the actual experience and conditions obtaining on the numerous tramways and light railway systems of continental Europe.

A report in regard to the carrying of baggage, express and mail matter and the tariffs therefor was read by M. G. Marsal. The question of carrying baggage, express and mail matter on city tramways is by no means developed in the different countries of Europe to the extent it deserves, judging from the responses which were received from the different cities where the tramway companies are members of the Union Internationale. Among the reasons for this are that agencies of the express companies are established in all the cities by the railroad companies and the business is admirably organized, due to the experience of many years. The business forms a monopoly against which the greater part of the city railway companies, even those having long franchises, have never been able to make much progress. The established agencies also have very complete accommodations for serving the public in the way of special vehicles, such as omnibuses, delivery wagons, etc., to serve hotels and to run from house to house, that the tramway companies fear that it would not pay to install equipments of this kind to compete with the established systems. Originally the tramway companies were limited to the carrying of passengers, but in many cities where they connected with railway stations the companies have confined themselves to carrying mail packages when accompanied by the passenger. The exclusive carrying of passengers is an easy and profitable business for tramway companies and was further justified in the case of animal traction where the cars were light and of limited dimensions, but it appears that passenger service only has continued to furnish the business notwithstanding the fact that electric traction makes it possible to establish a special compartment in the cars for carrying baggage and express matter. The carrying of mail matter and postal packages is also capable of great extension, but has not been very largely developed, judging from the reports which were received.

The report then quoted the answers received from several companies, and in conclusion stated that the answers were not sufficient and the examples not sufficiently numerous to permit of reporting in a definite manner on the profits and the benefits which should result from carrying baggage and express matter or even to recommend the organization of a department for the transporting of merchandise. The question depends largely upon local circumstances and the activity of the commercial movement in the cities.

A scheme of uniform accounting for electric railways was reported on by M. Leon Janssen. A uniform method of accounting is essential in the comparison of different roads and no comparison is possible if the accounts are not established on some basis. The scheme proposed in the report is briefly as follows:

The three principal items are the receipts, the expenses and the profits and losses. The expenses are divided under four general heads which are, interest on capital, sinking fund and depreciation, cost of administration, and operating expenses. The last item is subdivided into nine general heads, each of which is again subdivided into several minor items. The nine subdivisions of operating expenses are, management, transportation expenses, power house expense, rolling stock, maintenance of way, electrical conduits, building, general expense and miscellaneous. Under the head of management are included the salary and emoluments of the manager, the salary of the manager's staff; expenses of the manager's staff, cost of furniture; postage, telegrams, telephone, etc.; heating, lighting and cleaning, the repair of furniture; miscellaneous, and other expenses. Under the head of salary and emoluments of the manager are given the fixed salary of the manager, the share

of profits of the manager, entertainment, hotel bills, traveling expenses and miscellaneous.

A similar subdivision to that given under the head of management is applicable to all other items into which the operating expenses have been divided, for example, under the head of transportation expenses would be included the salary and emoluments of the superintendent of transportation and his staff, and under the head of central station expenses would come the salary and emoluments of the chief engineer and his staff, the subdivisions being practically the same as given under the heading of management.

The subject of brakes was reported upon by M. Poetz. There were replies from 20 companies to the series of questions sent out in regard to brakes, and owing to the divergent and often conflicting nature of the replies there was some difficulty in drawing any general conclusions. The consensus of opinion, however, was that electric cars should always be equipped with at least two kinds of brakes, and almost invariably the ordinary hand brake forms one of these. The other two brakes mentioned principally are electric brakes and compressed air brakes. The report states that where the electric brakes are employed they should be supplemented by hand brakes, as it is impossible to bring a car absolutely to rest on an incline with the electric brake, and all the axles of the car should be fitted with electric brakes where quick stopping is a condition of safe operation. The electric brake is entirely suitable for use in ordinary service, does not fatigue the motorman like the hand brake, and is exceptionally powerful. Compressed air brakes are regarded as equal to electric brakes and have several advantages on trains of cars. Their cost of installation and maintenance is said to be more than that of electric brakes, and they take up more room under the car.

The second International Tramways & Light Railways exhibition which was held in conjunction with the Union Internationale opened auspiciously on July 30th. It is two years since a similar exhibition was held in London, and the growth of the electric tramway industry is shown from the fact that there are now more than twice as many exhibits as on the previous occasion. Among the prominent exhibitors may be mentioned Messrs. Dick, Kerr & Co., who showed among other things, a very handsome car built for the London County Council. The English Electric Manufacturing Co. and the Electric Railway & Tramway Carriage Works, at Preston, made a joint exhibit with Messrs. Dick, Kerr & Co. The British Westinghouse Electric & Manufacturing Co. made an extensive exhibit which included a completely equipped working trolley line with a car fitted with Newell magnetic brakes. The British Thompson-Houston Co. showed the latest type of apparatus for operating light railways, tube railways and tramways, and the Thompson-Houston master control system was exhibited in operation. Messrs. Askham Bros. & Wilson exhibited a large variety of track material, including rails, joints, crossings, bonds, etc. Messrs. Doulton & Co. showed samples of Doulton multiple conduits and Messrs. Robert W. Blackwell & Co. had a large exhibit in which the Peckham truck was a prominent feature. The General Electric Co. had an interesting exhibit and the Brush Electrical Engineering Co. also made an extensive exhibit of its tramway manufactures.

ACCIDENTS.

A head end collision between a passenger and a freight car occurred on the Hudson Valley Ry. near Caldwell, N. Y., July 9th, in which 17 persons were injured, one death resulting.

A head-on collision between two loaded cars occurred June 28th on the Hudson Division of the Marlboro (Mass.) Street Ry., about two miles from Marlboro. The cars met on a curve at the foot of a steep grade. The motorman of one car was killed and 35 passengers were more or less injured.

By far the most serious accident of the month occurred the night of July 4th on the Mountain Lake Electric R. R., of Gloversville, N. Y., which is a road of some 4½ miles extending from Gloversville to a pleasure resort on the nearby mountain. There had been a very large crowd on the mountain during the day, and after 9 o'clock in the evening all the cars returning were heavily laden, being dispatched from the resort at intervals of five minutes. At 9:30 an open car left the resort and was followed in a few minutes by a closed car. The motorman of the latter lost control of it, the brake rigging giving way; he then reversed the current, which

threw out the circuit breaker in the power house. The rear car struck the open car ahead of it and the two continued down the grade together and on reaching a curve near the bottom both overturned, crushing a number of passengers, who were thrown out as the cars upset.

Twelve persons were killed, 20 injured so badly that they were taken to hospitals, and 11 others less seriously hurt. On the 6th the motorman of the runaway car died from his injuries, making a total of 13 deaths.

The Mountain Lake Electric Railway Co. began operating its line in August, 1901, and this is the first accident that has occurred.

A rear end collision between two cars on the Toledo, Fostoria & Findlay Electric Ry. occurred at 6 p. m. on July 4th, resulting in serious injuries to two or three passengers. The cars were returning from San Reeves' Park, near Fostoria, and were taking siding to let outgoing cars pass. The first car had stopped on the siding when the second crashed into it, the air brakes having failed to work.

An accident which resulted fatally to one person and in injuries to 20 others, occurred on the Chautauqua line four miles from Boulder, Colo., at 11 p. m. July 4th. The cars, which were heavily loaded, had started down a declivity when the chain brakes used on the trailers became ineffective. The train rushed down hill at a high rate of speed, overturning at a bend in the track, and both motor car and trailers were wrecked. Of the 200 passengers aboard all but 21 escaped uninjured.

Two persons were fatally injured and several others seriously injured in a head-on collision on the Mahoning Valley Ry. near Edenburg, O., at 4:30 p. m., July 4th. The New Castle special leaving Youngstown at 4 o'clock crashed into one of the regular cars going at an equal rate of speed, with the result that both cars were wrecked and 11 out of 200 passengers received injuries, two of them dying after being removed to the hospital.

A storm at Birmingham, Ala., July 4th, damaged the property of the Birmingham Railway, Light & Power Co. to the amount of \$20,000. The principal damage was to the wires and cables, over 40,000 ft. of wire being a complete wreck.

A heavy windstorm which swept Central Indiana June 25th caused the Union Traction Co. of Indiana to suspend operations between Anderson and Indianapolis for several hours. In several places wires and poles were blown down, and trees blown across the track.

Storm and flood at Wheeling, W. Va., July 9th, occasioned much inconvenience to the street railway companies operating in Wheeling and vicinity. A car on the Moundsville line of the Wheeling Traction Co. was struck by lightning and caught fire, but the passengers, though badly frightened, escaped without injury.

A head-on collision between an express and a passenger car on the lines of the Hudson Valley Ry., near Caldwell, N. Y., on the afternoon of July 9th, resulted in injuries to 16 passengers, one of whom died on being removed from the wreck. The cars met between two switches at a point where both were going down grade.

On the morning of July 16th one of the large double truck cars used on the Wentworth Ave. line of the Chicago City Ry. crashed into a smaller 31st St. car at the junction of these two streets. Both the cars were crowded and a number of persons injured, though none fatally. Owing to the recent rain the tracks were slippery and the driver of the Wentworth Ave. car did not see the 31st St. car until he was nearly upon it. The motormen of the cars applied the brakes, but were too late to prevent a collision. The larger car remained on the tracks, while the smaller one was thrown over upon its side on the sidewalk.

The Fond du Lac (Wis.) Street Railway & Light Co. has received a 500-kw. generator which will furnish power for the operation of cars on the Fond du Lac-Oskosh interurban line.

The United Railways & Electric Co., of Baltimore, has completed arrangements to insure the lives of the 3,000 motormen and conductors employed on its lines. The family of a man thus insured will be paid \$1,000 if he be fatally injured while in the service of the company. The insurance is virtually an agreement between employer and employe that in such a case the sum paid shall be accepted as settlement of any claim that might be brought against the company. The United Railways & Electric Co. pays the entire cost of insurance, making no reduction in the wages of the men.

FINANCIAL.

PHILADELPHIA CO., PITTSBURG.

The Philadelphia Company and affiliated corporations have issued the following report for the month ending May 31st:

	1902.	1901.
Gross earnings from operations.....	\$1,123,411 60	\$987,984 08
Operating expenses and taxes.....	613,730 99	531,130 72
Net earnings from operations.....	509,680 61	456,853 36
Other income.....	78,025 61	17,460 06
Total earnings and other income.....	588,606 22	474,322 42
Deductions from income.....	70,941 33	34,647 82
Total income.....	511,664 89	439,674 60
Fixed charges.....	323,163 64	264,007 51
Surplus	188,501 25	175,667 09
Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Company	154 26	56,306 90
Balance representing Philadelphia Company's interest in the total net income...	188,346 99	119,360 19

BROOKLYN RAPID TRANSIT CO.

The Brooklyn Rapid Transit system, including all companies, has issued the following comparative statement for the month of May, 1902:

	1902.	1901.	Increase.
Gross receipts.....	\$1,156,344 84	\$1,075,576 47	\$80,768 37
Expenses, including taxes...	730,152 44	715,161 32	14,991 12
Net receipts.....	426,192 40	360,415 15	65,777 25

The comparative statement for the 11 months ending May 31st shows:

Gross receipts.....	\$11,624,417 09	\$10,920,174 38	\$704,242 71
Expenses, including taxes...	8,220,062 33	7,237,894 12	982,168 21
Net receipts.....	3,404,354 76	3,682,280 26	*277,925 50

*Decrease.

MONTREAL STREET RAILWAY CO.

The Montreal Street Railway Co. has issued the following comparative statement of earnings and expenses for the month of May, 1902:

	1902.	1901.	Increase.
Passenger earnings.....	\$173,901 58	\$160,611 82	\$13,289 76
Miscellaneous earnings.....	4,506 57	671 03	3,834 94
Total earnings.....	178,408 15	161,283 45	17,124 70
Operating expenses.....	86,780 45	90,765 89	*3,985 44
Net earnings.....	91,627 70	70,517 56	21,110 14
Fixed charges.....	18,672 42	11,632 74	7,039 68
Surplus	72,955 28	58,884 82	14,070 46
Operating ratio.....	49.90	56.51	

*Decrease.

CHARLESTON CONSOLIDATED CO.

The Charleston (S. C.) Consolidated Railway, Gas & Electric Co. has issued a comparative of six months' operations ending May 31st:

	1902.	1901.
Gross receipts.....	\$399,572 38	\$245,745 02
Operating expenses.....	208,324 54	159,422 70
Gross income.....	191,247 84	86,322 32
Fixed charges.....	75,825 61	76,713 82
Net income.....	115,422 23	9,606 50
Deductions sinking fund and new installations	5,705 21	4,976 98
Net balances, profit.....	109,717 02	4,629 52
Operating ratio.....	52.1	64.9

For the six months ending May 31st the company carried 4,479,555 passengers as against 2,146,401 for the corresponding period of the preceding year, and made 954,104 car miles as against 665,499 for the six months ending May 31, 1901.

METROPOLITAN STREET RY., NEW YORK.

Kuhn, Loeb & Co., of New York, recently received subscriptions at 97½ for \$11,000,000 of Metropolitan Street Railway Co.'s 4 per cent refunding 100-year gold mortgage bonds, which is a part of the recently authorized issue of \$65,000,000. The balance of \$54,000,000 is reserved to retire outstanding bonds of other issues of the Metropolitan company and on its subsidiary companies. The issue which is limited to \$65,000,000 is secured by a refunding mortgage which is the only obligation of the Metropolitan company covering all its lines and leases and is therefore the only lien embracing the entire system as it is now constituted. The outstanding capital stock of the company is \$52,000,000, and it has paid regular dividends of 7 per cent on its outstanding share capital since January, 1899. The gross earnings of this company show a steady increase during the last four years, and dividends at the same rate have been guaranteed by the Interurban Street Railway Co. to which the Metropolitan system was recently leased.

CHICAGO UNION TRACTION CO.

A synopsis of the report of the Chicago Union Traction Co.'s operations for the fiscal year ending June 30th shows an increase in gross receipts but less satisfactory net results owing to three reasons, i. e., the company has paid out about \$400,000 in taxes this year and met back taxes for the previous year; operating expenses have been increased, and the wage scale has been readjusted in such a manner as to involve an additional annual outlay of about \$125,000. Last year the company's surplus amounted to \$8,575 and one quarterly dividend of \$150,000 was paid on preferred stock. During the current fiscal year no dividends have been paid. The following is a synopsis of the company's report for the fiscal year:

	1902.	1901.
Passengers	\$7,801,098	\$7,269,816
Mail, etc.....	16,158	15,101
Miscellaneous	4,516	4,222
Total operating income.....	7,821,772	7,289,139
Operation based on an operating ratio of .54 for both years.....	4,223,700	3,942,194
Net	\$3,598,072	\$3,346,945
Other income.....	869,671	869,671
Total	\$4,467,743	\$4,216,616
*Charges and taxes.....	4,415,080	4,268,040
Balance	52,663	158,576
Dividend	(114)	150,000
Surplus	61,239	8,576

*Assuming taxes for 1902 at \$750,000 instead of \$320,296, as in 1901.

NORTHWESTERN ELEVATED R. R.

The Northwestern Elevated Railroad Co., Chicago, reports gross passenger receipts for the six months ending June 30th at \$575,414 as against \$503,315 for the corresponding period last year. The total gross receipts are given at \$595,000, and it is shown that the increase of passengers carried for June, 1902, over June, 1901, is 13.4 per cent. Operation for the first six months of the present year are given in the following table:

Gross earnings	\$595,000
Operating expenses, including loop rent and taxes.....	320,000
Net earnings, Northwestern proper.....	275,000
Net earnings of loop (six months).....	262,500
Loop expenses.....	132,000
Total income.....	407,500
Northwestern "L" bond interest.....	280,000
Balance for preferred stock, 5.1 per cent.....	127,500

CHICAGO & MILWAUKEE ELECTRIC RY.

A gain of \$9,860, or an increase of 30 per cent, is shown in the report of the Chicago & Milwaukee Electric Railway Co. for the six months ending June 30th, over operations for the corresponding

period last year. The operations for the six months ending June 30, 1902, were as follows:

Month—	Gross.	Op. exp.	Net.
January	\$10,953	\$5,873	\$5,080
February	9,522	5,046	3,875
March	11,215	6,185	5,030
April	13,057	5,898	7,158
May	16,440	7,352	9,087
June	17,750	7,065	10,685
Totals	\$78,939	\$38,021	\$40,918

Compared with the previous year the following results are given:

	1902.	1901.	Increase.
Gross earnings.....	\$78,939	\$65,460	\$13,479
Operating expenses.....	38,021	34,402	3,619
Net earnings.....	\$40,918	\$31,058	\$9,860

PENNSYLVANIA TO ENTER NEW YORK CITY.

The franchise which the Rapid Transit Commission decided on June 16th should be granted to the Pennsylvania R. R. for a double track entrance via tunnel into New York City entails an approximate increase in the railroad's annual fixed charges of \$1,961,535. The franchise compensation is estimated in the following table:

To city for tunnel and street rights.....	\$75,535
To city for taxes on real estate (estimated).....	486,000
Total to the city.....	\$561,535
Plus interest on \$40,000,000 investment at 3½ per cent.....	1,400,000
Approximate increase in company's fixed charges.....	\$1,961,535

The annual payments for the franchise are summarized as follows:

	First ten years.	Next fifteen years.
For river rights.....	\$200	\$200
For tunnel rights in Manhattan borough, being 44,341 feet (partly estimated) of single track.....	22,170	44,341
For tunnel rights in Queens Borough, being 8,100 feet (partly estimated) of single track..	2,025	4,050
For street rights in Thirty-first and Thirty-third sts., north and south of terminal.....	14,000	28,000
For secondary station at Thirty-third st. and Fourth av.....	1,140	2,280
For parts of Thirty-second st.....	36,000	36,000
Totals each year.....	\$75,535	\$114,871

It is stated that if the route under Thirty-first St. be availed of, these amounts will be increased by \$16,652.50 for the first 10 years, and by \$33,305 for the next 15 years.

The Northern Ohio Traction Co. reports for the month of May receipts, \$60,746; operating expenses, \$33,910; net earnings, \$26,836; surplus, \$10,169. An increase in gross earnings of \$12,242 over the month of May, 1901, is shown.

The sale of the Richmond (Va.) Traction Co., the Virginia Electrical Railway & Development Co. and the West Hampton Railway & Power Co. to the Merchants' Trust Co., a New York syndicate, was consummated at Richmond June 23d. The price realized for these properties, including bonds and obligations assumed by the purchasers, is about \$4,000,000.

The bondholders of the Lake Street Elevated Railroad Co., Chicago, have exchanged more than 25 per cent of outstanding debenture bonds for first mortgage issues at the Northern Trust Co.

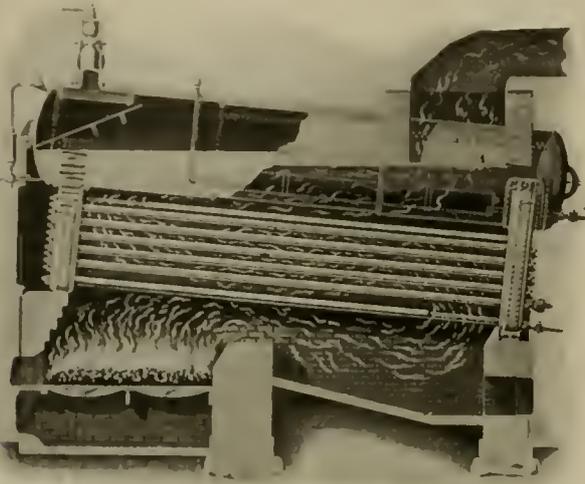
FIRE IN CHICAGO.

Fire destroyed the storage barn of the Chicago Consolidated Traction Co., at Lake St. and Ridgeland Ave., on the evening of July 16th. The loss included 100 box cars, 1 sweeper and 3 snow plows, and the coal handling machinery that was stored in the barn, approximating a total of \$125,000. The cause of the fire is not known. The building, valued at \$25,000, was entirely destroyed.

FRANKLIN WATER TUBE BOILER.

The accompanying illustration shows in longitudinal section and elevation the water tube boiler built by the Franklin Boiler Works Co., of Troy, N. Y., and known as the "Franklin." The boiler is built entirely of wrought steel and consists of one or more drums, having openings in the bottom near each head at which are connected the water legs, the water-legs being connected with each other by tubes parallel to and under the drums. The water-legs are made of plates, flanged to fit the drums and fastened together by butt strap riveted joints, this construction giving a maximum interior cross section; the water-legs are strengthened by hollow stay bolts.

When set, the boiler is slightly inclined, the water filling the tubes, water-legs and about half the drums. The circulation is from back to front through the tubes, thence up through the front water-leg, through the drum from front to back, and down the back leg. To insure proper direction for the furnace gases, fire brick tiles are placed on the bottom row of tubes, extending from the front of the boiler to within a few feet of the back water-leg, and on the top



FRANKLIN WATER TUBE BOILER.

row of tubes from the back of the boiler to within a few feet of the front leg; this arrangement causes the gases to pass three times under the boiler before reaching the uptake. Rows of tiles rest on the walls of the setting and on bars riveted to the drums, and extend from the front of the boiler to the wall of the up-take chamber.

The outer walls of the water-legs are provided with hand holes directly opposite each tube, for the purpose of cleaning and inspection. No cleaning is done from the sides, so that if desired any number of boilers can be set side by side.

The steam outlet is placed at the front end of the drum where it is farthest from the water, and just below it are placed a separating device consisting of a perforated dry pan and deflection plate. The feed water discharges into a mud drum of thin steel placed below the water line in the drum, this arrangement being designed to collect impurities which are precipitated upon entering the boiler, and also to provide for the heating of the feed water before it has a chance to come in contact with the shell or tubes.

The front end of the boiler is supported on cross beams resting on and bolted to steel columns which extend to the foundation. A lug is riveted to the front head and bears on a roller set in a roller chair placed on the cross beam.

The rear end is supported on the rear foundation wall which is carried up for the purpose. On this wall are set plates and rollers on which rests the back water-leg. This method of supporting the boiler, independent of the setting, provides for any change in the inclination of the boiler and for expansion and contraction.

The upright columns and cross beams form the frame work of the front. Small cross channels are bolted to the upright columns and support the upper half of the front. The lower half consists of wrought steel plate panels to which are bolted the frames for the fire and ash doors.

This method of construction provides for the removal of all or any part of the lower half of the front without disturbing the supports or the upper half, and also provides for the installation of stokers without other change.

The boilers are built in a number of standard sizes, so proportioned that the grate surface, heating surface, steam space, water capacity, circulating openings and draft openings per horse power do not vary more than 3 1/2 per cent.

NEW COMPANY BUYS OREGON TROLLEY LINES.

The Oregon Water Power & Railway Co., incorporated last year as the Oregon General Electric Co., and which about a month ago filed amended articles changing its name, has acquired all the rights and holdings of the Portland City & Oregon Co., which has been formally dissolved by action of its board of directors. The same men own the new corporation that owned the old one, however, James H. and Fred S. Morris, the former being president and the latter treasurer and manager of the Morris & Whitehead Banking Association. W. H. Hurlburt is president, J. Frank Watson vice-president, A. B. Croasman treasurer, and W. T. Muir secretary.

The new company is capitalized at \$2,000,000, and its articles of incorporation confer power to issue bonds to the sum of \$3,000,000. All the work started by the Oregon General Electric Co., including the trolley railroad, inures to the new company. Plans for the construction of an electric power station on the Clackamas River and the building of a trolley road to that property, which has formerly been prepared, will now be carried out by the new company, and Mr. F. S. Morris states that the work will be prosecuted vigorously to completion. He says the company contemplates electric developments in the vicinity of Portland that will call for the expenditure of about \$5,000,000.

A number of electric roads will be built to develop this territory and work will at once commence on the extension into Clackamas County. Two ship loads of steel rails are now on the way from Europe. The road to the Upper Clackamas will not have a grade exceeding 1.5 per cent, except in one place, where there will be a short rise of 2 per cent, and the sharpest curve will not exceed 3 deg.

The Seattle Electric Co. will erect a transformer house in Fremont, Wash., at a cost of \$5,000, to supply power to the Green Lake Electric Ry.

Mr. J. T. Vasse, right-of-way purchasing agent for the Central Texas Traction Co., is procuring deeds for a right of way between Waxahachie and Ennis, Tex., for an interurban line.

The survey for an electric railroad running between Oxnard and Hueneme, Cal., has been completed and grade stakes placed. The company promoting this road has consolidated with the Bakersfield road and work has already been commenced.

Mr. H. H. Mellman, chief promoter of an electric railroad from Dayton to Pendleton, Ore., has obtained most of the necessary franchises from the towns and counties along its route. Every effort is being made to secure the remaining franchises, after which the work will be started at once.

SPECIAL TRAIN FOR THE DETROIT CONVENTION.

For years the Wabash Railroad has made a particular point of running special trains to the convention city on the occasion of the annual meeting of the American Street Railway Association, an attention which has always been greatly appreciated by the street railway men and manufacturers attending these meetings. The special train insures that those coming from considerable distances will have a pleasant trip in congenial company, and in effect extends the convention time for all who are passengers. This year, as heretofore, the Wabash will have "Street Railway Convention Specials" to Detroit.

NEW PUBLICATIONS.

CASSIER'S MAGAZINE for July is a special mining number of more than three times the usual size and almost constitutes a text-book on mining and metallurgy. It contains 15 principal articles on various mining subjects and nearly 300 illustrations collected from all parts of the world. This number deserves the careful perusal of all interested in mining and metallurgical subjects.

THE GARDNER, (MASS.) WESTMINSTER & FITCHBURG STREET RAILWAY CO. has issued the second edition of a pamphlet and guide directing the readers' attention to the many attractive features of the region traversed by the company's lines. Wachusett Mountain, the lake and park, and the various resorts in the vicinity are shown in abundant half-tone illustrations. Descriptions of the most desirable routes, time tables and miscellaneous information will make this booklet an important acquisition to all who project a summer outing in picturesque New England.

PLATES OF CONSTRUCTION FOR THE DESIGN OF DYNAMOS, (4th edition) edited by Prof. E. Arnold, published by Ferdinand Enke, Stuttgart, Germany, 2 parts. Price of each part, including portfolio, 20 Marks 40 Pfennigs. The first part of this work contains designs for 41 continuous current machines of from 3½ to 1,000-kw. output. The remaining sheets are devoted to drawings of the important details. The second part contains designs of 29 generators of from 20 to 1,500-kw. output, 9 rotary converters, 13 asynchronous motors and 8 transformers, in addition to 9 sheets of details. The designs of these machines have been selected from a large number which are constructed by the most prominent firms of European manufacturers and the publication, therefore, illustrates the standard forms of European electrical machines of the present day. The drawings are all furnished with the principal dimensions and are to scale while the winding data and other calculations are given in separate tables for easy reference.

THE CINCINNATI, HAMILTON & DAYTON RY. has issued a crisp and clever novelette called "On the Way to Michigan," which will be conceded to be a singularly catchy advertisement. All who see the striking little book gay with pictures in black and red will wish to read it, and will find the story inimitably droll and entertaining. It is all about one white and brindle Cupid, a canine match-maker, and the victims of his hymeneal plots. Cupid careers through the story from Cincinnati to Mackinac and Les Cheneaux with a romantic young bachelor in pursuit. There is a summer girl, of course, at the journey's end, "a regular Diana in a swagger polo cart," and the complications in which Diana and the bachelor become involved through the Machiavelian arts of Cupid afford the fun. Incidentally, the luxury of traveling via the "C., H. & D." is suggested in such a manner that the reader is inclined to board the next train over that pleasant route and seek his summer's recreation among the pines of Michigan. Put-in-Bay, Mt. Clemens, Cheboygan, Alpena and Point Aux Barques are among the desirable resorts accessible by the C., H. & D. lines, and thence, in some cases, via steamer, and a description of such tours forms an appendix to the little book.

ADVERTISING LITERATURE.

THE WILLARD STORAGE BATTERY CO., of Cleveland, O., has issued its 1902 catalog describing and illustrating its various products in the line of storage batteries. The different types of batteries, showing size, number of plates and capacity, charge and discharge rates, and price are conveniently tabulated, and in addition to this the catalog contains a set of instructions for setting up, putting into operation and maintaining these batteries.

THE ATLAS RAILWAY SUPPLY CO., Chicago, Ill., is distributing a new catalog describing and illustrating its products in the line of rail joints, rolled steel joints, rail braces and rail sections of all descriptions. The materials used in these fittings is a high grade of cast steel and malleable iron, and the castings are warranted as to fit and finish, and are guaranteed against breakage. The catalog also calls attention to the "Atlas" liquid primer and surfacer, which are adapted to application to bare wood without any

previous preparation. Among other claims for these materials it may be mentioned that their use reduces the time required in painting cars from 10 to 15 days over the old methods, and it also lessens the cost of painting the car by \$15 or \$20. Any ordinary old paint can be covered without burning off the old paint.

THE AMERICAN STEEL & WIRE CO. has published a pamphlet under the title of "Electrical Tables" which contains a number of useful tables of dimensions and weights of pure copper wire with comparative sizes of different gages in decimals of an inch, tables of resistances, etc., all of which are very useful for reference purposes. The pamphlet includes a list of products manufactured by this company which are sufficiently numerous to cover 25 pages of type.

"SOFT WATER" is the title of the railroad edition of the new catalog issued by the Kennicott Water Softener Co., of Chicago. The Kennicott process is well adapted to railroad service for the reason that it is automatic and continuous, and the softened water does not have to be repumped at the storage tank. The catalog shows several illustrations of railroad water softening plants which have been installed by this company, and also shows detailed drawings of its apparatus.

INSTALLATIONS OF THE GREGORY ELECTRIC CO. is the title of a large, handsomely printed catalog issued by the Gregory Electric Co., of Chicago. While the catalog contains no descriptive matter there is a very complete story in the large number of installations catalogued, the names of which alone cover 70 pages, and which are distributed throughout almost every part of the United States. Interspersed through this large list of the company's installations are views of its factory, store rooms, repair department, supply department, etc., which describe the extent of the company's works.

THE RAILWAY APPLIANCE CO., of Chicago, dealer in railway specialties, has published a new catalog devoted to the various products handled by the company. These include the Gilman-Brown emergency knuckle, the Jennings car and engine replacer, the auxiliary coupling for use on curves too short for operation of the M. C. B. couplers, "Economic" metallic packing, the Ajax cotton belting diaphragm for vestibule cars and the "R. A." all metal bumping post, besides car movers, special wearing knuckles, etc. These devices are all shown in half tone illustrations, and are very fully described. The company will be pleased to mail its catalog No. 3 upon request.

THE UNITED TELPHERAGE CO., of New York City, has issued its circulars Nos. 22, 23 and 24, describing several kinds of telpher lines which it has installed. One of these methods is expressly adapted to the handling of trunks and baggage at railway stations, and the illustrations show an electrically propelled telpher upon which the baggage can be directly unloaded from the car and by means of which it can be delivered to any desired point without further manual labor. Another form of telpher described is an aerial cross-country line for carrying buckets suitable for handling various materials across country roads, over rivers and other obstructions. Another arrangement is shown for handling stock in paper mills, and the object of these circulars is to show the application of telpherage to various industries.

THE ELECTRIC STORAGE BATTERY CO. has just issued "A Book of Curves Illustrating the Operation of 'Chloride' Accumulators in Railway and Lighting Service," which is of interest to managers and power plant men. There are over 40 plates which graphically illustrate the actual operation of batteries of "Chloride" accumulators in their typical applications to electric railways, central lighting and power stations, isolated lighting plants, etc. The company states that it believes the data will be of assistance in the solution of problems concerning the economical generation and distribution of electric power; the curves shown were selected as being representative examples of the operation of "Chloride" accumulators in railway power stations, rotary sub-stations and line sub-stations, for regulating and peak work; in central lighting stations for peak work, emergency use and supplying the demand during the hours of light load; in isolated lighting and power plants for

assisting the generators at the hours of heavy load, carrying the entire load during the night, regulating the fluctuations of elevator or other motor service, etc.

PROTECTED RAIL BONDS is the title of the new catalog just issued by the Protected Railroad Co., for which the Mayer & England Co., Philadelphia, is agent. The book comprises 130 pages, the greater number of which are devoted to illustrating and describing the various types of bonds, their applications, and the tools for putting them in place. Under the heading "A Few Points About Proper Rail Bonding" has been included an interesting treatise on bonds and bond testing, illustrating the present practice in installing and testing. There are given data which will be found useful to street railway managers and engineers, arranged in a convenient form for reference. An interesting feature of the book is a directory of the companies using "Protected" bonds, arranged by states of the United States, and foreign countries. This list includes 42 states and countries. The catalog is copyrighted by A. H. England.

"SMITH VAILE PUMPING MACHINERY" is the title of Catalog 42 which is issued by the Stillwell-Bierce & Smith-Vaile Co., of Dayton, O. The catalog contains 136 pages of descriptive matter and illustrations showing the large variety of steam pumps made by this company. No expense has been spared in equipping the hydraulic plants of this company with the most approved machinery, and its products in the line of pumping machinery incorporate every improvement that experience has indicated to be valuable and desirable. Recognizing the demand for economy of steam consumption, the company recommends its compound condensing engines to be operated condensing if possible, as well as its triple expansion engines where sufficiently high initial steam pressure can be had. The company makes a complete line of air compressors, condensing apparatus including jet and surface condensers, vacuum pumps, pumping machinery for municipal water supplies, as well as small boiler feed pumps, etc.

THE GENERAL ELECTRIC CO. has recently issued the following advertising literature: Bulletin No. 4285, on Automatic Circuit Breakers, Type M, for 500-volt direct current work. Bulletin No. 4288, Slow and Moderate Speed Belt Driven Generators. Bulletin No. 4289, Adjustable Shunt Field Coil for Thompson Recording Wattmeters. Catalog No. 9103, on Transformers for High Potentials (second edition). Catalog and price list No. 7555, on Parts of Carbon Feed Enclosed Arc Lamps, Form 2, With 220-Volt Direct Current Multiple Circuits. Catalog and price list No. 7556, superseding No. 7516, on Parts of Form 2 Carbon Feed Enclosed Arc Lamps for Alternating Current Multiple Circuits. Catalog and price list No. 7557, on Repair Parts of G. E. 54-A Railway Motor. Catalog and price list No. 7558, on Repair Parts of G. E. 67-A Railroad Motors. Flyer No. 2099, on Blue Printing with Enclosed Arc Lamps. Flyer No. 2101, on Fuse Wire. Flyer No. 2102, on G. E. Porcelain Knobs and Cleats. Flyer No. 2103, Parts for Electric Brakes, and Price List No. 5099, on Fan Motors.

THE CONSOLIDATED CAR FENDER CO. is mailing its friends and customers its new No. 5 catalog describing the company's various styles of fenders for wheels, cars, etc. The original Model A car fender of this company was first placed in service on electric cars in 1893, and during the eight years in which the company has been supplying fenders it has kept in constant touch with street railway managers whose experience and suggestions have been adopted from time to time. Different types of fenders, made by this company, are adapted to high and to low cars, to suburban and interurban cars, and others are adjustable to any type of car on the market. The company is also making a wheel guard to be used in connection with the front fenders. The wheel guard is designed on practically the same lines as the fenders, but is reduced in size and is not supplied with a cushion. This is attached to the truck of the car directly in front of the wheels, and it can be dropped at the same time and by the same action on the part of the motorman by which the front fender is dropped. This company also manufactures the Campbell snow broom and the Millen car step lifter. The snow broom is made in half sections of any length and can be applied or removed from the shaft of a car in a few minutes. The Millen car step lifter is attached to the under side

of a car and has connections to both platforms, so that either the motorman or conductor may turn up and fasten the running boards of open cars without leaving the platform. The catalog is fully illustrated and contains a complete price list.

CHANGES AT PROVIDENCE.

June 24th the Rhode Island Co. assumed control of the United Traction & Electric Co., of Providence, which includes the Union Railroad Co., the Pawtucket Street Railway Co., and the Rhode Island Suburban Railroad Co. The United Traction Co. & Electric Co. owned all the stock of its subsidiary companies, and they have been leased to the Rhode Island Co. for a term of 999 years. There is practically no change in the personnel of the board of directors or the officers, so there will be but little change in the conduct of the system. Mr. Marsden J. Perry, who was vice-president of the United Traction Co., has been elected president of the Rhode Island Co. The other officers are as follows: Vice-presidents, Samuel P. Colt, Providence; Randall Morgan, Philadelphia; Walton Clark, Philadelphia; secretary and treasurer, Lewis Lillie, Philadelphia; assistant treasurer, Cyril A. Babcock, Providence; assistant secretary and comptroller, Walter R. Elliott, Providence; general manager, Albert T. Potter, Providence; superintendent of transportation, Albert E. Potter. Under the terms of the lease the Rhode Island Co. guarantees a 5 per cent dividend from July 1st on the stock of the United Traction & Electric Co.

SOFT COAL ON MANHATTAN LINES.

Owing to the scarcity of hard coal available for use in its engines, the Manhattan Railway Co., of New York, resorted recently to the use of soft coal, discontinuing temporarily the through trains from 58th St. and 6th Ave. to Rector St. and transferring passengers on this route by shuttle at 50th St. in order to minimize the smoke nuisance resulting from the change of fuel. The change to soft coal, as was inevitable, has called forth a volley of protest from various quarters. With a view to obviating the smoke nuisance in as great a degree as possible the company used its remaining stock of anthracite coal exclusively on the 6th Ave. line from 150th St. to South Ferry, thus relieving the 6th Ave. shopping district of smoke, and every effort has been made to avoid inconvenience to the public.

The Toronto (Ont.) Railway Co. reports traffic returns for Dominion Day for this year at \$8,298.64, which is an increase of \$494 over the returns for Dominion Day a year ago.

franchises for an electric railway system in Havana, Cuba, beginning at a point in that city where the steamers land, passing through the center of Havana, and forming a loop around the principal residence and commercial districts with a line to a resort six miles down the coast. The concessions are estimated to be worth fully \$25,000,000. Work on the line to the resort referred to has been begun, and it is announced that the system will be completed with all possible rapidity. Associated with Messrs. Park and Hamilton in the project are Devitt, Tremble & Co., of Chicago; G. F. Penhale & Co., and H. W. Whipple, of New York; H. W. McDonald & Co., of Chicago, and W. J. Hayes & Sons, of Cleveland.

A strange and very painful accident occurred on the Wheeling-Bellaire line of the Wheeling (W. Va.) Traction Co., July 5th. A conductor, stepping from the running board to the rear platform of his car as it rounded a curve was struck by the shaft of a wagon left standing too near the tracks. The shaft completely pierced his thigh, lifting him from his feet. The horse at this moment started to run away, but was prevented from doing so by the wounded man, who seized the reins, stopped the horse and then pushed himself off the shaft. The conductor, whose name is B. W. Pumphrey, will recover, but the incident is none the less worthy of note for two reasons: first because it is an example of the heroism often shown by men in street railway service, and second because it invites attention to the public disregard of ordinances, which have been passed by most cities, to the effect that horses shall not be left unhitched in streets, particularly where cars are passing.

ECHOES FROM THE TRADE

THE BOSTON ELEVATED RAILWAY CO. has executed a large contract with the Green Fuel Economizer Co. for installing several economizers at the Central power station.

THE J. G. BRILL CO. is building a new spring shop 200x75 ft. which will be fitted with the most modern machinery and with oil furnaces. The Brill company makes all of its own springs both coil and elliptic.

THE DELANEY OIL & LUBRICANT CO., Milwaukee, reports shipments to Cuba and Porto Rico of Delaney's water purifier, "Dilley's Fat" (a new lubricant), fire extinguishers (chemical powder) and steel cable lubricant.

THE HOLYOKE STREET RAILWAY CO., of Holyoke, Mass., has recently increased its power plant by the addition of a 1000 h. p. engine direct connected to a G. E. 1200-kw. generator and 2700 h. p. Babcock & Wilcox boilers.

THE KENNICOTT WATER SOFTENER CO., 3544 Butler St., Chicago, has one of its water softening machines in operation on the Union Pacific R. R. which removes 335 lb. of lime and magnesia from water every day—over five tons per month.

THE GARL ELECTRIC CO., of Akron, O., has furnished a complete telephone equipment to the Northern Texas Traction Co. The Garl portable telephones with the jointed poles for connecting to the wires are used with cars and stationary telephones are placed at terminals as well as bridge telephones in the offices.

THE AKRON ELECTRICAL MANUFACTURING CO., of Akron, O., is planning to increase its capacity by erecting a new factory in the early fall. This company is steadily increasing its business and has recently opened a Cleveland office, in the Electrical Building, which is in charge of Mr. P. J. Boucher.

CASS HARKINS, of Columbus, O., a well known manufacturers' agent and consulting engineer, who has been in business in Columbus for a number of years, has been appointed sole agent for central Ohio for the We-Fu-Go and Scaife water softening and purifying apparatus manufactured by Wm. B. Scaife & Sons Co., of Pittsburg, Pa.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, announces that Mr. G. F. Greenwood, 34 Empedrado St., Havana, Cuba, has been appointed agent for the sale of the "Chloride" accumulator in Cuba. All inquiries and business from this section should be forwarded Mr. Greenwood and will receive from him prompt attention.

THE FOUNTAIN MANUFACTURING CO., maker of electrical outlet, switch and junction boxes, has removed its general offices and sales room from No. 97 Bank St. to No. 15 Cortlandt St., New York, to which all communications should be addressed. A stock room will be maintained at No. 97 Bank St. for the convenience of the local trade.

THE BALL ENGINE CO., of Erie, Pa., is building a large new shop in the western part of the city in which it is planned to have the machinery installed by December next. This company will hereafter devote more attention to the building of large engines and it is this in connection with the increased general demand for its engines that has led to the building of the new plant.

A STEAM RAILWAY 4½ miles long, the Cincinnati, Georgetown & Portsmouth Ry., is shortly to be converted from steam to electric traction. The Tenth Railway Equipment Co., which has the contract, has recently purchased from the Westinghouse Electric & Manufacturing Co. two 600-kw. A. C. generators and a number of 300 kw. rotary converters for supplying current to the line.

THE HEYWOOD BROS. & WAKEFIELD CO., Wakefield, Mass., has recently received orders from the St. Louis Car Co., John Stephenson Co. and Newburyport Car Co., for seats for 72 cars for the Boston & Northern R. R. These seats are the No. 42 with back offset at one end, upholstered in high grade crimson plush, with Wakefield bronze grab handle on the corner of the back.

THE SAN GABRIEL ELECTRIC CO., of Los Angeles, Cal., has recently purchased a 750 kw., two phase, engine type Westing-

house generator which is to be installed in a sub-station of the Pacific Light & Power Co. The latter company has recently acquired the San Gabriel Co. and the new alternator will be used in connection with its general system of lighting and power in Los Angeles and the vicinity.

THE LUMEN BEARING CO., of Buffalo, N. Y., reports that the increased business of the company in the street railway field is such as to require it to enlarge its plant to three times the present capacity. The department now used as a foundry will be changed to the machine shop and a much larger room for the foundry provided. This company makes the well known Lumen bronze bearing and a number of other specialties.

THE UNDERFEED STOKER CO. OF AMERICA has lately closed contracts for Jones underfeed stokers with the following: Worcester Consolidated Street Ry., Worcester, Mass.; Rochester Athenaeum and Mechanics Institutes, Rochester, N. Y.; Municipal Heating Co., Syracuse, N. Y.; Howard Street Pumping Station, Allegheny City, Pa.; Pennsylvania Railroad (tug "America"), New York; Arnold Print Works (Eclipse Mill), North Adams, Mass., third order.

THE MALTBY LUMBER CO., of Bay City, Mich., which recently made a prominent display on a train load of ties shipped to Des Moines, Ia., has made another large shipment of poles to points in Arkansas. The shipment was handled in the same manner as the train load of ties, the whole number of cars being kept together during the run and prominent signs being displayed on both sides of the cars. Through the courtesy of the railroad companies the train made only daylight runs during the entire trip.

PORTER & BERG, of Chicago, report an unusually excellent business for the present season. They make a specialty of handling electric railway supplies exclusively, and carry a very complete line of specialties which they are enabled to offer at very attractive prices. They represent a number of well known eastern makers of electric railway specialties whose goods they carry in Chicago, together with a general line of electric railway supplies, and from this stock they are at all times able to make quick deliveries.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. among recent sales reports the following: Induction motors, reducing transformers, "low equivalent" lightning arresters with choke coils and high tension circuit breakers for the Tom Boy gold mines, of Pandora, Col. Two 500-kw. railway generators for the Steubenville & Wheeling Traction Co. Three 200-kw. engine type generators for the Riter-Conley Manufacturing Co., Pittsburg; these will be direct connected to Westinghouse gas engines, using natural gas.

THE LIBERAL OFFER of Messrs. Adam Cook's Sons of New York to engineers and others to furnish a can of their well known Albany grease, also a grease cup, free of charge, prompts a highly complimentary testimonial from Mr. Roy J. Rivers, superintendent of the Minneapolis Milling Co. He says: "I received a sample can Albany grease and grease cup and have given them a trial and find them very satisfactory. I am using less grease and there is less 'heating' than with any grease I have ever used here. I wish you every success."

THE BUCKEYE ENGINE CO., of Salem, O., has just completed the moving of all its various patterns into the large five-story building recently built. This building was constructed especially for the purpose of storing the patterns. A new building to be used as a pattern shop is now under way and also an office building. The latter is to be of brick and will be a model structure. The business of the Buckeye Engine Co. has been rapidly increasing and the demand for increased capacity has resulted in the continual growth of the plant until it now covers a great deal of ground.

AMONG THE RECENT SALES of the Westinghouse Electric & Manufacturing Co. are ten 75 h. p. induction motors and four 100 h. p. induction motors for the Lackawanna Iron & Steel Co. The small motors will be used for driving the coke oven blowers in the Buffalo plant of the Lackawanna company. The larger

motors are for use in the gas cleaning plant and machine shop. The Lackawanna company has purchased in all, 151 type 6, Westinghouse induction motors ranging from 1 to 100 h. p. in size. Sales have also been made to the Fayette Manufacturing Co. of electrical power transmission apparatus for the company's refractory brick plant at Chester, Pa.

THE RECONSTRUCTED GRANITE CO., of New York, reports having had an unusually prosperous season, the business for the first four months of the present fiscal year being equal to the sales for the whole of the preceding year. It has just completed a large order for over 6,000 surface contact boxes, weighing about 80 lb. each, for the Lorain Steel Co.'s system being installed at Wolverhampton, Eng. It is also filling very large orders for the Yerkes underground system in London, of third rail insulators, as well as other large orders for various portions of the United States. The company is increasing its plant, so as to double its present capacity, and is branching out into several new lines of insulation, including overhead high potential insulators for feed wires.

THE MORSE CHAIN CO. of Trumansburg, N. Y., has issued an interesting catalog entitled "Silent Running High Speed Chains for the Transmission of Power" in which attention is called to the many purposes for which this chain can be used to advantage. Marked advantages are claimed for the Morse chains where room is lacking to get the proper sized pulleys, where short distances between the shafts are necessary or desirable, where the stresses to be transmitted are large, where it is required that the speed ratio be positive or where it is large, where moisture, heat or dust interfere with proper working of belt or where there is grit present which would quickly cut out the joints of ordinary chains. An installation is cited where the Morse chain was used for driving condensing pumps and is subjected to a maximum pull of 10,000 lb. which of course is intermittently applied on the joints. Notwithstanding the severe conditions, this is stated to have run continuously night and day for seven months without noise.

THE LUDLOW SUPPLY CO., which started in the electric railway supply business at 313 Electric Building, Cleveland, O., last October, advises us that owing to its increasing business the company has been forced to move into larger quarters and has leased Rooms 301 and 302 Electric Building, and now occupies three times the space available in the old quarters. This firm now represents the following manufacturers: The Morris Electric Co., New York, on rail bonds and fare registers; the Chi-sholm & Moore Manufacturing Co., Cleveland, on rail joints, braces, chairs, chain hoists and cranes; Frank Ridlon Co., Boston, on "Wilson" trolley catchers; Garton-Daniels Co., Keokuk, Ia., on lighting arresters; Duff Manufacturing Co., Pittsburg, on "Barrett" jacks; H. Gore & Co., Boston, on track drills; Speer Carbon Co., St. Marys, Pa., on carbon brushes; Lumen Bearing Co., Buffalo, on journal bearings and trolley wheels; Kisinger-Ison Co., Cincinnati, on trolley wire splicers; The Nichols-Lintern Co., Cleveland, on track sanders; Crouse-Hinds Electric Co., Syracuse, on headlights; Simplex Electrical Co., Boston, on electric car heaters; R. B. Bliss Manufacturing Co., Pawtucket, R. I., on "Woods" car gates; Garry Iron & Steel Co., Cleveland, on pneumatic compressors and jacks; Automobile & Cycle Parts Co., Cleveland, on "Milwaukee" trolley poles. The territory contiguous to Cleveland is one of the best in the country for electric railways, and the Ludlow Supply Co. is filling a long felt want in that territory.

PAWLING & HARNISCHFEGER, Milwaukee, Wis., state that the demand for electric cranes and hoists remains highly satisfactory. They advise that present booking of orders is on the average of one crane per day, which fully equals their works' capacity. There is a noticeable broadening of inquiries, particularly from the central and western states, and the prospect for sales in these sections looks very good. The foreign demand is bettering, judging by the inquiries within the last month. Prominent among the recent purchases of cranes and hoists are as follows: Pennsylvania Railroad Co., West Philadelphia, one 6-ton trolley. Grand Crossing Tack Co., Chicago, one 75-ton ladle crane with 25-ton auxiliary trolley. Starley Electric Manufacturing Co., Pittsfield, Mass., for Michigan Lake Superior Power Co., Sault Ste. Marie, Mich., two 15-ton cranes. S. Morgan Smith Co., York, Pa., one 10-ton crane. Pressed Steel Car Co., Allegheny, Pa., one 5-ton special hoist. The Westinghouse Machine Co., East Pittsburg, one 10-ton crane. Pittsburg Plate Glass Co., Ford City, Pa., one 3-ton crane. Bethlehem Steel Co., South Bethlehem, Pa., one 3-ton crane with 10-ton

auxiliary trolley; three 2-ton chain block cranes. The A. & P. Brown Co., Elizabethport, N. J., one 15-ton crane with 3 1/2-ton auxiliary hoist. Jas. B. Clow & Sons, Newcomerstown, O., one 5-ton hoist. American Foundry & Construction Co., Hazlewood, Pa., one 5-ton special hoist. Buffalo Foundry Co., Buffalo, N. Y., two 30-ton cranes with 5-ton auxiliary hoist; four 10-ton cranes. Ball Engine Co., Erie, Pa., one 25-ton crane with 5-ton auxiliary hoist.

THE LUMEN BEARING CO., of Buffalo, N. Y., reports that its business on "Lumen" bronze bearings has increased to such an extent that the company has prepared plans for an addition to its plant which will increase the capacity to three times what it is at present. The company has recently purchased property which will give it a floor space of 18,000 sq. ft. Special attention will be devoted to the street railway trade in journals for trucks and axle bearings for motors, in which specialties the Lumen Bearing Co. has been very successful.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, Pa., has published a Bulletin No. 73, on "The Application of Storage Batteries to Lighting and Power Stations." The plant described is situated at Milan, Mich., and the operation of the battery is shown diagrammatically. Since the installation of the battery this plant has been able to do twice the amount of business of which it was previously capable.

THE BAKER ENGINE & MACHINE CO., of No. 112 N. Third St., Philadelphia, is now installing two 600 h. p. compound engines for the Augusta (Ga.) & Aiken Ry., which is building by John Blair MacAfee. The company has also sold two engines of 500 h. p. each to M. P. McGrath, of Easton, Pa., for a plant at West Point, Pa. Two 400-h. p. engines made by the Baker company were put in operation last month at the power house of the Cumberland & Frostburg trolley road, recently completed by the Penn State Construction Co.

THE NEW YORK SWITCH AND CROSSING CO., of Hoboken, N. J., has recently put a new electric derailing switch on the market, which is meeting with very good results. It is simple, consisting of operating and switch boxes, and connections, and so far has stood the test, although perfection is not claimed for it. Six sets have been sold in Long Island; the Standard Electric Co., Danville, Va., has taken four, the Cleveland Construction Co., one, and the Hudson Valley Railroad has ordered one. The switch and crossing company is about four months behind on orders, the chief difficulty being to get good men.

THE NICHOLS-LINTERN CO., of Cleveland, O., has issued an attractive pamphlet describing the track sanders made by it. Each equipment consists of two sanding traps with gaskets and one special operating valve. Special designs are furnished with the outlet at any desired angle and arranged for attaching either rubber hose, wire hose or iron pipe so as to meet all conditions required by steam or electric roads.

THE SLATER ENGINE CO., of Warren, Mass., is now building an 800-h. p. cross-compound engine for the Wabash River Traction Co., Wabash, Ind.

THE OHIO STEAM PUMP CO., of Canton, O., which has heretofore been using a part of the old Whitman & Barnes plant, has just purchased a site and will erect a new factory building which will enable it to handle its increasing business in much better shape.

WESTINGHOUSE, CHURCH, KERR & CO. announce the removal of their Pittsburg office from its former location on the first floor of the Westinghouse Building to more commodious quarters on the eighth floor of the same building. This change is the direct outcome of largely increased business in this district, and is accompanied by the organization of two new departments, those of engineering and of construction, in addition to the original sales department. The object of the management in making the change is to be able to accommodate more thoroughly and promptly the wishes and needs of patrons. They are prepared to give immediate attention to all classes of general engineering and construction work as applied to power and its uses in transportation and industry. They will provide in all cases from their engineering force adequate personal supervision of work in hand, both during construction and subsequent thereto. The office conducts, as formerly, the sales department of the Westinghouse Machine Co., and the increased facilities afforded by their new quarters, in addition to the acquirement of an engineering force, will enable them to fulfill the most extensive contracts.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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VOL. XII.

AUGUST 20, 1902.

NO. 8

The regular September number of the "Street Railway Review" will be made the Detroit Convention Souvenir. The convention being from October 8th to 10th, this will enable us to place the special issue in the hands of our readers several days before they leave for Detroit.

The "Daily Street Railway Review," which has been a highly-appreciated feature of the A. S. R. A. conventions since 1899, will this year be published in Detroit on October 8th, 9th, 10th and 11th, the first number appearing early on the morning of the opening day of the convention. As heretofore these four issues will be mailed daily to our subscribers and reach every street railway in the world, giving those unable to attend the conventions their first reports of the association meetings; in Detroit the "Daily" will be distributed at all the hotels as well as at the convention hall.

This will be the fourth year that the "Review" has published its Daily Edition at the Convention, and the growth in the size of these special issues is an index of the increasing importance of the annual meeting of the A. S. R. A. At Chicago, in 1899, there were five numbers of the "Daily Review" aggregating 104 pages of reading matter; at Kansas City the next year there were four numbers with a total of 89 pages of reading matter, a slight average increase; at New York last year the four issues of the "Daily" contained 125 pages of reading matter, or almost the same number as in two of the regular monthly editions of the "Review." Last year we made an innovation in numbering the pages of the "Daily" in sequence with the monthly "Review," so that the last page of the September monthly was 628 and the first of the October monthly was page 723. This plan will be followed with the Detroit "Daily" and therefore to make a complete file for 1902 the four numbers for October 8th, 9th, 10th and 11th should be preserved as well as the October monthly which will be dated the 20th.

On another page will be found the program for the Detroit meeting of the American Street Railway Association and also the

announcements of the chairman of the committee on exhibits concerning the rules governing the exhibition. The program as announced is one of unusual interest and among the papers that are particularly apropos are those on the "Merit System of Discipline," the "Transport of Express and Parcel Delivery," "Steam Turbine Engines," and "Signals for Urban and Interurban Railways," all of which are equally important to interurban and to city companies. The other papers deal with questions that affect rather city railway systems. The subjects of discipline and signals are mentioned elsewhere as being ones to which those who are charged with the operation of high speed lines are giving the most earnest consideration, and there is also a widespread interest in the steam turbine, and its application to railway work.

The Association will this year arrange for the publication of the convention papers well in advance of the meeting and their distribution to the members in ample time to give all those interested an opportunity to collect data and prepare for discussion at the convention. The executive committee has urged that the member companies instruct their delegates to be present at all business meetings of the association, and this suggests to us the idea that possibly the association has gone too far in the direction of cutting down the time allotted to its annual meetings, which is now but two days as compared to four days which was considered short enough a few years ago. The fact should not be overlooked that for many of the delegates the few days spent in attendance on the A. S. R. A. conventions constitutes their nearest approach to a vacation. When the street railway companies acting as hosts offer so much in the way of entertainment and the opportunities for profitable inspection trips over outlying suburban lines are as great as they are, it is not astonishing that the delegates should fail to attend all the association meetings. The setting apart of an entire day for the examination of exhibits has proved to be a most satisfactory arrangement and should by all means be continued, but we believe that hereafter the convention should extend over at least four days.

The applications to the secretary for exhibit space were far in excess of the space at first available, and permission was granted by the city of Detroit to temporarily enclose portions of the streets adjacent to the exhibition hall. In addition to this temporary tracks will also be put down outside the annex. This year those in charge of the exhibit hall have promulgated regulations governing the dimensions and location of signs displayed in connection with the exhibits, which are similar to those adopted at the 1901 convention with such gratifying results in improving the appearance of the hall.

The New York State Street Railway Association is the oldest of the state associations and is but one year junior to the A. S. R. A., the 1902 New York meeting which will be held at Fort William Henry Hotel, Lake George, N. Y., on September 9th and 10th being the twentieth annual convention of the state association. The New York association has devoted a great deal of attention to the consideration of questions which were of peculiar interest to New York roads, and has been a most convenient means of securing cooperation among members when united action was desired in all matters, such as tax and franchise questions, that affect the entire state. While thus by special reports and committee work covering the things within its field as a state, as distinguished from a national association, it has not failed to be of service to the street railways of the entire country; at its annual conventions there have always been technical papers of the highest character, and the discussions of practical subjects have proved of assistance to many an operating man outside of the state. The Association has every reason to be proud of the work it has done, and great credit is due Mr. G. Tracy Rogers, who has been the president for several years, and to the executive committee.

The coming meeting will undoubtedly be well attended as the development of electric railways in New York, particularly interurban lines, has been very rapid during the last two years.

The first decade of the 20th century bids fair to become as distinctly that of the "third rail" road as 1891-1900 was that of the "trolley," and the marked development made in this direction suggests several interesting points in connection with modern interurban railway practice—some in the nature of causes for the changes we see being made, and others that are results of these changes.

The third rail for a current conductor is the result of efforts to get higher speeds on electric railways without danger to the passenger. For safe operation at high speeds, heavy cars and trucks and a well built roadbed are essential, and the trolley wheel, with its small area of contact is entirely inadequate to conduct the larger current demanded because of increase in both car weight and speed. The electrical engineers of the Baltimore & Ohio R. R., in equipping the belt line tunnel for electrical operation, recognized this difficulty, and attempted to overcome it by increasing the number of trolleys on the locomotive, after a few years the overhead trolley system was abandoned and a third rail laid on the surface substituted as the conductor. The successful operation of heavy trams on the Chicago elevated railroads and some of the branch lines of the New York, New Haven & Hartford demonstrated the advantages of the third rail where large currents are to be transmitted to the car, but it was also apparent that an unprotected electrical conductor could not be safely installed in public highways, where most electric railways are located. A private right of way which can be fenced or otherwise protected from the general public is necessary if the electrical conductors are to be placed at the surface of the ground.

The policy of securing for electric lines the fee or a perpetual lease of the land occupied by their tracks was, we believe, first put in practice by the Cleveland capitalists who developed the extensive interurban systems radiating from that city. Their idea was that although the private way might be more expensive at first cost, the elimination of all franchise renewal questions, the opportunity to better protect the company from the results of injuries to trespassers on the tracks and at the same time get a better profile than the highway generally offers, and the possibility of higher speeds with safety, would vastly outweigh the objection of higher first cost. We believe that the failure to adopt this policy has in many cases been due solely to the fact that the laws of many of the states permit electric or "street" railways to depart from the highways only where there is a physical necessity for such a deviation. Where the laws are favorable, there has recently been a marked increase in the extent to which the substitution of a third rail for an overhead wire is considered practicable and desirable. Thus until about a year ago the idea of purchasing a right of way through a town of any considerable size was scarcely thought of, and where this was done it was only as a last resort to prevent a "hold-up" of the new company, the authorities having demanded exorbitant compensations for the franchises granted.

Aside from the two instances mentioned, where steam railroads have put down a third rail for electrical operation, and on the elevated lines, the third rail has been adopted by the Albany & Hudson Railway & Power Co., which put its 36-mile line between Albany and Hudson, N. Y., in operation in 1900, the Grand Rapids, Grand Haven & Muskegon Railway, which began operating over 42 miles of track in western Michigan this summer, and the Aurora, Elgin & Chicago, which it is expected will begin operating during the current month. On both the New York and the Michigan roads it was considered impracticable to use the third rail in cities and villages, but on the Aurora, Elgin & Chicago, which is described at length in this number, the third rail is used everywhere except for a short distance in one of the terminal cities. To do this it was necessary to buy rows of lots or portions of lots, extending through the various towns, and in many cases considerable expense was incurred in removing or tearing down the buildings on the premises bought. We entertain no doubt but that the private right of way will in the near future be considered a necessity for electric interurban roads of any considerable length.

* * *

Along with the question of location which apparently has been solved satisfactorily, come those of signal systems and discipline of trainmen, and these grow in importance as speeds are raised and the volume of traffic increases. The recognized standard for electric railways is now a dispatching system in which, however, the telephone is used rather than the telegraph. Two instances have been cited in recent numbers of the "Review" where steam and electric trams running over the same tracks were successfully handled, the electric cars, which alternated with the steam trains, being given train numbers and subject to the same rules as the latter. Although no special difficulties were experienced in these cases, the idea is gaining ground that to insure the greatest safety of operation on the high speed electric lines a block signal system is desirable, for double as well as for single track lines.

Some complications are introduced by reason of the service rails

being utilized for the return of the electric current, and the signals operated by "track circuits" made and broken by the car wheels and axles are not applicable to electric railways without modification. The manufacturers of signal apparatus, as well as railway managers, are alive to the demand, however, and signal systems carefully designed to meet the conditions are being put in service.

Good discipline is largely a matter of good management, and while there may be at present a scarcity of men who are experienced in the handling of the apparatus on electric cars, and at the same time appreciate the importance of obeying train orders. It will be, we believe, only a short time until the roads needing this class of men will have them.

* * *

Some important developments in regard to the maximum speeds practicable on electric railways may be expected in the near future as it has been announced that the General Electric Co. will conduct special tests over the Aurora, Elgin & Chicago line, probably within the next sixty days. Those in charge of this work are confident that speeds in excess of 100 miles per hour can be attained without difficulty, though no predictions are made. These speed tests will be made under conditions that are in some respects much more favorable than was the case with those made on the Berlin-Zossen experimental line, as the trouble there lay in the track rather than the cars. There have been some attempts made to draw from the Berlin-Zossen experiments the conclusion that an electric car is more severe on the track than is a steam locomotive, but this does not appear to be justified.

The attitude of the daily press toward street railway companies led us, in 1899, to urge the street railways of the large cities to publish weekly or semi-monthly bulletins for themselves and thus be assured of an unbiased medium for presenting their announcements to the public. Since that time several companies have published, during the summer months at least, weekly papers which serve to convey information that patrons of the cars could not readily get in any other way, and at the same time are good advertising mediums when the railway company has a park or pleasure resort on its line. The Detroit United Ry is the latest addition to the number of companies using this method of reaching the public.

The New Jersey & Hudson River Railway & Ferry Co. which operates a suburban road in New Jersey and a ferry across the Hudson River to New York, landing at W. 130th St., has for several years spent considerable sums of money in advertising and with satisfactory results; the idea of the management is to tell people about the attractions of its line and how to reach it. This example could be followed with profit in other cases where suburban or interurban cars do not run into the terminal cities but passengers have to transfer to the city roads; specific instances could be cited of electric lines having city connections where there are no attempts made to notify the public in general how the outlying road can be reached.

In this number we publish the fourth of a series of articles by Mr. W. E. Partridge on special types of cars, which are both interesting and instructive, as showing the development of these peculiar classes of electric railway rolling stock. The first three of the articles by Mr. Partridge were on "California and Combination Cars" and the one now published treats of an allied type, "Convertible Cars," including of course the semi convertible car. A car that can be quickly adapted for either fair or foul weather and is durable, has many advantages which are quite generally appreciated.

The question regarding the advantages and disadvantages of a narrow gage for local suburban railways which was discussed at the International Tramways Congress in London, brings out the fact that it has advocates in Europe, but in this country the companies having narrow gage lines are finding it necessary to lay an additional rail, so that standard gage cars may also be operated. While the first cost is of course favorable to the narrow gage, this construction is hampered by want of space on the trucks and in the cars, and in the case of electric railways the difficulty of adapting the standard sizes of machinery to the trucks. The additional cost of the transshipment of freight and express matter is also an important item in many cases.

The Aurora, Elgin & Chicago Railway.



The Aurora, Elgin & Chicago Ry., which is now practically completed, constitutes one of the most important suburban electric railway undertakings which has been attempted up to the present time. This road covers one of the most populous suburban districts in the neighborhood of Chicago, and with nearly 100 miles of its own track and physical connections with several other

suburban electric railways the system will serve some twenty cities and towns outside of Chicago having an aggregate population of about 150,000, some data as to the distribution of which will be given in another place.

The construction of this road, including the roadbed, power house, sub-stations, and line work, has been designed in a most careful and substantial manner and no expense has been spared to

principle" that for the security of investors and permanency of the road an electric railway company should own its right of way in fee, or at least have a perpetual easement in the realty occupied by its tracks. With the exception of the city street crossings the company owns the fee of all of the right of way. In the country the strip of land is 100 ft. wide except for a few short stretches, which aggregate perhaps half a mile in length, where the width is 66 ft. In all cities and villages the company bought either the whole or portions of the lots necessary to give it a complete way, in many cases moving or wrecking the improvements on the realty. Being organized under the railroad law the franchise question has no terrors for this company.

The company owes its origin and the successful completion of its plans principally to Mr. L. J. Wolf, of Cleveland, who has been ably assisted by Messrs. Will Christy, of Akron, O., and Charles Jones, of Wheaton, Ill. Mr. Wolf has for years been prominently identified with electric railways, and is at this time president of the



GENERAL VIEW OF ENGINE AND GENERATOR ROOM, POWER STATION, BATAVIA, ILL.

make every detail of the installation as complete and thoroughly up-to-date as possible, and in all of its engineering features this road represents the most modern and approved practice. It is a third-rail system throughout and the curves and grades have been laid out with the idea of operating a high speed schedule.

The road passes through a picturesque section of country which, though served by the suburban lines of several steam railroads, is still greatly in need of more frequent and rapid service. The passenger traffic between all of the suburbs reached by this road and Chicago is capable of vast expansion, but it is at present greatly hampered by the time necessarily lost in making connections between the different steam road branches now operating in this territory, so that at certain times of day a trip which should be made in an hour or less is frequently protracted to two or three hours. By furnishing a frequent and rapid service, as is designed by the Aurora, Elgin & Chicago, the transportation facilities of these suburbs will be greatly improved and a large proportion of the traffic of this territory is certain to be diverted to the new line.

This enterprise has been developed by Cleveland men, and they have acted on what we believe deserves to be called the "Cleveland

Springfield & Xenia Traction Co., which is now building an electric line between Springfield, O., and Xenia; vice-president of the Western Ohio Railway Co., of Cleveland, and president of the Elgin, Aurora & Southern Traction Co. and of the Aurora, Elgin & Chicago. Mr. Christy is one of the pioneers in interurban electric railroading, having been for some years the manager of the Akron, Bedford & Cleveland, which is now part of the Northern Ohio Traction Co.'s system; after leaving this company he, with Mr. M. J. Mandelbaum, of Cleveland, effected the consolidation of the Dayton Traction Co., the Cincinnati & Miami Valley Traction Co., and the Cincinnati, Hamilton & Dayton Electric Railway Co., forming the Southern Ohio Traction Co. Mr. Jones was connected with the construction of the Lorain & Cleveland Ry., which it will be remembered, for some time held the record for high speed on electric lines, and was formerly one of the engineers of the Lorain Steel Co., at Lorain, Ohio. Mr. E. H. Arnold, who has had immediate supervision of the construction on the Aurora, Elgin & Chicago, was assistant chief engineer on the Lorain & Cleveland, and has had an extended experience in electric railway work.

The company is a consolidation of the Aurora, Wheaton &

Chicago Railway Co., the Elgin & Chicago Railway Co. and the Batavia & Eastern Railway Co., and the officers are President, L. J. Wolf, vice-president, M. H. Wilson, secretary, Harry Greenbaum; treasurer, M. J. Mandelbaum. The capital stock is \$3,000,000, one half of which is preferred, and there were authorized \$3,000,000, in 5 per cent gold bonds, to be issued as needed for construction.

The construction force comprised Will Christy, president of the Cleveland Construction Co., who was general manager during construction; W. E. Davis, vice president of the Cleveland Construction Co., consulting electrical engineer; Chas. Jones, chief engineer; E. H. Arnold, construction engineer; Ernest Gozenbach, electrical engineer, W. L. Morris, mechanical engineer.

The operation of the road will be in charge of Mr. Warren Bicknell; the operating staff will include C. E. Flemer, auditor; W. W. Crawford, superintendent of transportation; Ernest Gozenbach, electrical engineer.

The route of the Aurora, Elgin & Chicago Ry. and the steam railroads with which it will be in competition in the territory served are clearly shown on the accompanying map. From the Union Loop, Chicago, to the terminal of the Garfield Park branch of the Metropolitan West Side Elevated Railway at West 52d Ave. is a distance of 6½ miles, the schedule time between these points being 25 minutes. From West 52d Ave., the eastern terminus of the Aurora, Elgin & Chicago, this line is a double track road for 21 miles to the Chicago Golf Club near Wheaton. From Wheaton

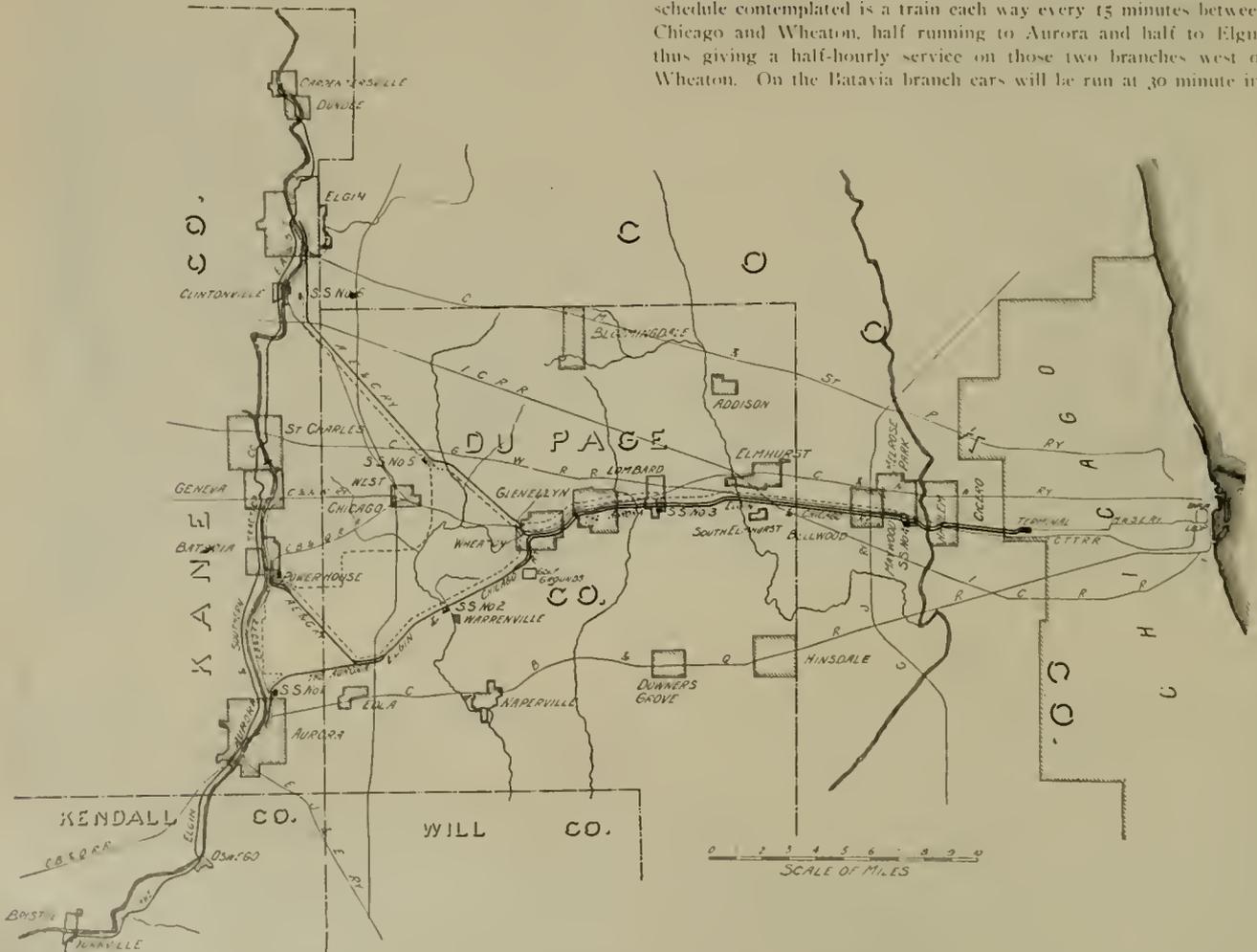
are long sidings, one of 1 mile, one of 1½ miles, two of 1,500 ft. and three of 800 ft., which will bring the total to 82 miles measured as single track.

The running time from Aurora, Elgin or Batavia to Chicago will be 45 minutes for express trains and one hour for local trains. The



VIEW ON COOK COUNTY LINE.

schedule contemplated is a train each way every 15 minutes between Chicago and Wheaton, half running to Aurora and half to Elgin, thus giving a half-hourly service on those two branches west of Wheaton. On the Batavia branch cars will be run at 30 minute in-



MAP OF THE AURORA, ELGIN & CHICAGO RY. AND CONNECTING LINES

there are two branches, one northwest to Elgin, 16½ miles, and one southwest to Aurora, 14½ miles, making the road from the eastern terminus to Aurora 33 miles long. Another branch from the Aurora fork runs to Batavia, 7 miles from the junction. Of the 56 miles of road, 21 miles are double track and in addition there

tervals connecting with Aurora and Chicago trains at Eola Junction. The maximum number of cars per train will probably be four.

The rates of fare have been adjusted so as to be somewhat less than the lowest commutation rates of the competing steam lines. The principal distances and rates of fare, in cents, are as follows:

From W. 52d Ave., Chicago, to

	Distance, Miles.	Single Fare.	Round Trip.
Austin Ave.	1	5	10
Oak Park	2	5	10
Harlem	3	5	10
Maywood	4 ¹ / ₄	5	10
Bellwood	4 ³ / ₄	10	20
South Elmhurst	9 ³ / ₄	15	25
Lombard	14	18	30
Glen Ellyn	16 ¹ / ₂	20	35
Wheaton	19	25	45
Chicago Golf Grounds	20	30	55
Warrenville	23 ³ / ₄	40	75
Eola Junction	27 ³ / ₄	45	80
Aurora	33	50	90
Batavia	33 ³ / ₄	50	90

Children over six years and under twelve years of age are entitled to half-rate tickets. No fare is charged for children under six years of age when accompanied by an adult. The half-fare rates are about one-half that given in the table.

At Elgin and at Aurora physical connection is made with the tracks of the Elgin & Southern Traction Co., which is a consolidation of the companies along the Fox River from Carpentersville to Yorkville, via Dundee, Elgin, Clintonville, St. Charles, Geneva, Batavia, Aurora, and Oswego. The Elgin, Aurora & Southern system includes the Carpentersville, Elgin & Aurora, the Aurora & Geneva, and the Aurora, Yorkville & Morris Railways, and is controlled by the same interests as the Aurora, Elgin & Chicago.

The steam railroads in the territory are the Chicago, Milwaukee & St. Paul to Elgin; the Illinois Central; the Chicago & Northwestern to Wheaton, Geneva and Batavia; the Chicago Great Western to St. Charles; the Chicago, Burlington & Quincy to Batavia and Aurora; the Elgin, Joliet & Eastern to Aurora.

The population of the towns outside of Chicago served by the Aurora, Elgin & Chicago Ry. is as follows:

Austin	15,000
Oak Park	10,000
Harlem	3,500
Maywood	4,500
Melrose Park	2,800
Bellwood	200
Elmhurst	2,000
Lombard	700
Glen Ellyn	900
Wheaton	3,000
Warrenville	500
Eola	200
Aurora	30,000
Batavia	4,500
Elgin	30,000

Total 107,800

To these may properly be added the population along the Elgin, Aurora & Southern as follows:

Carpentersville	1,800
Dundee	2,000
Clintonville	600
St. Charles	3,200
Geneva	3,000
Montgomery	500
Oswego	800
Bristol	600
Yorkville	1,200

Total 14,600

In addition to this there is in the territory west of the Fox River and within 40 miles of Aurora, Batavia and Elgin, and tributary to them a population of about 200,000.

Tracks and Bridges.

The route for the Aurora, Elgin & Chicago was chosen only after a most careful survey of the territory as the object was to build a line on which trains could be operated at high speeds. With the exception of the curves near Chicago, which were ren-

dered necessary to avoid crossing streets at angles so acute as to make undesirably long breaks in the third rail, the curves are struck with long radii, and are connected by long tangents. The maximum grade is 1.8 per cent for about 1,000 ft., this being necessary to get down into the Fox River Valley; none of the other grades are above 1 per cent.

The track standards are shown in one of the accompanying engravings. The line is laid throughout with 80-lb. T-rail of the A. S. C. E. standard section, in 60 ft. lengths. The joints are made with 28-in. 4-bolt splice bars; the bolts are 1 in. in diameter by



BRIDGE OVER DES PLAINES RIVER.

4 in. long. Ties are spaced 2,840 to the mile, each fifth tie being of oak 6 x 8 in. x 9 ft., for the support of the third rail insulators. On tangents the other ties are of cedar 6 x 8 in. x 8 ft., and on curves of oak of the same dimensions. The entire line is gravel ballasted except on the sections near the Fox River, where crushed stone is used.

The conductor rail is of T-section, 100 lb. per yard, of a special soft steel, 0.10 per cent carbon; the rail is 5¹/₂ in. high, the head being 2¹/₂ in. wide and the base 5¹/₂ in. It is supported with the inner flange of the head 10³/₈ in. from the gage side of the service rail, and on insulators which bring the top of the rail 11 3-16 in. above



CATTLE PASS AT SOUTH ELMHURST.

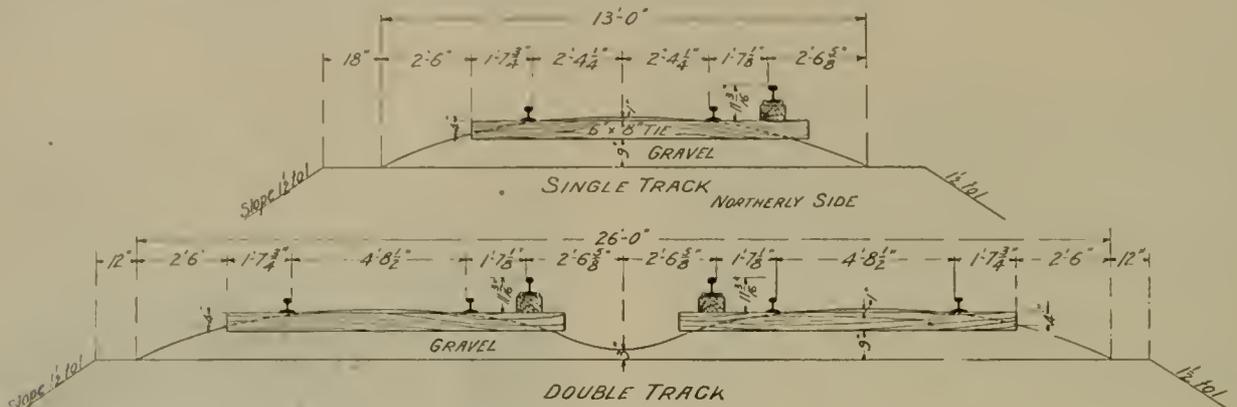
the ties. On that portion of the line first built the third rail insulators are paraffined wooden blocks with foot stands and top plates of malleable iron, but the standard adopted for future work is a malleable iron insulator designed and patented by Mr. Gonzenbach, which is shown here in vertical section. The insulation collar, circular in plan, is made of "Dirigo" and sets on top of the circular malleable iron base; the malleable iron cap fits over this and has two bearing strips for the rail and two vertical lugs to prevent lateral displacements. These insulators were made by the Ohio Brass Co. The weight of the rail is relied upon to hold it in

position and no fastenings are provided; the insulator bases are secured to the ties by two railroad spikes.

At highway and railroad crossings the rail is broken and the car runs the crossing under its momentum. These breaks in the third rail vary from 26 ft. to 100 ft., according to the conditions, there being but two breaks of 100 ft. Wherever there is such a

ground) and the bond terminals are shown in detail in the line drawings. The three bond terminals for connection to the rail are spaced about 2 in. between centers, the holes being drilled in the inner bottom flange, thus making available a large contact area between the bond and rail.

The space between the cable end and the bronze terminal shell is

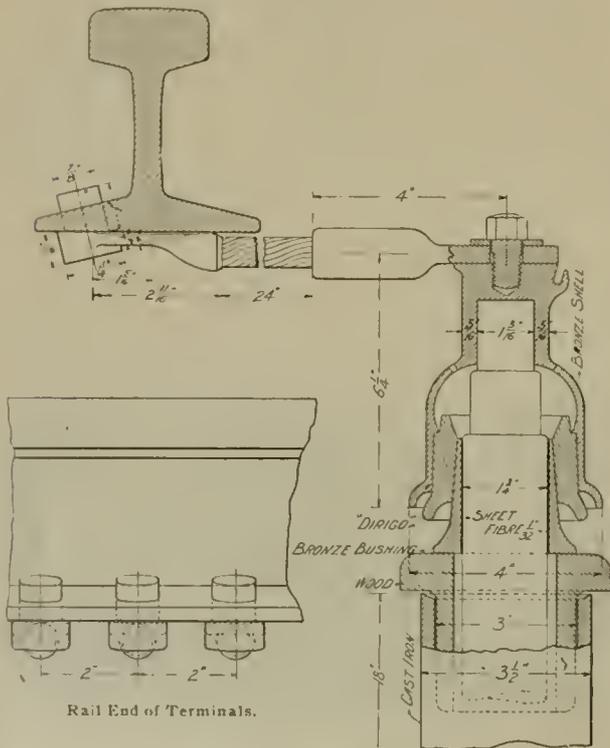


TRACK STANDARDS FOR AURORA, ELGIN & CHICAGO RY.

break, the sections are connected by cables laid 3 ft. underground and covered by planks. These cables are of copper and were furnished by the American Steel & Wire Co.; they are of three sections, 1,500,000, 1,000,000 and 500,000 c. m., the heaviest section being used for a distance of about two miles on either side of the sub-stations, the one million section for succeeding distances which are about six miles, and the lightest cables are used at special work. The

filled with paraffine. The cast pipe which protects the cable end is fastened to a 4-ft. post, the pipe having a band cast on it under which a strap can be conveniently placed.

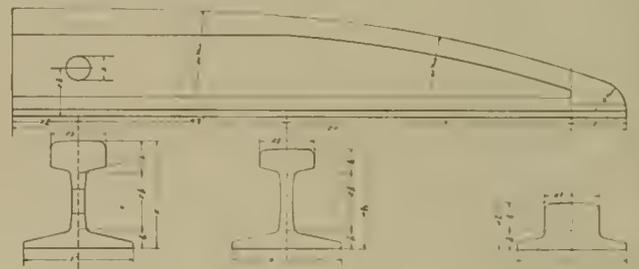
The sections of conductor rails are provided with cast tips 28 in. long which serve to guide the contact shoe into position on the



GONZENBACH CABLE TERMINAL AND "PROTECTED" TERMINAL BOND.

cables first ordered were rubber insulated but later a paper insulation cable was adopted as the standard.

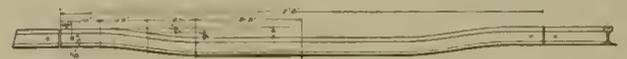
These cables are soldered into terminals, made by the Ohio Brass Co. according to the design of Mr. Gonzenbach. From the cable terminal to the conductor rail connection is by a three-branch stub end bond 24 in. long made by the Protected Rail Bond Co., of Philadelphia. The cable terminal (including the wooden bushing and the cast iron pipe for protecting the cable where it enters the



TIP FOR THIRD RAIL.

100-lb. rail and the adjacent rail, 33 ft. long, is also given an inclination of about 2 in. A drawing of this tip is shown herewith. The splice bars for the conductor rail are similar in design to those used on the Manhattan Ry., New York City, and which were illustrated in the "Review" for December, 1900, page 708. These bars are 83 1/4 in. long, with two bolt holes 1 1/8 x 1 3/8 in. spaced 6 1/4 in. between centers and were made by the Ohio Brass Co. and the Ludlow Supply Co. At each joint of the conductor rail are two 7 in. 500,000-c. m. solid terminal "Protected" rail bonds furnished by the Mayer & Englund Co., of Philadelphia. The track rails are double bonded with 12-in. bonds, 1-in. terminals, the bonds being partly the "Protected" and partly the American Steel & Wire Co's. bonds.

At turnouts and switches it is necessary to depress the conductor rail for a short distance to permit the shoe to change its position



DROP RAIL AT SPECIAL WORK.

without striking the side of the rail. For this purpose sections of the third rail are bent as shown in the line drawing of the "drop rail" and placed with its center 12 in. back of the point of double tread on the service rail switch. In addition the conductor rails for 10 ft. on each side of the 12-ft. drop section are given a slope of 1/2 in. in 10 ft., the ties being dapped where they receive the insulators.

At highway crossings vitrified clay cattle guards, made by the Climax Stock Guard Co., Marquette Bldg., Chicago, are installed.

These guards are made of blocks each 24 in. long by 8½ in. wide, and in section like an inverted W with walls 1¼ in. thick. Forty sections are required for a guard 8 ft. by 8 ft., and these are held in place by strips of wood. The Aurora, Elgin & Chicago ordered over 700 guards, which are used exclusively; the half-tone engraving of the exterior of the sub-station shows one of the "Climax" guards in the foreground.

The road being built with high speed operation in view no expense was spared to make the track the best that it is possible to build. By reason of the exceptionally heavy rainfall this season the settlement of the roadbed has been as great as would ordinarily take place in two or three years, so that when finally surfaced the track will be in perfect condition.

All the steel structures on the road are designed for a live load of two 142-ton Cooper's E-40 locomotives followed by a uniformly distributed load of 4,000 lb. per lineal foot. The steel bridges are of the deck type wherever the conditions permitted, and elsewhere are through girder bridges.

The principal steel bridges are as follows: Des Plaines River, double track through girder, two 100-ft. spans. East branch of Du Page River, double track deck, one 69½-ft. span. West branch of Du Page River, single track through girder, one 89-ft. span, in conjunction with a 22½-ft. deck span. Lombard highway crossing, double track deck, one 36-ft. span. At three other highway overhead crossings are 45-ft. through girder spans. The Elgin branch crosses

Class A.—Portland cement, 1 part; sand, 2 parts; stone, 4 parts. Used for arch sheeting, bridge seats and parapet walls.

Class B.—Portland cement, 1 part; sand, 3 parts; stone, 6 parts. Used for abutments, bench walls for arches, and retaining walls.



CROSSING FOR OVERHEAD ROAD.

Class C.—Portland cement, 1 part; sand, 4 parts; stone, 8 parts. Used for foundations and other work as directed by the engineer in charge.

The foregoing proportions are by volume, one-fourth barrel of



35-FT. ARCHES OF CONCRETE MASONRY.

the Chicago & Northwestern tracks on a 150-ft. through truss bridge. All abutments and piers are of concrete.

In addition to the various steel structures there are concrete arch bridges at various points. Over Salt Creek at South Elmhurst is a concrete bridge with two 35-ft. arches, and at other small streams

cement as packed by the manufacturers being taken as a cubic foot, and the sand and stone measured loosely, the stone to be broken to pass a 1½ in. screen.

The concrete was put down in layers of 4 in. to 5 in. in thickness and thoroughly rammed until water appeared on the surface.



WATERWAY AT BATAVIA

are arches of from 10 to 15 ft. span. Views of several culverts and cattle passes are shown in the half-tone engravings.

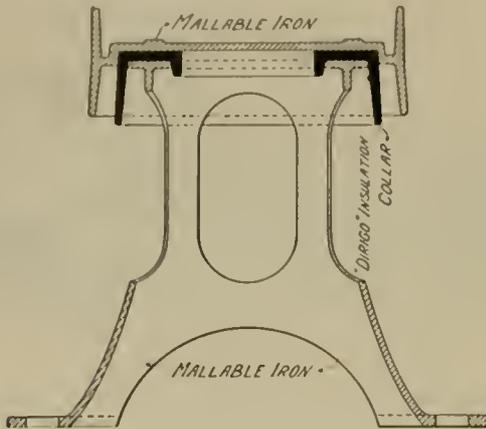
The specifications under which the concrete work was done provide for three grades of concrete, the composition and uses of which were as follows:



DOUBLE-BOX CULVERT AT BELLEWOOD.

In order to get into Chicago with the Aurora, Elgin & Chicago line it was necessary to cross several steam railroads at points where it was impracticable to separate the grades: At Forest Home, three miles west of 52nd St., the Wisconsin Central, Chicago, Great Western and Chicago Terminal Transfer roads are

crossed, about ten miles west of Maywood there is crossing with the Chicago Junction road and at South Elmhurst with the Illinois Central. These three crossings are protected by interlocking signals, with derailing switches in both the steam and electric lines. The derailing switches are of the lifting type which leaves the track rails



GONZENBACH THIRD-RAIL INSULATOR—ONE-THIRD SIZE.

unbroken, this being effected by having the derailing points thrown into a position on top of the service rail; the derailing switches and split switches were made by the Morden Frog & Crossing Works, Chicago.

At intervals of four miles there are cross overs with lights. The turnouts all have spring frogs.

The right of way is all fenced with the American Steel & Wire Co's. woven wire fencing, 55 in. high with 11 wires. The posts are of cedar, 8 ft. long, with 6-in tops, set 3 ft. in the ground; they are spaced 16½ ft. apart.

The eastern terminal of the road where passengers are transferred to the Metropolitan West Side Elevated Railway, of Chicago, is shown in one of the line drawings. The Metropolitan company owns a tract of land at W. 52d Ave. on which it has constructed a

inside the loop gives the means of ingress and egress to passengers without their crossing any of the tracks, these being fenced in. The Metropolitan has built inspection pits and storage tracks as indicated on the plan.

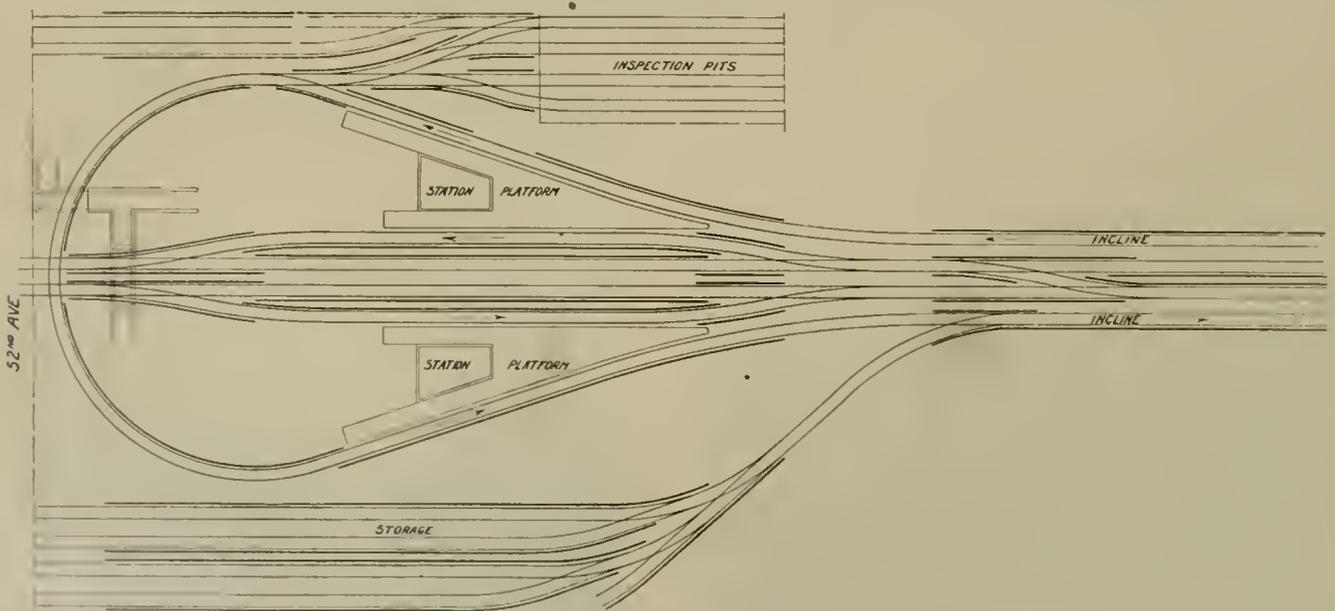
In connection with this terminal, there has recently been completed an interesting piece of engineering work that is quite out of the ordinary. When the Metropolitan incline, which is a double track deck structure with four lines of plate girders, supported on transverse plate girders which rest on two rows of steel columns, was built it was necessary to make a reverse curve at the east end because the necessary rights of way for a straight track could not be secured at that time. The girders carrying the curves, however, were designed for the straight line location to which it was intended



CROSSING AT INDIAN CREEK, NEAR AURORA.

to shift the structure ultimately, and extra plates spliced to the girder ends for temporary use.

Fortunately the Metropolitan company secured the needed rights of way and was enabled to move the incline before it was used for regular traffic. The work of moving was undertaken July 25th and completed Aug. 8th; it was done by contract under the direction of



TERMINAL AT 52D AVE.

Loop and connecting track Metropolitan Road. Central tracks—Aurora, Elgin & Chicago Ry.

terminal loop at grade, the elevated structure being reached by an incline extending between 48th Ave. and 52d Ave. The Aurora, Elgin & Chicago double track line crosses the Metropolitan loop at grade, the platforms for transfer of passengers being located within the loop and between the tracks of the two roads used for the same direction of traffic. A subway with stairs leading to the sidewalk in 52d Ave. and to each side of the Aurora, Elgin & Chicago tracks

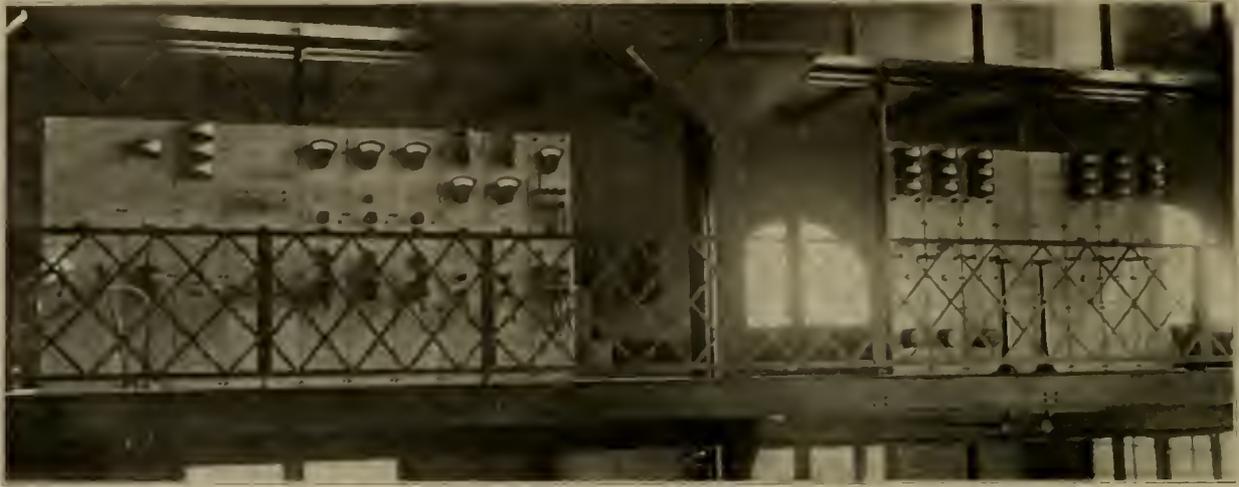
Mr. W. S. Menden, chief engineer of the Metropolitan. The three spans of the reverse curves mentioned were cut apart for removing the extra plates referred to and shifted separately. The rest of the incline, comprising 19 full spans, was moved as a whole.

In moving the structure was first jacked up some 18 in. to clear the pedestal anchor bolts and a blocking of 6 and 8 in. timbers was then built between the old and the new pedestals; two lines of 80-lb.

ance, it is constructed of Illinois buff brick with white stone foundations and trimmings, the building, including the coal storage, being 202 ft. 4 in. x 160 ft. 6 in. The engine and generator room measures 109 ft. 6 in. x 83 ft. 5 in. and the boiler room 108 ft. 2 in. x 49 ft. 0 in. The stack is placed at the center of the length of the boiler room with one wall flush with the wall separating the boiler

distribute the power. This plan of arranging the machinery is a most logical one as it permits of additions at either end of the apparatus at present installed without derangement of the general plan that is followed out.

By reference to the half-tone illustrations and the line drawing showing the station in section it will be seen that coal trains may

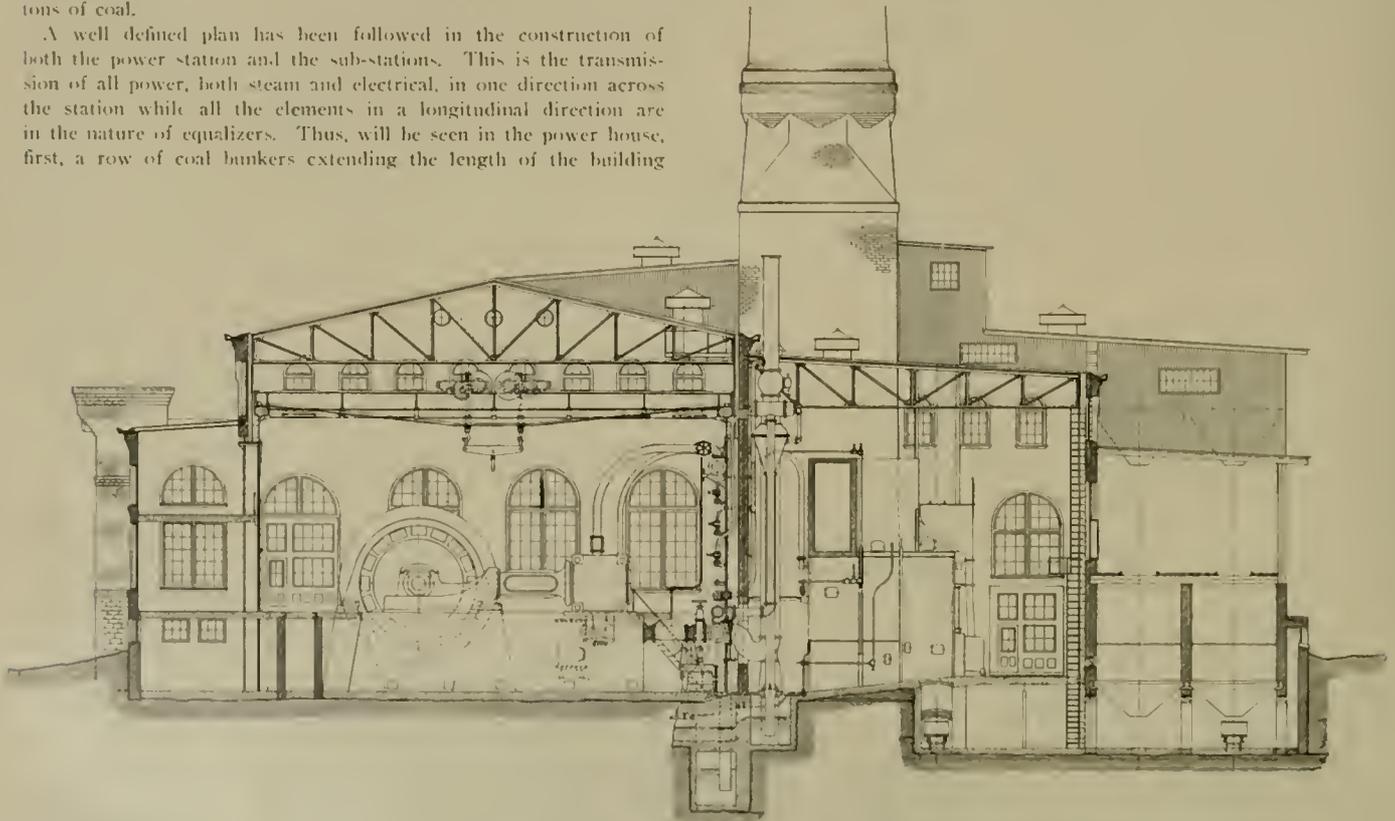


SWITCHBOARD GALLERY IN POWER STATION.

room from the engine and generator room. The coal storage is 25 ft. wide inside the walls and extends the entire length of the building and is divided by brick walls into 18 compartments in the bottom of each of which are two steel hoppers. Each of the 18 bunkers has a capacity of 3,771 cu. ft., and is designed to hold 100 tons of coal.

A well defined plan has been followed in the construction of both the power station and the sub-stations. This is the transmission of all power, both steam and electrical, in one direction across the station while all the elements in a longitudinal direction are in the nature of equalizers. Thus, will be seen in the power house, first, a row of coal bunkers extending the length of the building

be run over the bunkers and the contents dumped. In the basement, under the coal bunkers and boiler room, there are tracks of 20-lb. rails laid to 2 ft. outside gage, over which are run small cars of about 1 ton capacity for transferring coal to the boiler bunkers. The space between these track rails is filled with concrete so that



CROSS SECTION OF POWER HOUSE, BATAVIA.

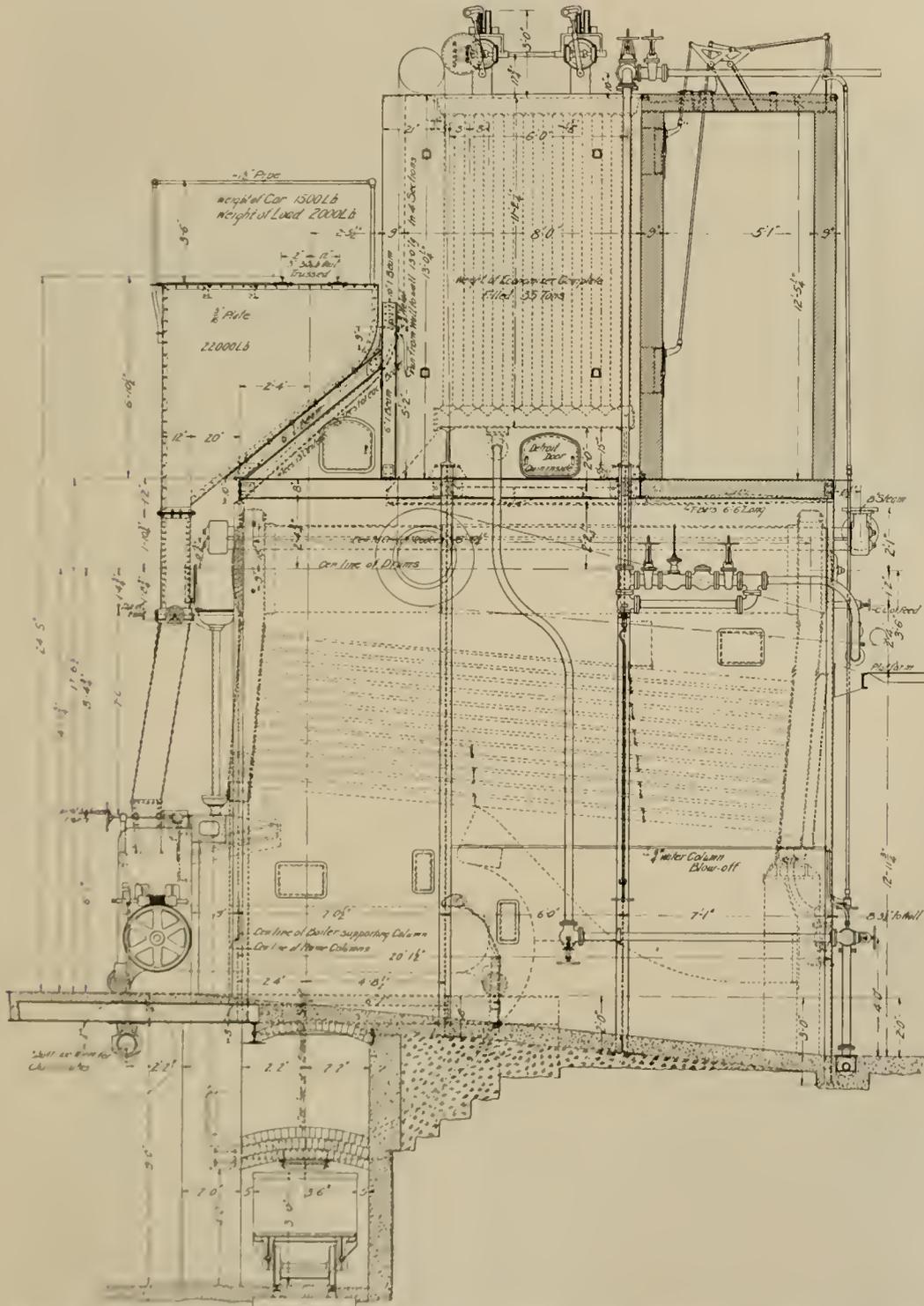
and parallel to these are the boilers. Then comes the steam piping for the entire plant suspended on the partition wall between the boiler and engine rooms. The next row of machinery consists of pumps and auxiliary apparatus followed by the engines, then the dynamos and lastly the transformers, oil switches and cables which

there is no chance for dirt to accumulate and a better footing is afforded for the men handling coal. Two transverse tracks at the center of the building lead to two elevators located in front of the stack on which the loaded cars are lifted to a longitudinal track running above the boilers. In front of and over each boiler is a

steel bunker holding from 5 to 7 hours' supply of coal, the coal being fed down through chutes to the furnaces.

A track in the basement under the boilers permits the small cars to be loaded with ashes, and they are then run to the elevators and lifted to the level of the bottom chords of the roof trusses and run out to ash hoppers, located above the coal tracks. From these

three more are in course of erection. These are all water tube boilers with 4,500 sq. ft. of heating surface and 500 sq. ft. of superheating surface each, and were built by the Edge Moor Iron Co., Edge Moor, Del. A novel feature of these boilers is the front, which on each consists of a single Kinnear rolling steel door; this arrangement of front is particularly desirable in this station where the chutes from the coal bunkers above the boilers would seriously interfere with the opening of doors of the ordinary type.



SECTION SHOWING ARRANGEMENT OF BOILER UNIT—MCKENZIE FURNACE—EDGE MOOR BOILER—GREEN ECONOMIZER.

hoppers ashes may be dumped directly into freight cars and hauled away.

The exterior of the coal storage shelter is of steel, lattice at the top, and sliding doors in the middle.

The boiler room is designed for 10 boilers of 500 horse power, nominal rating, of these five have been placed in operation and

Each boiler has 234 tubes 4 in. by 17 ft. 4 in., the headers being 18 ft. 10 1/4 in. between centers as measured along the center lines of the drums of which there are three, each of 30 in. diameter.

Each boiler has a McKenzie traveling grate with effective area 11 ft. 8 in. long by 11 ft. wide. The arch over the front end of the furnace is of special bricks with longitudinal grooves on the sides which fit to bars of bulb section bolted to a cast iron box girder shown in end view in the line drawing of the boilers.

Each boiler is equipped with a Green fuel economizer, which is located immediately above the center of the boiler. This arrangement, which is different from that in any other installation made by the Green Fuel Economizer Co., makes the economizer practically a part of the boiler, as the gases pass directly into the economizer and on leaving enter the smoke flue. Each economizer is fitted with an automatic scraper which is driven by an electric motor. Each economizer has 2,600 sq. ft. of heating surface, and a water capacity of 20,000 lb.

All the boilers are fitted with Morris patented blow-off valves arranged for use as a combined wash-out and emergency valve. A feature of this valve is the making of the body and cap joints with flanged, tongued, and grooved joints, held together by two swivel eye-bolts made fast to the body of the valve; this arrangement permits the cap and stem to be easily removed when cleaning out the boilers or re-seating the valve.

The entire station has its foundation on rock and for the stack foundation it was only necessary to put in concrete footings extending to a depth below the lowest level of excavating necessary for waterways. This footing is about 15 feet deep.

In section the stack is square up to a few feet above the roof of the station, above which point it is circular. The square portion is of stone and the rest brick. The bottom is 23 1/2 ft. square outside

above normal. A feature which gives a very neat appearance to the engines is the heavy base plate extending over the entire width of the engine foundations under the guide barrels and cylinders, including the dash pots. These plates join with the extended webs at the base of the main bed plates, and are provided with oil channels and heavy beaded edges which unite conveniently with the floor of the engine room. The fly wheels are 22 ft. in diameter, of the segment or built-up type, and weigh 160,000 lb. each.

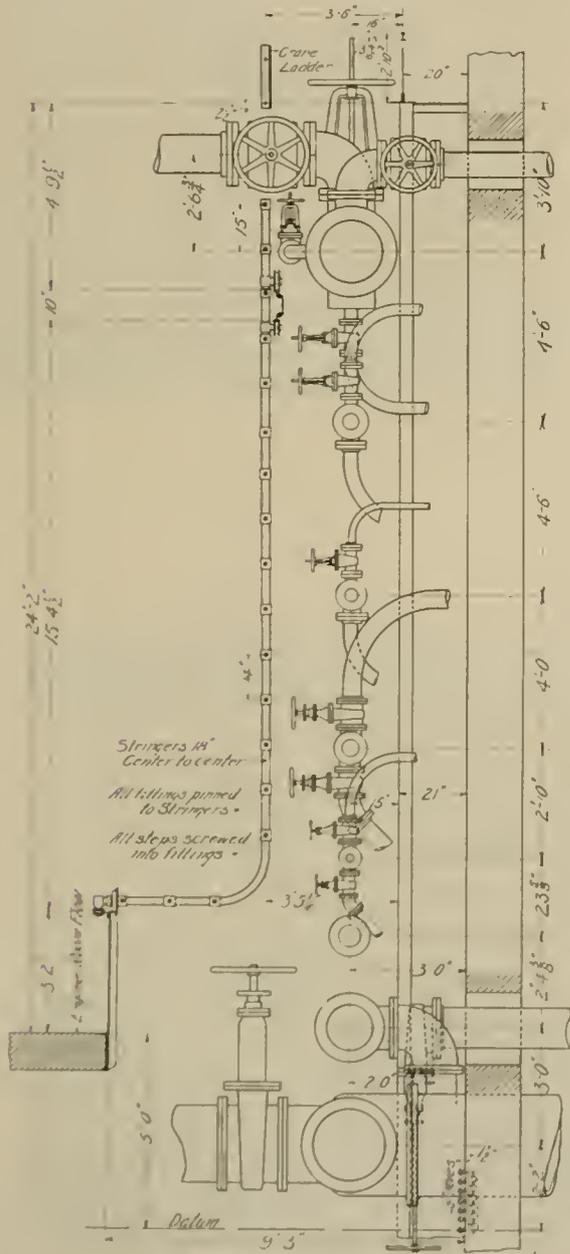
The generators of the main units are General Electric three-phase alternators, type A-T-8 rated at 1,500 kw., the rated output of each phase being 377 amperes at 2,300 volts, when running at 75 r. p. m.

For supplying current to the motors driving the auxiliary apparatus there are two engine driven motor units each consisting of a 14½ x 15 in. simple engine direct connected to an 8-pole 125-volt 160-kw. generator, and a motor-generator set comprising a 300-kw. induction motor and a 125-volt 300-kw. generator. These engines

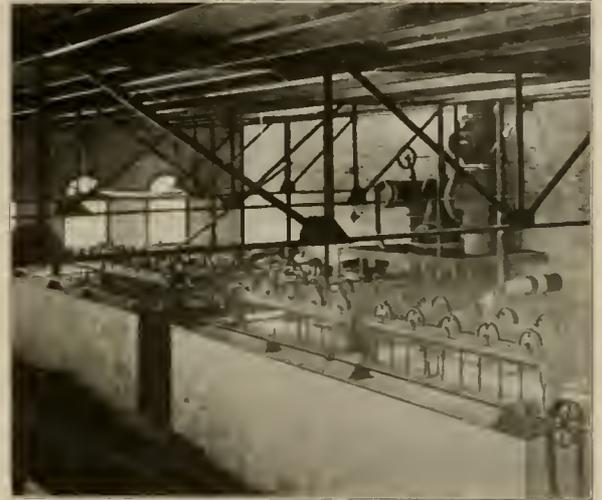
each, which for large weights are hooked to the extremities of a yoke and thus enabled to work together. From the power station plan it will be remarked that a track some 45 ft. long has been laid into the building so that loaded cars may be run in where the crane can be used for handling heavy weights.

The transformers, line switches and blowers are arranged symmetrically along the outside side wall of the generator room, the switchboard being placed in a gallery overhead.

The piping for the plant is, so far as possible, all placed on the engine room side of the wall separating the boiler and engine



SECTION OF PIPING.

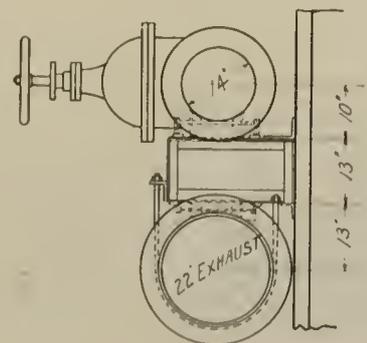


BOILERS FROM ABOVE.

rooms. Supported on suitable brackets which are furnished with rollers capable of adjusting the position of the pipe vertically and laterally, are eight mains arranged in the following order from top to bottom:

- 20-in. steam header, with 14-in. valve.
- 5-in. boiler feed main.
- 4-in. general water main.
- 5-in. dry vacuum main.
- 2½-in. service water main.
- 7-in. exhaust main.
- 14-in. condenser water main.
- 22-in. exhaust vacuum main.

The arrangement and connection of these headers are shown in the front elevation of the piping and by the section, which also shows the pipe leads and traveling ladder by which access to the piping is had. Each main is divided into two sections by a valve placed near the center of its length, and each section of the 16 sections thus formed is piped to a gage on the centrally located board. The front elevation shows eight of these gages, the other



DETAIL OF PIPE BRACKETS.

were built by the Phoenix Iron Work Co., of Meadville, Pa.; the generator are all General Electric.

The station design contemplates three 500-kw. rotary converters, which will make a sub-station equipment in the main plant.

The engine room is served by a 50-ton crane built by Alfred Box & Co., of Philadelphia. The crane has two hoists of 25-ton capacity

eight being on the left of the center line. The piping contract was let to the Crane Co., Chicago.

The station apparatus is supplied with oil by a Siegrist lubricating system, the pumps for which are located on the engine room floor opposite the stack, and the storage tanks in a room in the corner of the basement. In the oil room are two engine oil tanks, 3 ft. in



EXTERIOR OF POWER STATION.

diameter by 8 ft. long, and four cylinder-oil tanks, 2 ft. in diameter by 8 ft. long, two for high pressure and two for low pressure cylinder oil. Over these tanks is a wooden trough wide enough to receive two rows of oil barrels which are rolled into position, tapped and the tanks filled through funnels.

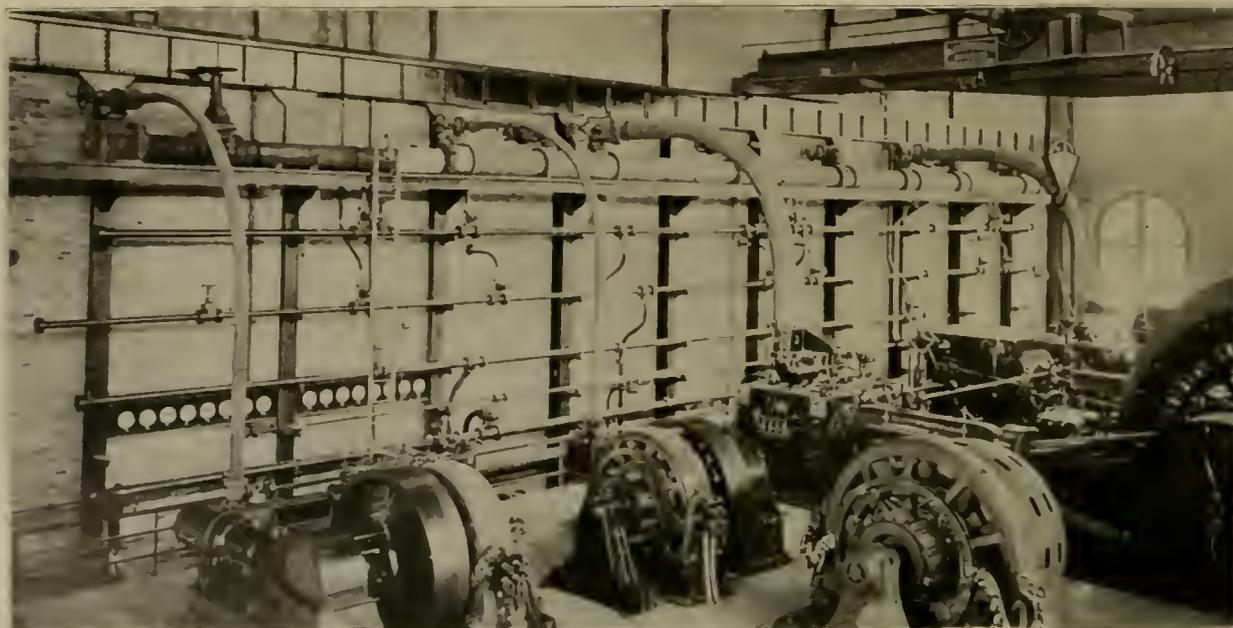
Connections from the house water tank are piped to the bottom of the oil reservoirs and the piping and valves are so that either one of the tanks for each kind of oil can always be in service. To provide against loss of pressure on the oiling system by reason of the temporary demands on the service system an air reservoir is provided in the oil room in which air is compressed to the service

Mr. Morris has arranged an ingenious device for indicating the water level in the tanks without using the gage glasses, which are liable to become broken, with a resulting "muss" in the oil room. Through the blank flange closing the hand hole in the end of the tank is placed a shaft having a suitable handle on the outer end and a section of small pipe on the inner end, placed radially; a hole is bored through this shaft and the outer end closed by a pointed screw which acts as a valve, and when opened established communication between the pipe mentioned and a passage in the lower side of the flanged joint through which oil or water appears,



BOILER ROOM FROM FLOOR.

according to the position of the free end of the radial pipe. A graduated scale indicates the amount of oil in the tank when the pipe has been rotated from a down-hanging position upwards until oil instead of water appears at the opening.



GENERAL VIEW OF PIPING IN MAIN STATION.

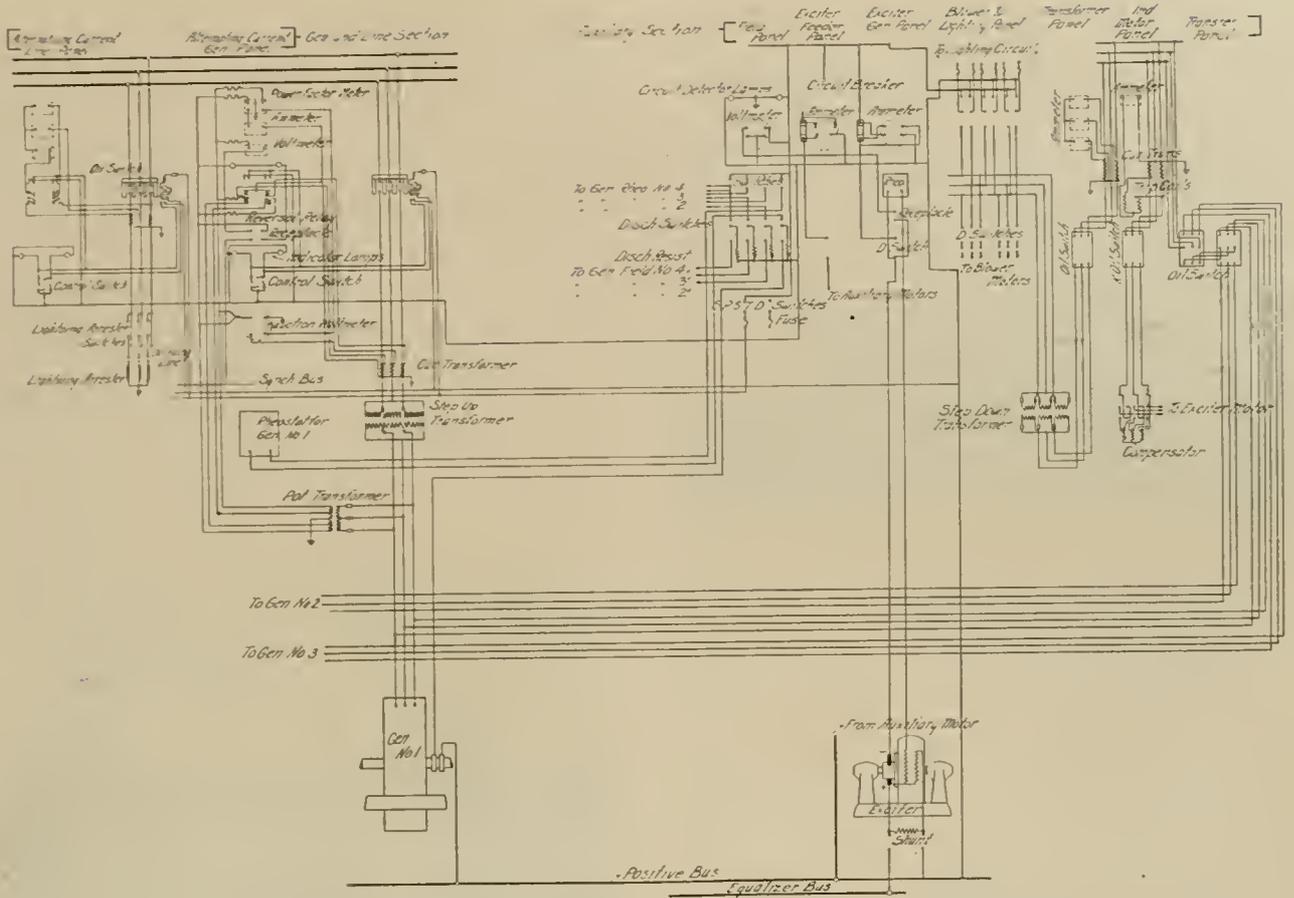
main pressure, and in case the latter is temporarily reduced check valves close and the reservoir comes into action and supplies pressure for distributing the oil.

After use the engine oil is passed through Burt "Cross" oil filters and returned to the tank.

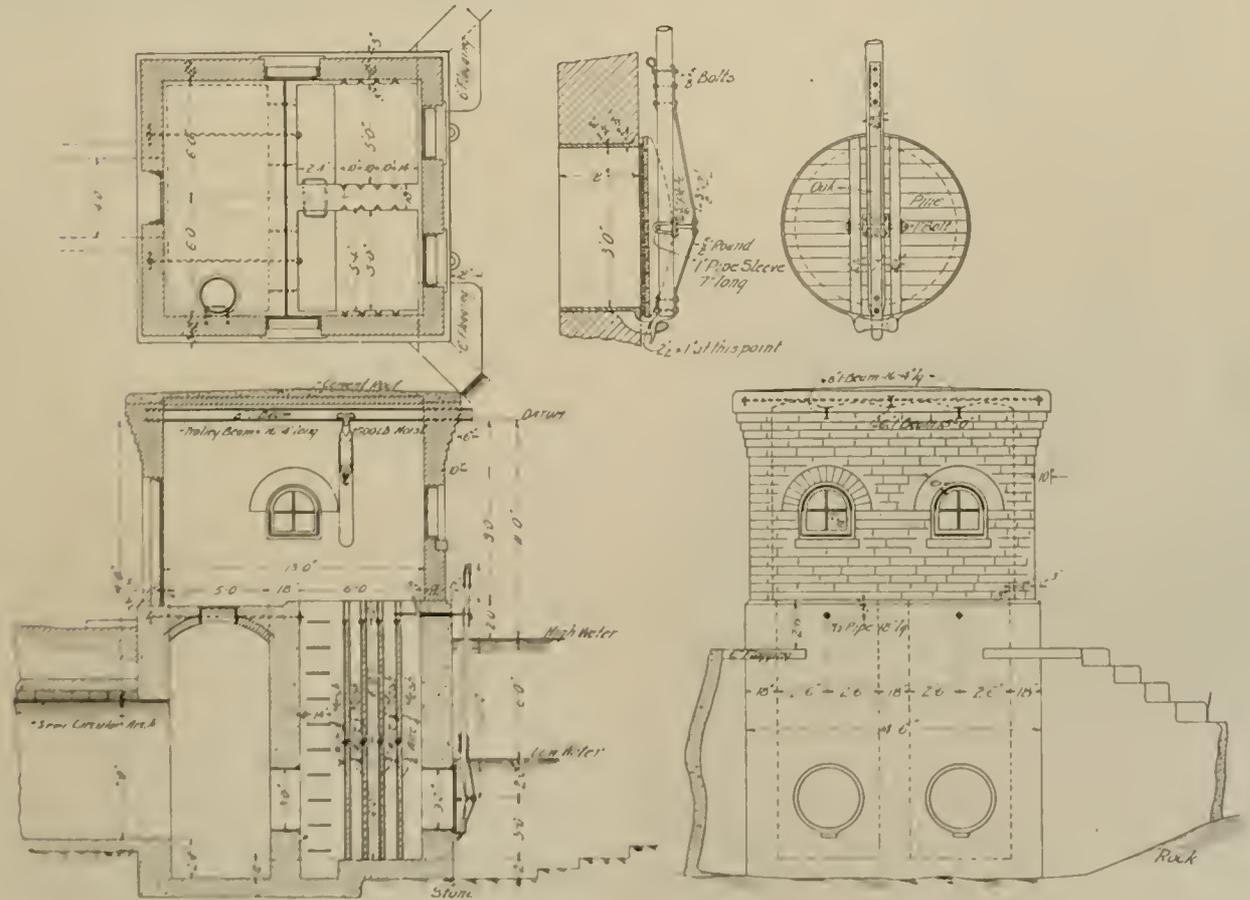
In the centers of the heads of the oil tanks (which are horizontal)

In this station there are an exceptionally large number of ingenious devices and interesting details, a number of which are shown in the accompanying drawings.

The water supply for the station is taken from the Fox River through a small gate house situated on the river bank. An elevation, a plan and section of this house are shown in one of the



WIRING DIAGRAM, MAIN POWER STATION, AURORA, ELGIN & CHICAGO RY.



SCREEN HOUSE AT RIVER END OF CONDENSING WATER TUNNEL.

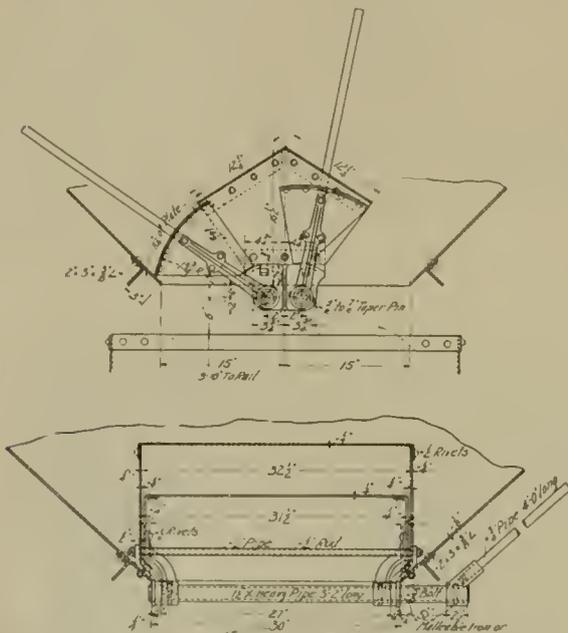
illustrations. The lower part of the house which is built of concrete contains three chambers separated from each other by means of concrete walls. The water enters the two front chambers by means of two circular gates near the lower part consisting of



EXTERIOR VIEW OF POWER HOUSE SHOWING COAL STORAGE.

cast iron pipes with a lug at the bottom for fastening on the cover when it is desired to shut off the water.

On entering these chambers the water passes through four screens with meshes of $\frac{3}{4}$ in., $\frac{5}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{8}$ in. successively. It then passes through two gates in the partition wall of the same style as



DETAIL OF HOPPER VALVE IN COAL STORAGE BINS.

on the outside wall and which are located in direct line with the former.

From the second chamber water is carried to the water way under the pumps by means of concrete lined semi-circular arches 7 ft. in height. When it is desired to clean out the screen chambers the water may be shut off by means of covers shown in detail in the illustration. These covers are made of pine wood and are circular in shape to fit the gate casting in the concrete walls. Between the casting and the wooden cover is a ring of rubber of 1 sq. in. section which presses against the seat of the casting so as to exclude any water from passing.

Two parallel vertical ribs of oak extend across the cover between which the handle for fastening the cover is hinged at the center of the cover by means of a bolt running through the ribs. On the lower end of this handle is a horn which fits into the lug at the bottom of the gate casting. This handle is long enough to extend above the high water mark of the river and its upper end is fastened by a strap set in the face of the building. By drawing

up this handle to the face of the building by means of the strap the cover is forced tightly against the face of the gate casting, excluding all water.

By covering the outside and inside gate of either screen chamber the latter may be pumped out and the screens cleaned or repaired. In the upper portion of the building two horizontal I-beams are suspended over the center of each screen chamber on which a carriage travels carrying a block and fall. By means of the latter the screens may be removed or replaced in position.

Transmission Lines.

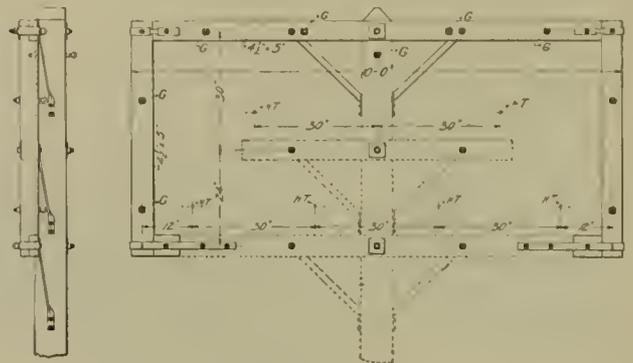
There are six sub-stations located as shown on the map. The high tension feeders are there indicated by broken lines, and it will be noted that there are two lines leaving the main station at Batavia, one following the railway to Sub-station No. 2 at Warrenville and thence to No. 3 at Lombard, and the other running across country to No. 5 and thence to Lombard. These two lines are of aluminum cables of carrying capacity equivalent to No. 00 copper wires. From the main station at Batavia to Sub-station No. 1 at Aurora, from No. 5 to No. 6, and from No. 3 to No. 4, other high



STRAIN TOWER AT SUB-STATION.

tension feeder lines are indicated; these are of aluminum cables, equivalent to No. 2 copper.

The high potential lines are carried on 40 ft. poles with 7 in. tops, which are placed 80 ft. apart. The cross arms are $4\frac{1}{2} \times 5\frac{1}{2}$ in. in section spaced 24 in. between centers vertically, the upper arm designed to carry two insulators, 60 in. between centers, and the lower arm to carry four insulators, 60 in. between centers, thus providing for duplicating the present feeder system when the demand for it shall arise. The insulators are the Locke No. 117, side and top groove triple petticoat, 7 in. in diameter and $4\frac{1}{2}$ in.



GUARD FRAME.

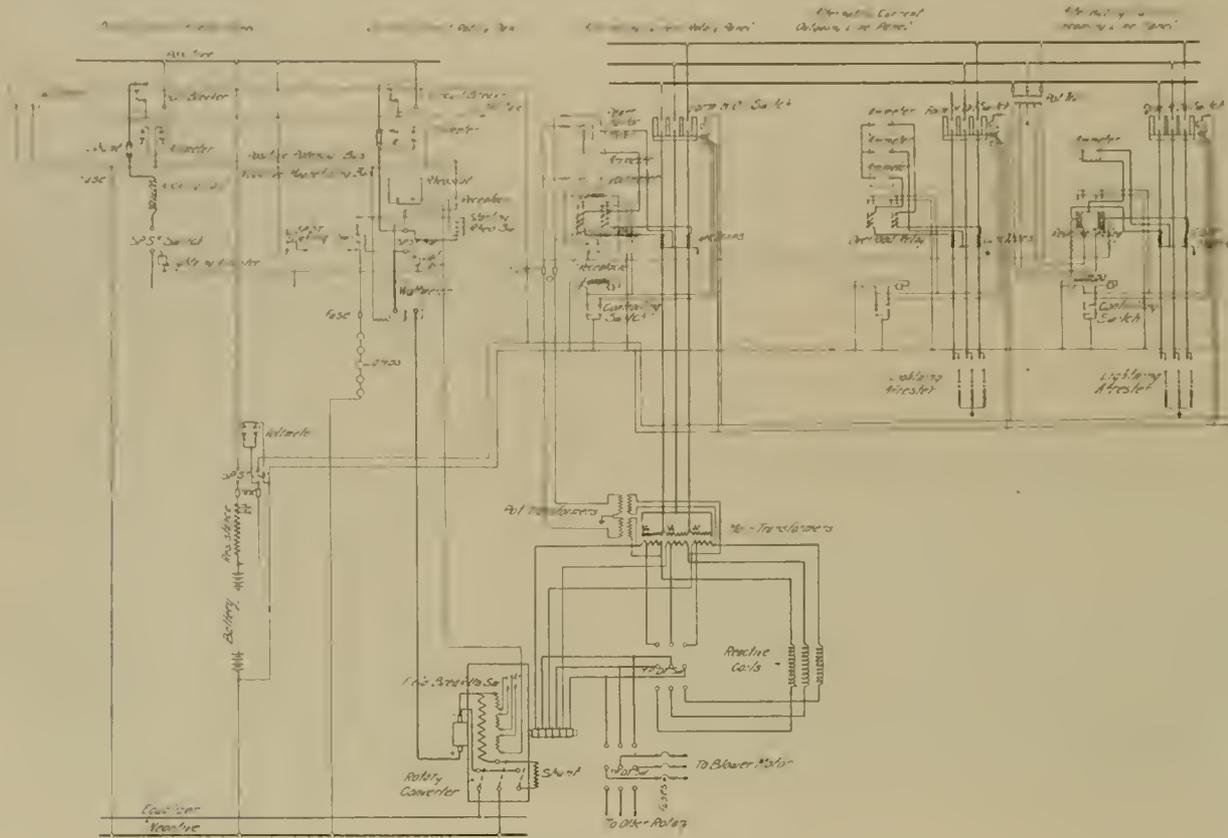
high, of glass, made by Fred M. Locke, Victor, N. Y.; these are designed for a working pressure of 30,000 volts. The high tension wires are transposed every mile.

Telephone wires are carried on cross arms about 7 ft. lower on the poles; these wires are transposed at every fourth pole. There

with the passenger accommodations omitted. The section in which the machinery is contained is 57 x 30 ft. and consists of a main room, a basement and a loft 12 x 33 ft. into which the high tension overhead lines are brought

In front of each sub-station is a strain structure for taking the

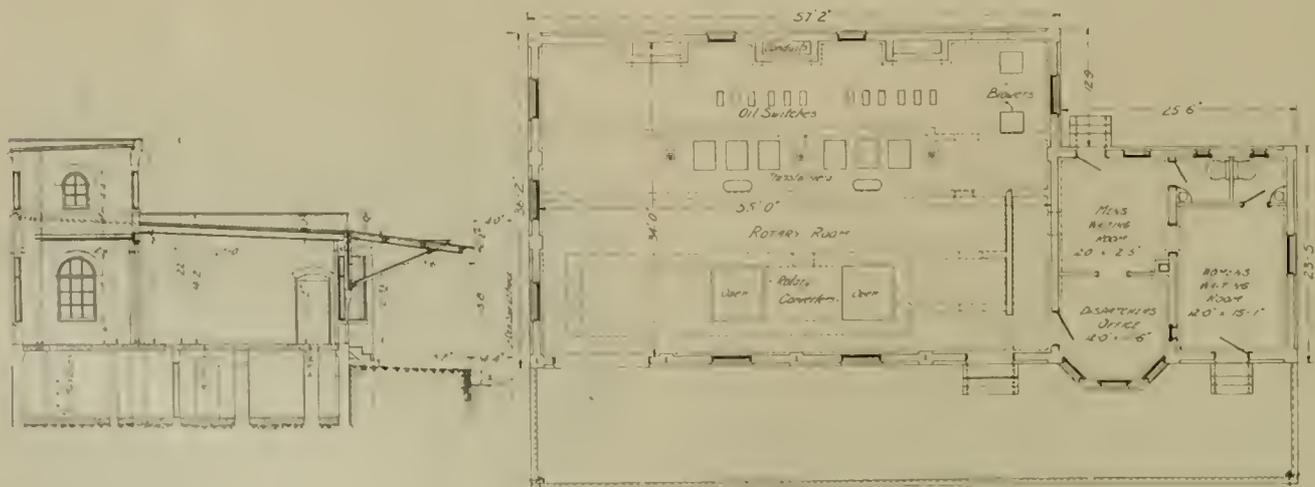
From the strain structure the wires pass into the station loft through special insulating tile and immediately after entering the building are connected to G. E. lightning arresters. The three wires of each circuit after entering the building each connect to large oil switches making two breaks in each circuit, and thence run down to



WIRING DIAGRAM OF SUB-STATION.

strain of the overhead wires before they pass into the sub-station loft. The accompanying illustration shows a working drawing of this structure. Instead of depending upon a single insulator for taking the stress in the direction of the line the insulators are arranged in sets of four. The line cable passes between these and is tied to a yoke made of 8-g-in. iron with the ends slightly bent and

the high tension 'bus bars' in the basement, which are very ingeniously encased in brick conduits which afford almost perfect insulation yet leave all of the wires entirely exposed for inspection. The compartment in the basement which contains these high tension bus bars has iron doors which close hermetically in order to permit a circulation of air under pressure through this chamber.



PLAN AND SECTION OF SUB-STATION WITH WAITING ROOMS.

tied to the insulators. This yoke is secured to the similar yoke on the second pair of insulators by two ties of wire which are twisted until it is apparent that the load is distributed between the two pairs of insulators.

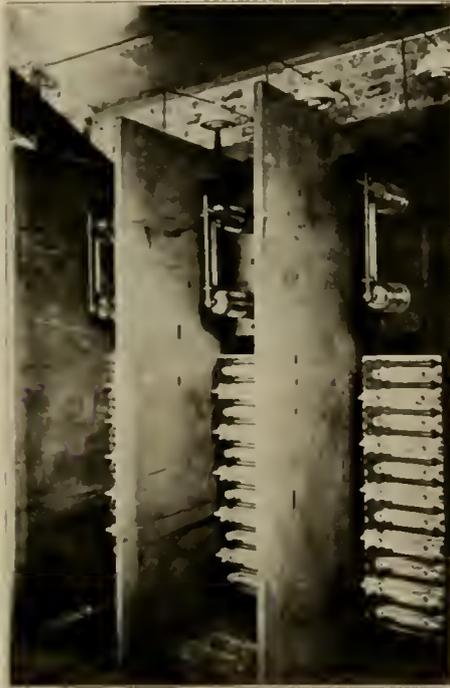
The high tension 'bus bars' consist of No. 2 bare copper wires stretched in a brick and concrete structure erected in the air lock under the transformers, the arrangement being practically the same in the central and the sub-stations. The bus for each branch of the

circuit is located in a tunnel made by placing horizontal partitions of cement concrete between vertical side walls of brick; and the leads to the oil switches and transformers are similarly separated by 4-in. vertical brick walls supported by steel angles at the corners.

It is noticeable that all the sub-station wiring is arranged so that all the wires and cables except those pertaining to the instruments on the switchboard are carried in the basement, and there are no high tension wires or heavy cables to be found in the main room where the machinery is located. This main room contains two General Electric rotary converters type H. C. running at 1,500 r. p. m. These transform alternating current of 25 cycles at 430 volts to constant current at 600 volts. There are six transformers

In the Lombard station from which the illustration is taken are three alternating current line panels for one outgoing and two incoming circuits. These three panels are at the left hand end of the board and the next two panels are used for the alternating current side of the rotary converters.

The diagram of wiring shown herewith will serve to explain the switchboard arrangements of all the sub-stations. The incoming



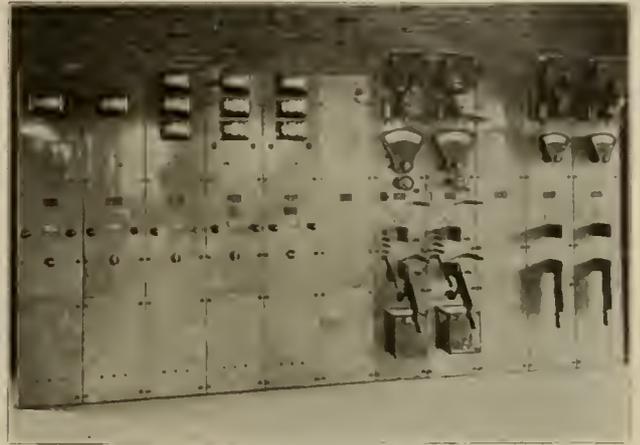
HIGH TENSION LIGHTNING ARRESTERS.

of the A. B. type wound for a primary voltage of 26,400 and a secondary voltage of 430; two reactive coils, type R. C. 48; two Buffalo Forge Co. blowers each driven by a 3 h. p. General Electric induction motor, type I, for furnishing the air for cooling the transformers and the high tension bus compartment in the basement.



ROTARIES IN SUBSTATION

The accompanying reproduction from photographs of one of the sub-stations shows the relative location of the machinery and the switch board. The latter is arranged in three general divisions which are alternating current high tension line panel, the direct current rotary converter panels and the direct current feeder panels.



SUB-STATION SWITCHBOARD.

line panels each contain one Thompson ammeter, one reversible relay, two signal lamps and a controlling switch for throwing the oil switch which opens and closes the circuit. The oil switch is provided with a motor which operates automatically as soon as the switch has been thrown and which keeps it constantly in readiness

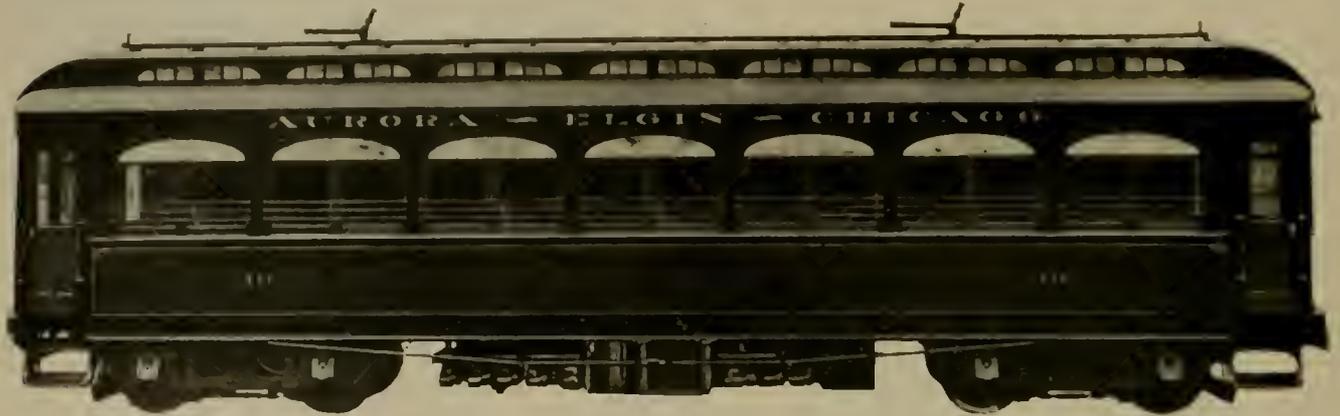


OIL SWITCHES AND TRANSFORMERS.

to be operated by a tripping device which is controlled by a small auxiliary switch at the switchboard. The two lamps above these controlling switches show whether the oil switch is open or closed, one position being indicated by a red lamp and the other by a green lamp. In case the incoming current should tend to reverse the sub-station machinery on account of its higher potential the reversal relay shown in the diagram comes into action. By means of a solenoid it can be adjusted to any required reading. The oil switch is operated if this reading is exceeded, in a similar manner as by the controlling switch. The panel for the outgoing current is similar to the one just described except that it contains an ammeter for each phase of the circuit and in this case a simple overload relay is used in place of the reversal relay on the incoming line. These relays are connected in parallel with the controlling switch and signal lamps, and are operated by means of the solenoid the core of which in rising closes the controlling switch circuit. The panels for the alternating current side of the rotary converter

each contain a power factor meter, an ammeter and a voltmeter, two synchronizing lamps, a plug receptacle for throwing the instruments in circuit, the controlling switch and signal lamps for operating the oil switch. On the back of the panel is an overload relay for operating the oil switch as previously described. The two panels controlling the direct current side of the rotary converter are separated by the width of one panel from the alternating current panels already described. These panels each contain a circuit breaker, an ammeter, a rheostat, a starting switch, lightning arrester and wattmeter. As the relays and controlling switches for operating the oil switches require continuous current a storage

non-telescoping ends. The under framing is entirely of 5-in. and 6-in. steel I beams riveted together with special channels and plates. The lines of the car body are similar in general appearance to what has come to be known as the Pullman style of sleeping car with compound Gothic windows. The Gothic sash is set in art glass, which adds greatly to the general appearance of the car. The interior of the roof presents a rich appearance and is ornamented with stripes and studded with frosted incandescents lamps, each of 16 c. p. set in sockets of oxidized copper. The ventilating sash are elliptical with art glass set in three sections. The ceiling is painted blue and the interior is rubbed down to a dead finish.



STANDARD CAR—NILES CAR & MANUFACTURING CO.

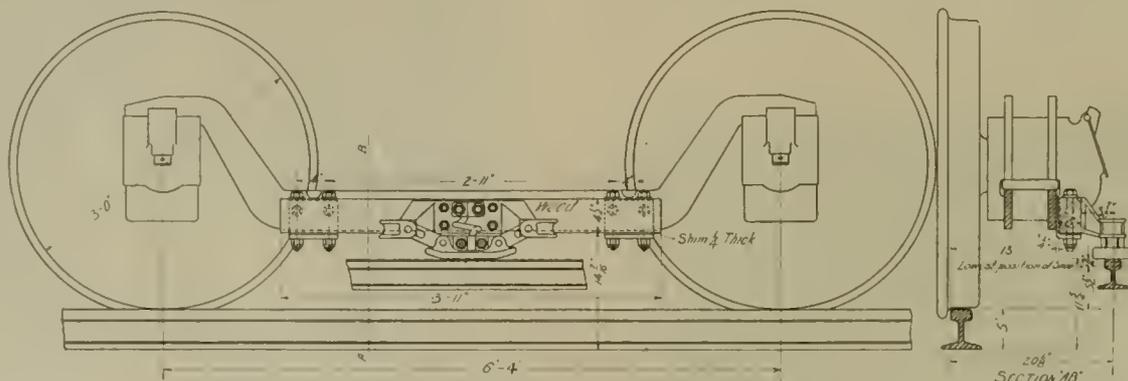
battery is provided for use in starting the plant when the rotaries are not in operation and there is, therefore, no continuous current available. The line current of 600 volts is cut down to a pressure of 125 volts by means of a resistance inserted in series and this pressure of 125 volts is used both to operate the relays and controlling switches and to charge the batteries when required.

The two panels to the extreme right of the board are for the direct current feed to the third rail. These each contain a circuit breaker, ammeter, voltmeter, kicking coil and a lightning arrester. A connection is made in the winding of the transformers so that the rotary converters can be run up to speed as motors with only a portion of the normal pressure. When they reach full speed this intermediate voltage is cut off by means of a double throw switch and the normal pressure is supplied.

the latter being in quarter oak and decorated with marquetry work. The trimmings are of solid bronze.

The seats are of the Hale & Kilburn walk-over pattern made of rattan and furnished with high backs and roll top head rests. Under each seat is supplied a Consolidated car heater. The car is arranged with cross seats and a center aisle, the latter being laid with matting. Each car has a smoking compartment and the trimmings throughout are of polished bronze. On each side are continuous basket racks and the glass is polished plate throughout.

Each car is equipped with four of the Nichols-Lintern Co.'s pneumatic sanders; these enable sand to be as efficiently distributed on curves as on straight track, insuring uniform track conditions when stopping, and preventing slipping of wheels at starting. The other special equipment includes Van Dorn draw bars and couplers,



ARRANGEMENT OF CONTACT SHOE.

Rolling Stock.

The rolling stock of the Aurora, Elgin & Chicago consists at present of 30 cars of the style shown in the accompanying engraving. Twenty of these cars are equipped with motors and the remaining ten are used as trail cars. The car bodies were made by the Niles Car & Manufacturing Co., of Niles, O., and as will be seen from the illustration are very handsome in general appearance. The construction of the framing is novel and was designed for the special purpose of withstanding the exceptionally high speeds to which the cars will be subjected. The length of the bodies over end plates is 47 ft. 3 in. and the extreme width of the cars over the side sills is 8 ft. 6 in. The cars are vestibuled and furnished with

Stanwood double steel steps, foot gongs, push buttons at each window, two trolley poles, rear and front signal lights, rear flags, fire extinguishers and a full line of tools in tool boxes to be used in case of accident. The vestibules have side doors and the step openings are provided with trap doors. The ends of the vestibules are open to allow passage from one car to another when run as a train. These cars are to be put under a speed test by the General Electric Co. and it is the intention to obtain speeds as much in excess of 100 miles an hour as possible.

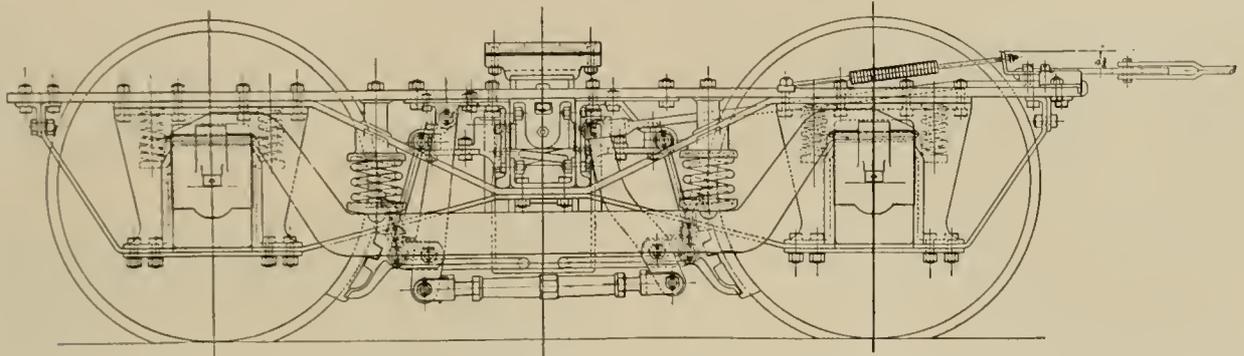
In order to accomplish these tests the cars will be supplied with different types of portable vestibules to overcome the air pressure at high speeds.

The bodies are mounted on Peckham M. C. B. No. 30 trucks with 6½-in. axles and 36-in. M. C. B. standard double plate cast iron wheels. The journals are 5x10 in. A side elevator of the truck and a transverse section through the center of the bolster are shown in the line drawings. These trucks were designed especially for high speed interurban service.

The side frames combine the equalizing bars used in the Master Car Builders' steam passenger car trucks with the diamond frame used in the M. C. B. freight car trucks, the idea of the combination being to give a double factor of safety, as the diamond frame alone is sufficiently strong to carry the weight of the car without the aid of the equalizing bars, which are arranged in pairs, one each side of the pedestals. To prevent the tilting of the top frames the spring

an ordinary Bourdon pressure gage mechanism with a special hand which makes contacts with the conducting stud at the position of minimum pressure and allows current to flow through a magnetic coil which operates a plunger carrying contact pieces for the motor circuit whereby the motor is started up. When the hand strikes the maximum stud the current is reversed and the plunger pulled away so as to break the circuit and stop the motor.

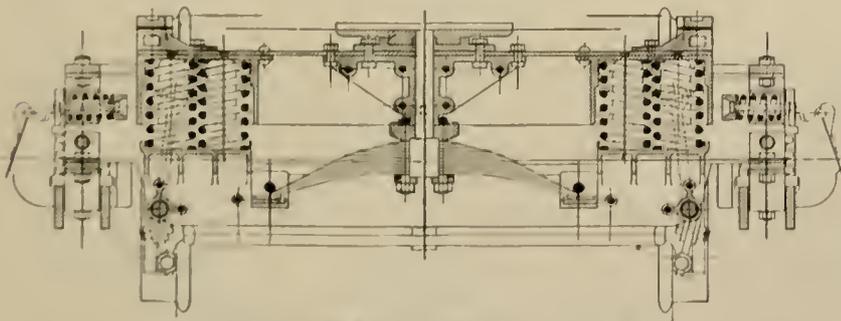
The cars are operated with the General Electric type M control system, which is adapted for running the cars separate or when two or more are coupled together in a train. When the cars are operated in a train the circuit connections are so arranged that the motors on all of the cars may be controlled from either end of any motor car. The type M system consists of two essential parts,



SIDE ELEVATION OF PECKHAM M. C. B. 30 TRUCK.

base of the truck is increased by locating helical springs each side of the journal boxes and supported from them by saddles. These pedestal springs carry a sufficient portion of the load to prevent the tilting of the top frames, the greater part of the load being carried by the equalizing bar springs. The side and end portions of the top frame are all in one piece, a forging. The transoms are bulb angles 10 in. deep, which extend full size with the side truss frame to which they are very rigidly secured. Gussets of sheet steel connect the transoms to the side frames hold the frames rigid and square. The trucks have Peckham's patent swing bolster; this is constructed of plates in form of a channel 10 in. deep and is carried on four long coil springs and one elliptic spring which support the bolster from the inside at its top, so as to hold it securely in a vertical position. Straps secured to the transom and extending over the bolsters prevent its being lifted out.

The arrangement of bolster springs, an elliptic in the center and



TRANSVERSE SECTION THROUGH BOLSTER.

two helical springs at each end, is designed to give an easy riding car and to prevent rolling motion of cars when running at high speed.

Each motor car is equipped with four G. E. 66 motors, 125 h. p. each, making a total of 500 h. p. per car.

These cars are supplied with the Christensen straight air brake equipment with independent motor driven compressors and automatic governor. The compressor and motor are combined in one machine consisting of a series wound motor and a duplex single acting compressor. The motor is mounted directly above the compressor, the motor base forming the top cover for above the compressor, the motor base forming the top cover for the same and this arrangement enables all the working parts to be run on oil. The governor used for this compressor consists of

namely, a series parallel motor controller composed of a number of electrically operated switches called the contactors and a separate electrically operated reversing switch called the reverser, and second, two master controllers, one located at each end of each motor car, which operate the contactors and reversers. A cable running the entire length of the train connects each master controller with the controlling circuits of the several motor cars and these cables are connected from car to car by means of suitable couplers. It is also necessary to continue these cables through any trail cars which may be in the train between the motor cars.

NORWICH ELECTRIC TRAMWAYS CO.

One of the model electric railway system of England is that of the Norwich Electric Tramways Co., operating 14 miles of railways, of which five miles are double track. Forty double deck closed motor cars, and 10 double deck trail cars, made by the Brush Manufacturing Co., are operated, mounted on single trucks of Peckham manufacture. The motor cars are equipped with Westinghouse 20 h. p. motors. Browett & Lindley 4,300-h. p. tandem horizontal condensing engines are installed in the power house, and the installation also includes four 300-h. p. B. & W. boilers and four 200-kw. Westinghouse generators. The Norwich company was created by acts of Parliament in 1897 and 1898, and has an authorized capital of £264,000, and authorized issue of debenture bonds to the amount of £60,000 all paid. The chairman of the company is Baron Emile De Langer, the managing director, E. A. Hopkins, and the general manager and chief engineer, Allan N. Banister.

The Binghamton (N. Y.) Railroad Co. is now installing a new 500 kw. generator at its main station, and building a new transmission line to the sub station at Casino, Endicott. The company is engaged in double tracking all the Union suburban lines.

The Greenfield (Mass.) & Deerfield Street Railway Co. has about completed its electric line from Greenfield to North Hampton, and expects to put the road in operation over 10 miles of the route in August. The construction of this line was begun last October.

LONDON'S TRANSIT PROBLEM.

There is no more striking instance than London of the dangers attendant on allowing events to shape their course, when the events are stages in the growth of an important financial, commercial and manufacturing center. The freeborn tourist in a German city is amazed and outraged by the placard "Verboten" which meets him at every turn. But the authorities which are so ready to forbid are at least equally ready with their services, and the cities under their care are spared the problem which vexes Londoners today.

London grew up in the first place without any scheme of street architecture which would have made a rational system of traffic possible, and in the second place without any central authority whose business it might be to provide the city with a system of transit, rational or otherwise. Central London is a comparatively small area, a tangled web of thoroughfares quite devoid of arterial highways for traffic, nevertheless it is the daily goal of an enormous population whose homes stretch for many miles in every direction. There is only one Lombard street and one Bond street, and there are nearly six million souls in Greater London.

If we look at the attempts made to provide for the necessary locomotion of the people from the suburbs to the center and within the central area itself, we find them alike hopelessly inadequate. The omnibus was introduced into London streets by the enterprising Shillibeer in 1820. Horse tramways, equally a private undertaking, made their appearance in 1860. Both are very slow methods of progression. The underground railway was welcomed forty years ago as a final solution of the transit problem. The "Metropolitan" put a girdle round the busiest and most populous part of the town, while the "District" provided for transit from various points on the Inner Circle to the farther suburbs. Within recent years both these lines, but more especially the District, have fallen into much discredit. The circular route is too slow for the twentieth century; the methods of working are out of date, and the accumulations of grime and smoke in the tunnels are becoming intolerable. The opening of the new electric lines sealed the fate of the old steam railways. For thirty years the Metropolitan and the District held good their claim to the title of "The Underground." But in 1890 the City & South London Railway, a deep level tube line, was opened, and a few years later the Waterloo & City Electric Railway provided for the transit from the southwestern terminus to the Mansion House. These lines showed what could be done by electricity, but they did not poach on the preserves of the Metropolitan. The "coup de grace" was given by the Central London which cut right across the most populous part of the area served by the old Underground. The Central London is worked on the most approved modern principles, with a dash and energy more American than British in character. No one with any experience of the comfort and convenience of this line would return to the old method of traveling. The Metropolitan and District companies, with ruin staring them in the face, could only decide to convert their lines to electric traction and adopt the improvements which the Central London had taught the public to regard as indispensable.

The unparalleled success and popularity of the Central London has given an enormous impetus to a number of similar schemes. In suburban traffic the old steam railway, like the old horse-tramway, has fallen out of the race. The electric motor—more especially on the unit system of control—has not only a great superiority in the matter of absolute speed, but has the further advantage that stopping, re-starting and accelerating are comparatively simple and easy matters, and that the whole complex system of shunting is rendered unnecessary. Thus the most effective possible use is made of the material, line and work.

Deep level electric tubes then are the salvation of London, and the only question that need disturb us at present is how to make the best use of our resources, and how to serve the vast area without omission and without overlapping and waste. That, we fear, is not a question of which the best solution is likely to be found with the eight companies whose schemes are now before the House, or with the thirteen new ones of whose undertakings we hear rumors. The problem cries out for some central authority. The Paris Metropolitan affords an interesting example of division of labor between the municipality and private enterprise. The scheme provides for five lines: a circle round Paris, concentric with but inside of the Ceinture, two lines running from east to west, of which one is already in working order, and two lines running from north to south. The circle is not a closed circuit, but consists of two self-contained lines, each worked on the

loop system. Confluent junctions between the different lines, which formed part of the original design, have been discarded owing to their tendency to produce congestion, and have been replaced by a scheme for exchange stations to enable passengers to pass from one line to another. The line between the Porte de Vincennes and the Porte Marlot, which was opened in 1900, corresponds very closely to the Twopeuny Tube, both in its internal arrangements and in the character of the district which it serves. The heavy locomotive is, however, dispensed with and every train consists of one motor and two trailer cars. Each coach is fitted with three brakes, a Westinghouse airbrake, handbrake and an emergency electric brake. All the work below ground is undertaken by the municipality, while the erection of the station buildings and the actual working of the line is in the hands of a private company which takes the whole of the receipts, out of which it pays a royalty to the municipality.

We have looked in vain to our own municipal authorities for a similar interest in our much graver and more complicated transit problem. The London County Council confines its interest to suburban tramways. The new tubes are so many isolated, independent schemes which will stand or fall by their individual merits, and have first of all to face the difficulty of finding the requisite capital. When all is said and done we are only tinkering at the question yet.

D. N. D.

STEAM AND ELECTRIC PARALLELS IN MASSACHUSETTS.

Several street railways are being built or projected in Massachusetts which will parallel existing steam roads, with the result that the railway fares in these localities are being considerably reduced. It is expected, according to the present progress of the work, that the Boston & Worcester Ry. will operate cars from Framingham to Boston by October 1st, including through cars to Boston, from Marlboro, Hudson and South Framingham. The power house of this road in Framingham is now nearly completed and it is second in size only to that of the Boston Elevated in New England. The stack, which is 185 ft. high, has just been completed. Another interurban line to parallel an existing steam road has been projected to run between Providence and Worcester. It will be as nearly as possible an air line between these cities, which makes its length 40 miles. It will use the tracks of the Union Railway in Providence and those of the Worcester Consolidated Ry. Besides securing an entrance into these cities, the necessary franchises and rights of way in the towns to be traversed have been obtained and the only remaining preliminary work is the securing of charters from the Massachusetts and Rhode Island legislatures.

THIRD-RAIL SYSTEM IN NEW YORK.

The third-rail electric system is practically completed on the Second and Third Ave. lines of the Manhattan Elevated in New York City, and it is expected that this system will be in operation on all of the lines of the company by the close of the present fiscal year. Through this change of its motive power from steam to electricity the Manhattan expects to make a considerable reduction in its operating expenses and thereby largely increase its earnings available for dividends. For the last fiscal year the operating expenses of the Manhattan were \$3,986,998. At the present time each train of five cars carries an engineer, conductor, fireman and three gatemen. No firemen will be needed on the electric trains, and this alone means a saving of \$330,000 per year. As trains will be one car longer with the electric system, there will be an additional saving in motormen's wages amounting to over \$100,000.

GRADUALLY GETTING THE NEWS.

The Scientific American of Aug. 9, 1902, quotes Engineering News as authority for the statement that a special trolley car for conveying fire engines is in use at Springfield, Mass. In its issue for June 15, 1897, the "Street Railway Review" illustrated and described the trolley car built for the Springfield fire department by the Wason Manufacturing Co., for the purpose of conveying fire engines. It is gratifying to know that our contemporaries not so intimately concerned with the electric railway field are keeping up to date in regard to the many applications of electricity to transportation.

THE BOSTON ELEVATED SUED.

The city of Boston has filed a number of suits against the Boston Elevated Railway Co. for damages to city property by the construction, maintenance and operation of the Boston elevated lines. The city claims that the value of several pieces of real estate has been depreciated, and bases its suits on the loss sustained in the market price of the property should it desire to sell it. In a test case of Edward F. Baker against the Boston Elevated Railway Co., the time for filing briefs has been extended. The fundamental issue involved in this case is whether substantial damages can be recovered for the noise produced by the operation of the road.

ROOFLESS OPEN CARS.

The accompanying illustration shows an open car which has recently been put into service on the lines of the Augusta Railway & Electric Co. The car is named "Starlight," and its design is due to Mr. W. E. Moore, superintendent of the company. It at once proved so popular that three or four more of the same kind are being added to the company's rolling stock. The car has no top or sides, and is merely a flat car with seats upon it, and



ROOFLESS CARS IN AUGUSTA.

two high posts are erected on each side at the center of the car to support the trolley pole and a cluster of lights. It is handsomely painted in silver, with gold trimmings, and has proved very popular for pleasure riding on hot evenings and well adapted to the warm climate of southern cities.

The car illustrated is a seven-bench car, equipped with G. E. 800 motors, K. 2 controllers and mounted on a Brill No. 14 truck. It is operated on a regular schedule, but on pleasant evenings only.

"BY THE WAYSIDE."

Under this title the Concord, Maynard & Hudson Street Railway Co. has published a very handsomely illustrated booklet describing the route of its road and showing a large number of the historical homes and points of interest, which are passed by the cars of this company. The scenery in this part of New England is unsurpassed, and the ride over the company's line is full of interest. The company has a luxuriously furnished parlor car seating twenty eight persons which can be chartered for special excursions between Concord and any point on its road, or on any of the roads with which it connects.

Purdie University, Lafayette, Ind., has recently received a full sized model of the locomotive "Tornado" which is stated to have been the second locomotive owned by the roads which now constitute the Seaboard Air Line. This locomotive was built in England and was placed in service in March, 1840. The University is indebted to Mr. R. P. C. Sanderson, superintendent of motive power, and J. M. Barr, vice president of the Seaboard Air Line Ry., for this interesting piece of apparatus.

PLANS FOR LAKE STREET ELEVATED.

It is stated that a plan to assess the stock of the Lake Street Elevated, Chicago, about \$10 per share is under consideration. While nothing has been definitely decided upon, it is believed that such an assessment would appeal favorably to the stockholders, when the entire plan is fully developed. It is estimated that the assessment would bring in \$1,000,000, to be applied to the floating debt of the company, and that this sum would reduce the latter to such an amount that the company would be enabled to float a 4 per cent bond issue in exchange for the present outstanding 5 per cent bonds. With the outstanding bonds refunded into 4 per cent bonds, and with \$1,000,000 of the floating debt wiped out, the company would be able to earn a good surplus above its fixed charges.

The physical condition and the earning power of the road are being steadily improved, and \$60,000 has recently been spent upon its construction. All the cars of the system have been put through the shops for the first time in several years, and the company has recently added eight new motor cars and twenty new trailers to its rolling stock. The company has decided not to build a power house, and arrangements have been completed with the Chicago Edison Co. whereby this company will furnish current to light, heat and operate the cars this winter. The Edison company will install additional machinery so as to enable it to furnish about 5,000 h. p. to the railway. The Lake Street company has prepared arrangements for operating an express service, but has been prevented by several legal entanglements in the suburbs, and also from the fact that it has been unable to secure the right to connect its lines with the tract of ground purchased for yards.

ST. LOUIS STREET CAR BILL DEFEATED.

The endeavors of the mayor and city council and the law department of the city of St. Louis to enact a general law to govern the operation of street cars were defeated August 1st by the legislature. The bill had been very carefully prepared and nearly six months had been spent in revising old ordinances and preparing sections of the bill. It provided running schedules for all the lines, maximum and minimum rates of speed and rigorous regulations for public safety and accommodation. The bill was reported unfavorably by the committee on railroads, and was finally defeated in the House of Delegates by a vote of 16 to 5.

ELECTRICITY FOR AIRSHIPS.

The rules and regulations governing the aeronautic competition at the St. Louis Fair have been published, and contain the following paragraph which is of particular interest to electrical inventors:

One prize of \$3,000 for a successful attempt to drive an air-ship motor by energy transmitted through space, either in the form of electric radiation or in some other form of electrical energy, to an actual amount of one-tenth of a horse power at the point of reception and at a distance of at least one thousand feet. The test must be made on the Exposition grounds by experts satisfactory to the jury.

NEW ROOMS FOR STREET RAILWAY EMPLOYEES.

August 4th the Rochester railway companies celebrated the opening of the new rooms for the use of the Street Railway Young Men's Christian Association. Among those taking part in the exercises were T. J. Nicholl, vice-president of the Rochester Railway Co.; R. E. Danforth, assistant general manager; George G. Morehouse, secretary; J. E. Dinkey and W. R. Shoop of the Buffalo, Rochester and Pittsburg Railway Co.; John F. Moore, secretary of the international committee of the Y. M. C. A., and others. Refreshments were served both in the afternoon and evening and the day was set apart for the street railway employes and invited guests.

Traffic on the Peoria (Ill.) & Pekin Terminal Ry. was abandoned for several days of the last week of July owing to a flood and wash-out on the line which resulted from the breaking of a dyke along the route. Tracks were submerged in some places for a depth of several feet and obstructed by trees which had been uprooted by the overflow.

OBLIGATIONS TO CARE FOR STREETS IN MASSACHUSETTS.

The full bench of the Supreme Court of Massachusetts has rendered a decision recently that affirms the claims of the street railway companies that under the law of 1898 they are relieved from taking care of the surface of streets in which their tracks are located. The case came up on the appeal of the cities of Springfield and Worcester where the city officials claimed that this statute of 1898 was unconstitutional because it impaired the obligation of conditions imposed upon the companies to keep the streets in repair. This contention was upon the theory that the conditions constituted a contract; but the court holds that it did not constitute a contract, but that the locations were in the nature of a license or permission. The court also rules that the effect of this legislation of 1898 was to free street railway companies from all obligations thereafter to keep any portion of the surface material of streets, roads and bridges in repair unless the obligation so to do had been imposed in the grant of original location, which the court defines to mean the first location granted to a company in a city or town.

The new law requiring the Massachusetts Railroad Commissioners to approve street railway locations granted by local authorities is making trouble for the board. Several cases have arisen where locations have been granted with conditions as to repairing streets, rates of fare, etc., which the company involved think are too much of a burden, and they, in asking the commissioners to approve them, have asked that they strike out some of these obnoxious conditions. This is a new phase of the matter, and the board is proceeding very slowly and carefully weighing the question whether it shall take the attitude of overriding the local authorities who claim to be better informed of the peculiar circumstances of each case. This was the chief argument made against the measure when it was under consideration by the legislature last winter, and the board would like apparently to avoid giving it a foundation of fact. On the other hand, it is undoubtedly true that the towns are asking more and more for these franchises and a new impetus is given to the movement by the decision above quoted that makes them realize that all they will ever get they must get now.

A loophole has been found in the new grade crossing loan act by which it is expected that new work can be undertaken. The act provides that the railroad commissioners must approve of the finding of the special grade crossing commissioners in each case before the state auditor will approve any expenditure of state money. The railroad commissioners are proceeding on the theory that this money is to be spent in the order in which they approve findings. In this way the small cases where there is less delay are benefitting.

NEW SPANISH STREET RAILWAY.

A street railway company has been organized, called the Compania de Tramvays de Gijon, which will operate a street railway in Gijon, Spain. The company, which received its charter in March, 1889, will build a road 7 km. in length, all of which will be single track. One kilometer will be within the city limits, and there will be 6 km. of single track. Eventually it is proposed to extend the line to a total length of 18 km. The company will operate 15 open and 10 closed horse cars, built by the Brush Electric Company, London, England. The officers of the company are Calisto Alvargonsales, president and general manager, Francisco Cienfuegos, secretary, and Mamerto Morujon, treasurer and superintendent.

FREE CHILDREN'S ENTERTAINMENT IN AUGUSTA.

Col. D. B. Dyer, president of the Augusta Street Railway Co., invited the children of the city to a free vaudeville entertainment on July 19th at Monte Sano pavillion at the company's amusement resort. The invitation was issued specially to poor children and the inmates of the orphan asylum and other charitable institutions were entertained by the company, which provided free transportation for all of the children. The pleasant ride and outing were enjoyed by several hundred children as much as the vaudeville performance which was arranged to be of special interest to the young folks, and the invitation was responded to by more guests than ever assembled on any one occasion in Savannah before.

A GRATIFYING ENDORSEMENT.

An accident which occurred June 14th on the Oleott Beach line of the Buffalo Railway Co., of Buffalo, N. Y., has been the subject of an investigation by Mr. C. R. Barnes, the electrical expert of the New York Railroad Commission. The accident was a rear end collision in which a closed car ran into the one ahead of it at 8:30 o'clock in the evening. A large number of witnesses were examined and the company gave Mr. Barnes every opportunity to make a thorough investigation. After detailing the accident from the statements of witnesses and employes Mr. Barnes' report states as follows:

"I find that this accident was caused by the carelessness of Motorman Miller; that the conditions approaching the point of accident are such, and there was sufficient daylight, so that, had he been on the lookout for Car No. 61, which he knew was ahead of him, he could have seen it for about a quarter of a mile, even though there were no lights burning on the car; he could have brought his car to a stop, if running at full speed, in about 500 feet. A test of stopping a car at this point was made under my supervision. * * *

"The fact that there was a man in the front vestibule with him is the only reason which can be assigned for his not bringing his car to a stop before running into car No. 61."

In closing his report Mr. Barnes states: "The method of operation on this line is first class in every respect, the company has a complete time table with full and explicit rules, and cars on this line are operated under the authority of the most complete train-dispatching system in use on any road in this state. Oil tail and signal lights are used on the cars." Mr. Barnes' report places the seal of official approval on the operation of this line, and his investigation has served to show the care which the company exercises for the comfort and security of passengers and the strictness of its rules.

STORAGE BATTERY IN MILWAUKEE RAILWAY PLANT.

As noted in the "Review" for July, the Milwaukee Electric Railway & Light Co. will install two batteries of "chloride" accumulators. One battery is to be used normally for regulating the fluctuations of the railway load and carrying the evening peak. It is, however, divided into two parts, which may, in case of an emergency, be connected in parallel across the outside wires of the Edison 3-wire system, the units being located in the same power house and discharged in conjunction with the lighting battery.

The other battery is to take care of the lighting peak and it will normally be operated as two independent series of 160 cells each on the Edison 3-wire system. The booster will be used as a shunt machine for charging one battery alone, or both in multiple. In case of an emergency the two batteries may be connected in series and discharged on the railway bus in conjunction with the railway battery. Each battery has a capacity of over 3,000 amperes.

CHICAGO TRACK REMOVAL.

Under the ordinance providing for the removal of track in the city not in use by the company owning them, the tracks on 40th Ave., between Randolph and Taylor Sts., Chicago, were removed on July 25th. This line is owned by the Harlem and Batavia Railroad Co., and is used by the Suburban Railroad Co., which has operated a single street car with a crew of two men in order to keep its franchise alive. Previous to the removal of these tracks the Suburban company had secured an injunction to restrain the city from tearing them up, but this injunction was vacated by Judge Kohlsaat and the removal of the tracks at once proceeded. The Suburban company, in order to gain the protection of the courts for its tracks, then prayed for the appointment of a receiver, which was granted. Counsel for the company state that the appointment of a receiver will prevent the city from removing any more of the tracks, and it is said that an order may be secured from the Court for the restoration of the tracks already torn out on 40th Ave.

The Erie (Pa.) Rapid Transit Street Railway Co. has inaugurated an express and baggage service, one car at present being devoted to the purpose.

Convertible Cars.

BY W. E. PARTRIDGE.

Under the title of convertible cars may be included all those forms of railway cars which are intended to combine the leading features of both open and closed cars. The first street cars were partly convertible in having windows that could be opened, while almost every form of open car has been capable of being partly closed. The types have remained quite distinct and most roads have maintained a more or less complete double equipment for the purpose of meeting the public demand for an open car. A few roads have gone so far as to make their closed cars with stationary windows, using them only during that part of the year when absolute protection is necessary. For the remainder of the year the open car pure and simple is made to answer the purpose.

It is recognized that the open car is a necessity, although its use involves several costly items. The number of car bodies must be doubled. The storage space must be large enough to accommodate all the cars. The trucks and electric equipment have to be changed from one set of bodies to another twice a year, or, in the second place, this part of the equipment must be double. In any case, for

there is a heavy cost, interest sometimes balancing the expenditure for labor in changing bodies, etc.

The idea of the convertible car is to build it in such a manner



FIG. 1—EARLY FORM OF CONVERTIBLE CAR.

that a single equipment of rolling stock is all that is required. This reduces the capital locked up in car bodies, does away with the cost



FIG. 2—CONVERTIBLE CAR, ROBERTSON PATTERN.

the sake of the insurance, a set of barn trucks must be provided for the car bodies in storage. Which method is employed depends upon the cost of the changes and the capital available. In either case

of changing from open to closed bodies, reduces the cost of car barns by one-half, and makes corresponding reductions in insurance, interest and various other accounts.

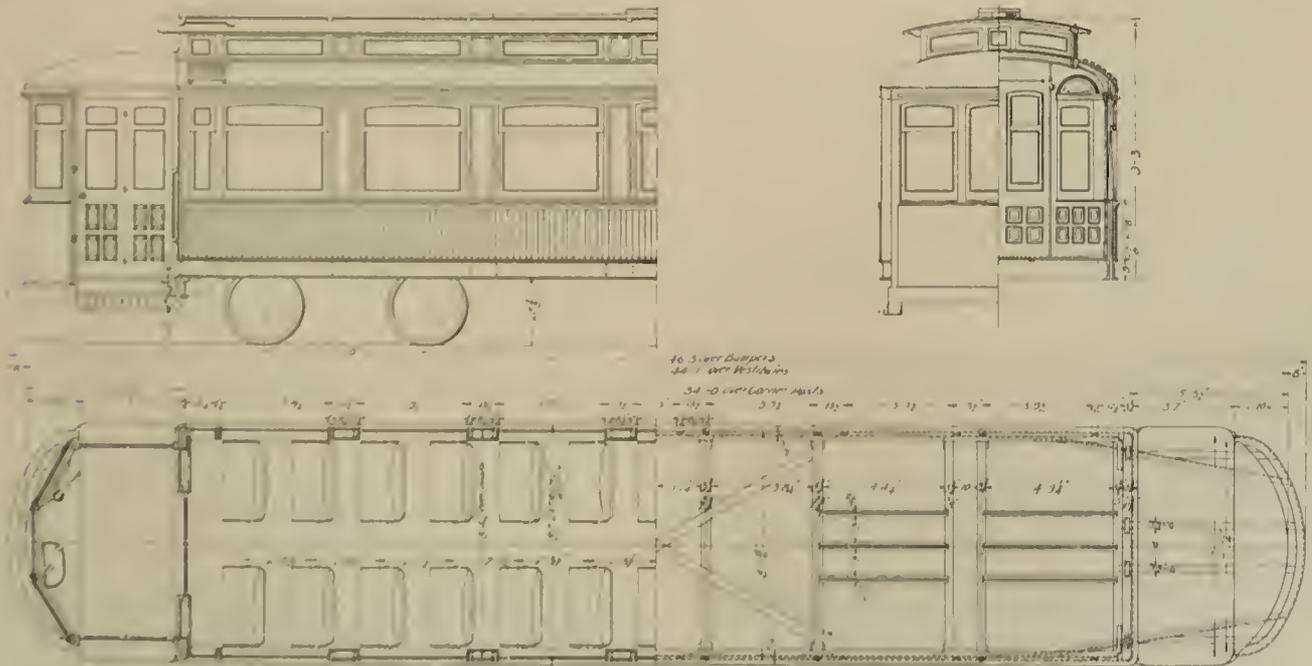


FIG. 3—PLAN, ELEVATION AND SECTION, ROBERTSON CAR.

Since the convertible car in general can be quickly and inexpensively changed from one style to another, it is readily adapted to the season. This is a point of no small importance, and it is pretty thoroughly appreciated by railway men. No further excuse is

Baltimore lines. The essential features are a closed body with a very low stationary side. The seats are transverse, with a center aisle. The windows are large and have below them a panel which is also removable, and when once in place, the windows cannot be

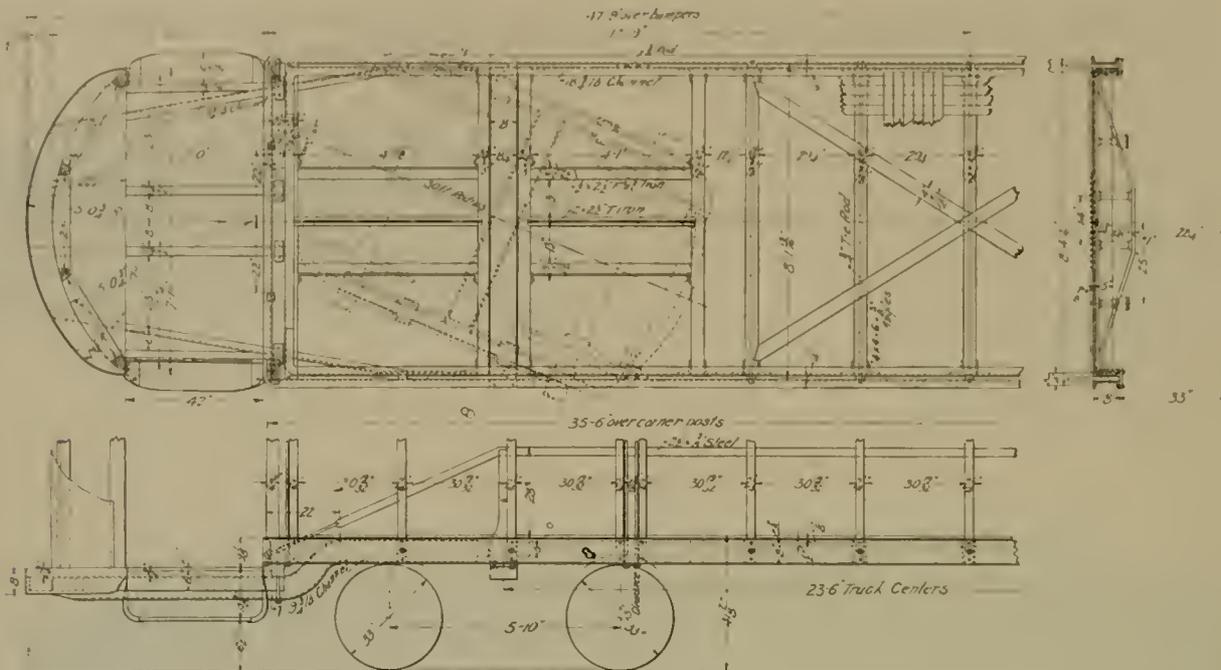


FIG. 4—PLAN AND ELEVATION OF ROBERTSON CAR FRAMING

necessary for presenting some of the leading forms of convertible cars which have been built in this country.

There have been some 60 forms of convertible cars patented in the United States. Not many of these, however, have come into use. The earliest system, perhaps, and one which has been very exten-

opened. The panels bring the solid side of the car about up to the top of the window guard netting. These cars, when windows and panels are both removed, have sides nearly as open as those of the standard open cars, and in some respects they are better liked than an open car. For the passenger they are pleasanter than an open

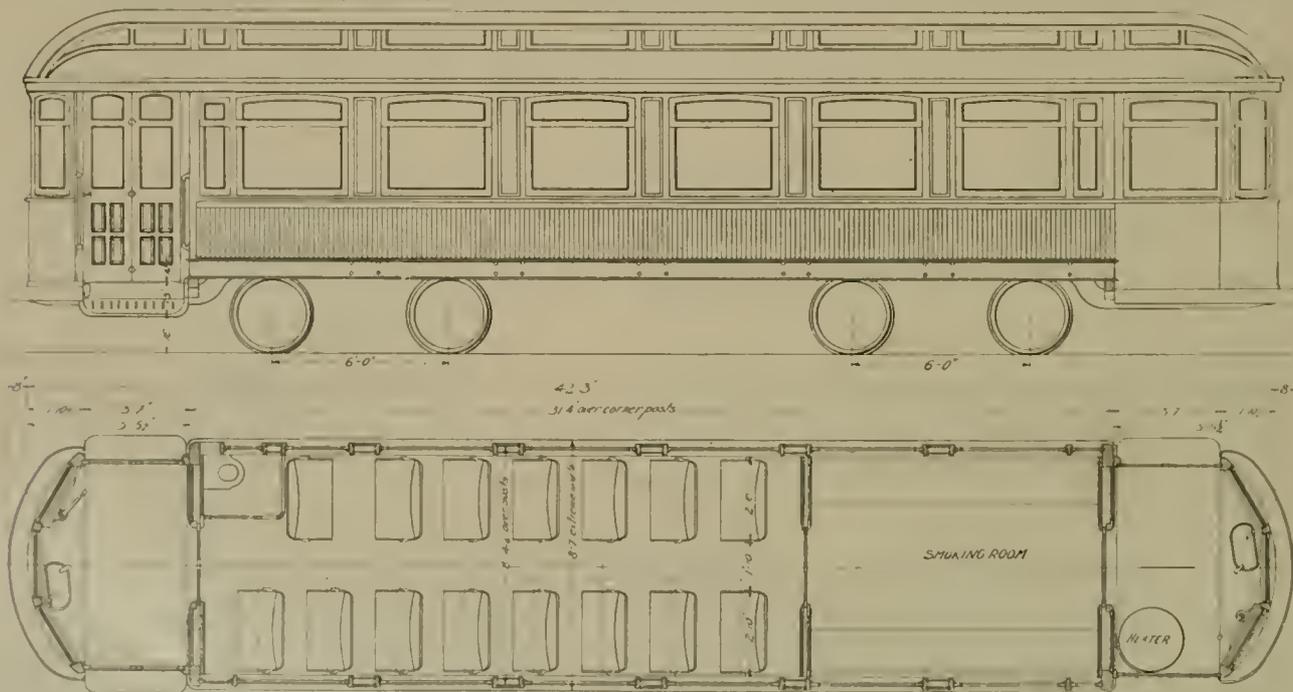


FIG. 5—PLAN AND ELEVATION OF LARGE ROBERTSON CAR.

sively built, is shown in Fig. 1. This form has been popular, and in spite of prejudice has worked its way into service in many parts of the country. Numbers of these cars have been built for the Cincinnati, Newport & Covington road, and also for many of the

car. The seating capacity is somewhat less than that of an open car, and they are not quite as quickly filled or emptied. The form is one which railway men looked at with little favor, but in spite of that it is forcing its way into use as it is liked by the public. Its

really objectionable feature is the cost and time needed for storing the glass and panels, and the large storage room necessary.

The idea of a convertible car has taken strong hold of inventors and several improvements and attempted improvements in design

design. It gave a complete open car with side entrances, and when closed it was a transverse seat car with a central aisle.

The next style of which any considerable number has been built is the Robertson, or Third Avenue car, as it is sometimes called.

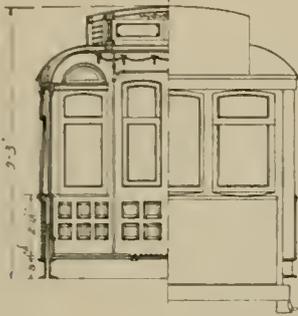


FIG. 5 A—SECTION OF LARGE ROBERTSON CAR.



FIG. 6—FOUR-WHEEL CONVERTIBLE CAR OPEN.

have been made and built within half a dozen years. One of these, worth mentioning for novelty, had hinged sides which swung outward and then slid into the body of the car in a horizontal position over the heads of the passengers. The mechanism was intricate and the operation inconvenient.

It was designed by Mr. Robertson, who was at the time superintendent of the Third Avenue Railroad in New York. The cars of this style which we illustrate are from standard designs of the St. Louis Car Co., and are shown in Figs. 2 to 5.

The floor frame of the car is of a novel form. The side sills con-

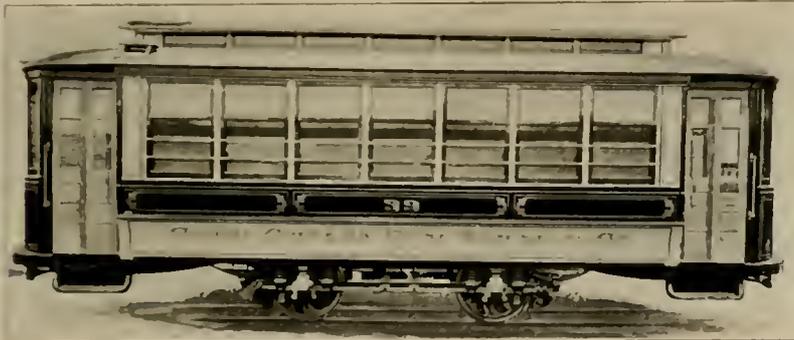


FIG. 7—FOUR-WHEEL CONVERTIBLE CAR CLOSED.

A little later came the duplex car. Glass and panels were arranged to slide in grooves in the posts into the roof. To effect this the body of the car was made circular in section and panels and sash

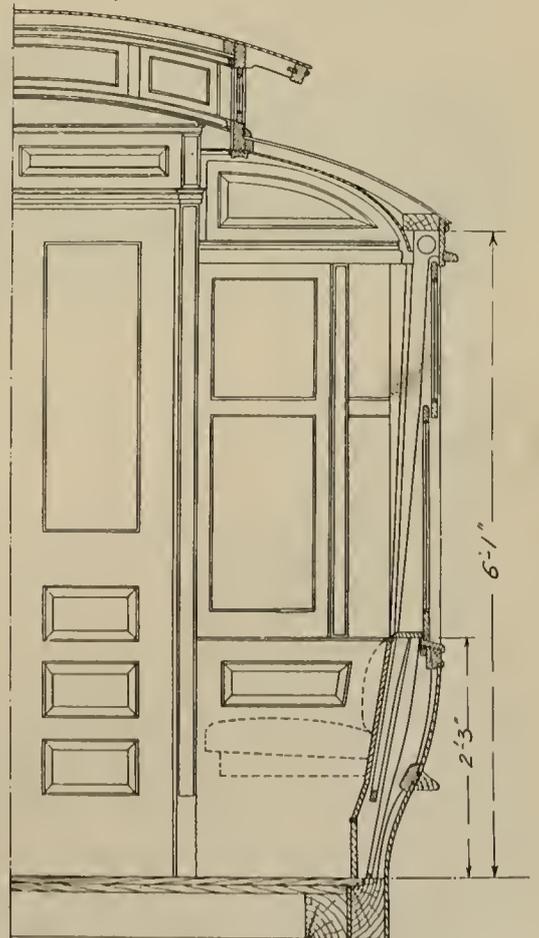


FIG. 8—SECTION OF CARS SHOWN IN FIGS. 5 AND 6.

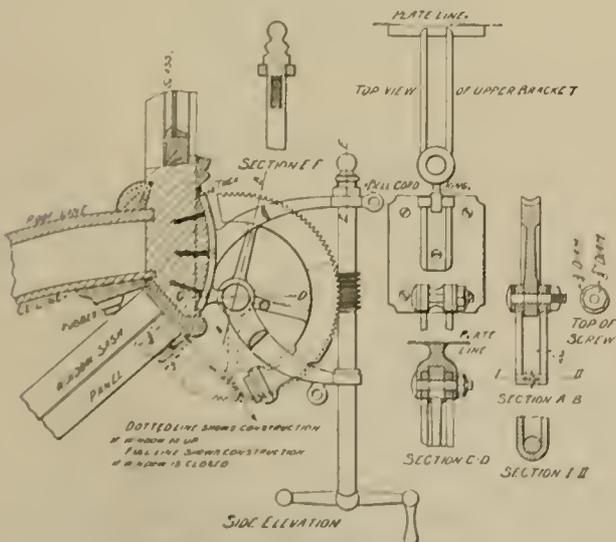


FIG. 10—SASH AND PANEL LOCK.

were segments of circles. The design necessitated the use of bent posts, or ribs. It was also necessary to use bent glass, which was costly. Many inconvenient features seemed inseparable from this

design. They are placed, back to back with a space between them. These are made long enough so that they form the end sills as well, being bent at the end of the car for the purpose, thus forming a continuous sill. These channels are riveted together at the posts, but are separated by a sufficient space to allow the sash to drop into the pocket which is formed between them. The depth of this pocket is a saving of

8 in. in the height of the window rail, or rather it enables the sash to be brought that much lower and at the same time completely houses in the side of the car. The floor plans in Figs. 3 and 4 show the construction. There are no longitudinal intermediate timbers. The cross timbers and tie rods bind the side sills together and with the iron bolsters give ample support for the body. The bolsters are 10 3/8 in. deep in the clear. Truss rods are also introduced into the side of the car as well as below the sill so that the body has ample support.

This form of construction permits the body to come very low, so that with 33 in. wheels, and by dropping the platform 10 in., the step

train on a steam road. The platforms are of rather more than the usual length, measuring almost 5 1/2 feet over the dashers.

A large number of improvements have been made in these cars since the first one was built some years ago. They are now in a practicable shape and are one of the standard styles of the St. Louis Car Co. They can be had of all sizes up to 42 ft. or more over all. They seem to be growing in favor, and a considerable number of roads have adopted them.

About the time when the first of the Robertson cars was built, or a little after, a convertible car was brought out by the J. G. Brill Co. Years ago Mr. John A. Brill invented a car of this kind and some were built. Turning his attention again to the subject, he brought out an improved form which appeared to meet the requirements better than anything which had preceded it. This car was illustrated and described at length in the "Review" for May, 1902.

Mr. Brill also adapted the roof storage system of his convertible car to what is known as the Brill semi-convertible. The car has proved a success and is being used by many large roads throughout the country. Having no wall pockets the seat ends are brought within the posts and thus 6 to 7 1/2 in. are added to the interior of the car. The sides can, of course, be either curved or straight. The windows are raised or lowered by a single operation—the lower section not being hinged to the upper is raised part of the way alone and without pausing automatically engages the upper sash by means

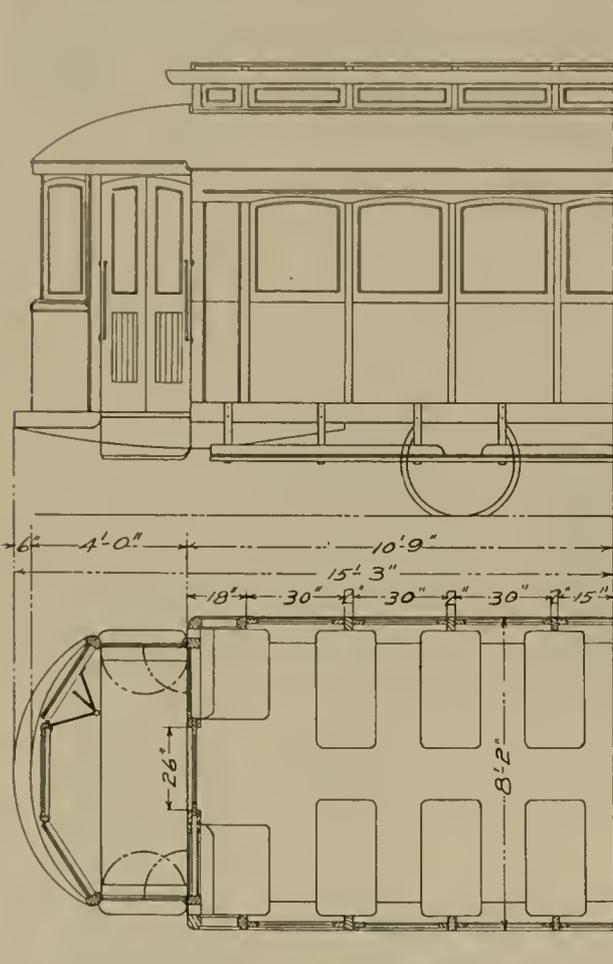


FIG. 9 CONVERTIBLE CAR WITH SIDE ENTRANCES AND CURVED PANELS.

comes within 16 in. of the head of the rail. The method of carrying the platforms is shown in Fig. 4. The side timbers are of iron with a sharp bend under the end sill to obtain the necessary drop.

The diagonal bracing is placed in the center of the floor, as is shown in both Figs. 3 and 4. This form of frame at the height indicated (33 in. 10 under side of sill) permits a truck with 33-in. wheels to radiate clear of everything on a 30-ft. curve, the trucks having 23 ft. 6 in. space between centers.

The body of the car is framed in much the usual way. It is stronger, however, than the usual form of straight side cars, because the sheathing is put on in two thicknesses. The inner layer is horizontal and gaged upon the posts. The outer one is vertical.

The double sills provide, as we have said, a much deeper pocket for the sash than would be possible with solid sills, as will be seen from the end view in Fig. 5A. When the sash are in the pockets a large open window is the result and the car, as far as the passenger is concerned, is practically open. Both the car shown in Fig. 3 and that in Fig. 5 have panels between the windows, a construction that greatly strengthens the body. A novel feature is introduced in the latter car. A heater is placed on the forward platform and a smoking room with longitudinal seats takes up a part of the forward end. In the rear there is a toilet room. This gives all the features of a

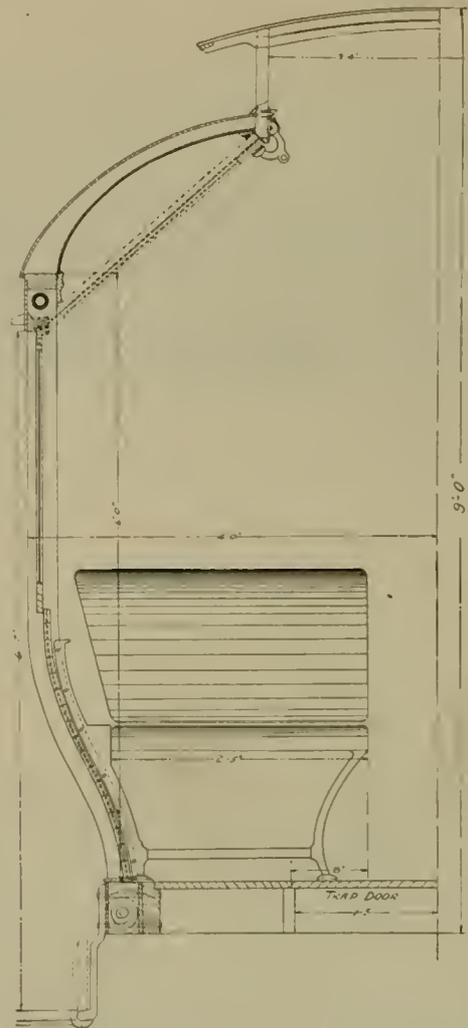


FIG. 11—CROSS SECTION OF CAR WITH SIDE PANELS.

of curves in the sliding grooves. The operation is easily accomplished because of the light weight of the lower sash in starting and the oblique position assumed on entering the roof pocket.

The success of these forms and the great advantages of the convertible type, have led many builders to undertake the design of cars of this kind.

Among other companies which have designed cars of this class is

the Jewett Car Co. It has recently brought out the style shown in Figs. 6 and 7. One of the engravings shows the car open for summer service; in the other it is closed.



FIG. 12—LACONIA CAR CO'S. SEMI-CONVERTIBLE CAR.

The construction in these gives a small curved side. This is a necessity in some situations where streets are narrow. Indeed there are many of our older cities where the straight-sided car is practically out of the question on account of delays arising from teams unloading at the curb. Fig. 8 shows how space is obtained in the wall of the car for such large sash. The division of the sash and the double posts makes a very neat and compact construction. It should be noted that the seats are longitudinal, an unusual feature in the later styles of convertible, but often very desirable.

The same company has another form of construction which is of an entirely different character. It is shown in Fig. 9. Here the glass and panels are raised to the roof and folded out of the way against the lower deck. The glass is hinged for the purpose at the top, as shown in Fig. 11. The mechanism for holding both sash and panels in place is shown in Fig. 10 on a large scale. It consists of a segment of a circle gearing into a worm wheel on a vertical handle. The hand wheel acts with great power and forces the segment firmly against the sash and panels so that falling down or getting loose so as to rattle appears to be out of the question.

From a glance at Fig. 9 it will be seen that this car when open has side entrances and is in every respect like a center aisle open

as completely enclosed platforms. The feature of side entrances is one which is much in demand in places where crowds have to be handled quickly.

Fig. 12 is a convertible car built by the Laconia Car Co. for the Columbus, Grove City & Southwestern Railway Co. This is a large, heavy car, suitable for high speed interurban work. Having straight sides space is found in them for the necessary pockets for the sash. The latter are double. The division comes at such a point that there is ample room for the two parts even with a low window rail.

The car just mentioned and the one shown in Fig. 13 are illustrations of the growing tendency to make interurban riding as pleasant as possible. In the summer season a car as open as possible above the window-rail, and having seats facing forward, gives the greatest satisfaction to patrons. When the Albany & Hudson bought its cars it included among them many of the convertible style shown in Fig. 13. Like that shown in Fig. 12, it closely approaches the steam road type. It is a large double truck car, capable of high speed. While the whole side is practically open so far as the passenger is concerned the side is not weakened by side

entrances. It is much safer than any side entrance car. The latter are not safe for interurban service nor for high speeds anywhere.

Lastly, as the most recent of all the convertible cars, comes that of the Stephenson Co. It differs from all of the other designs in stowing the upper part of the sash in the roof and disposing of the

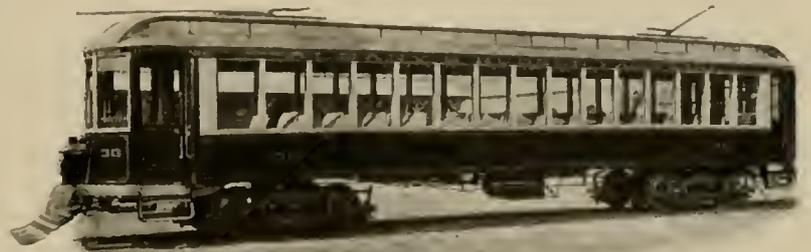


FIG. 13—ALBANY & HUDSON CAR.

lower sash in the side of the car below the window rail. The car is shown in plan and elevation in Fig. 14. In Fig. 15 the arrangement of the roof pocket is shown on a larger scale. The design is by Mr. P. M. Kling, general manager of the Stephenson Co. It is

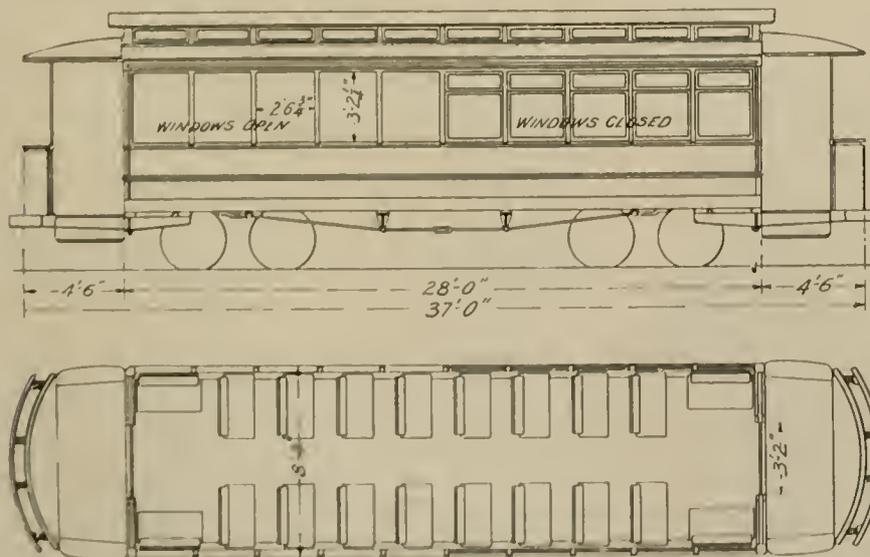
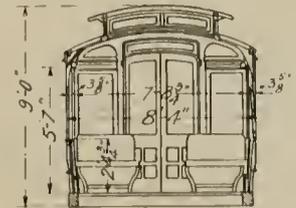


FIG. 14 A NEW FORM OF CONVERTIBLE CAR.



car. When closed it appears to be a standard box car, the only difference being that the posts appear on the outside of the panel. The car is fitted with a continuous top, or running board, as well

applicable to car with either the curved or the straight side, a feature of considerable importance, giving the invention a wider range of use than would otherwise be possible. It can also be

used with longitudinal or transverse seats. The car when closed is precisely like the ordinary box pattern with the one exception that the window rail is low. The form of the roof inside is not altered perceptibly. There is, however, a little more timber in the head of the posts, so that the roof at this point may be considered considerably stronger than in the ordinary construction. By a proper division of the sash the belt rail can be brought down to any

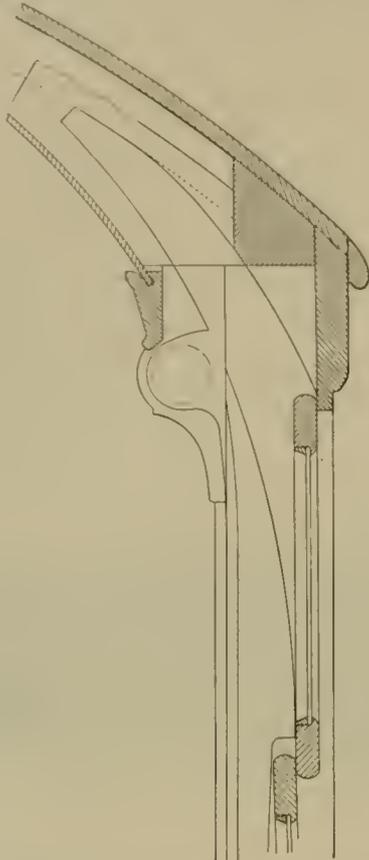


FIG. 15 METHOD OF STOWING SASH IN ROOF POCKET.

desired degree. In the car illustrated it is only 2 ft. 4½ in. above the floor. In these cars the window pockets are at all times closed by covers hinged in place, which form the arm rests. These covers are a small but important accessory. They prevent dirt from getting into the pockets and making the car offensive. This method of construction gives a car which is much stronger than any open car can be, much safer, and it would be difficult to point out any feature which is not as strong and durable as a standard closed car.

THE MANAGEMENT OF MEN.

BY G. J. A. P.

This is a subject which naturally interests any street railway manager, or, in fact, any person employing help, but my intention is only to refer to employes of street railways. There is no doubt that the merit system is one of the best means of securing good results from employes, but to this should be added a number of other considerations, which are in many cases entirely lost sight of.

A man is a man no matter what his occupation may be, and as such should be so treated. No matter how humble or small his position may be he will resent (if not by word, then in some other manner), any abuse to which he may be subjected.

Under no consideration should a foreman, or superintendent, be permitted to use profane language to an employe, nor should he be permitted to give his orders in a gruff or loud tone of voice, in the presence of the public. If a superintendent has any reason to give an employe any orders or to "call him down" for any cause, it should be done quietly and in such a manner that only the two interested are aware of what is being said. Often a mere look from a superintendent will hurt a car-

man more than all the lecturing he can give him, and the man is apt to remember it just as well.

Suspensions for days or weeks at a time help in some cases, depending upon the nature of the person receiving such punishment. Reduction in rank, however, is to most trainmen the severest punishment they can receive, and has about the best deterrent effect on them.

My experience has been that by winning the friendship and good will of employes more attention to duties and orders will result. A manager or superintendent who has a pleasant word for every one of his men—one who does not get "the swell head" simply because he is in authority—can get more general good results from his employes than can the manager who is too pompous to even notice an employe.

Few men are free from error, and if an employe makes a mistake and does not make an effort to hide it, but is perfectly frank in acknowledging the matter, be lenient with him, and it will result in his being on the lookout to avoid future errors.

A manager should study the disposition of every man he employs, and have all his subordinate bosses or superintendents do likewise. In this manner he will learn the good and bad traits of every man under him.

It does no good, but does considerable harm at times, for a manager to be so self-important that he cannot speak to an employe when he meets him. He can be friendly with all men, yet be positive and determined in his discipline, but under no consideration should he show any partiality.

Once men learn that any one of them can approach the "boss" and obtain a hearing, and that he will deal with all offenders exactly alike, they will feel more secure from the annoyances to which they are only too often unjustly subjected.

One feature which causes men to become dissatisfied with the management of a road is being called to headquarters with loss of time, to answer some trivial complaint which has been made against them. If these complaints were all first traced to their source, a great many would be found to have their origin in some personal feeling, which has no bearing whatever upon the man's acts while on duty, and if properly sifted, even the manager would not ask a man to lose time by reason of such complaints.

Many a complaint has been pigeon holed without a word ever being said to the man complained of, simply because on investigation it was found to be a case of personal animosity, which had no foundation for a complaint.

One rule which companies should strictly enforce is: Do not permit men to enter saloons while on duty, or when in uniform while off duty. A person who becomes intoxicated at any time should not be permitted to hold a position of any kind on the cars. There is nothing which will so demoralize the service of a railway as to allow trainmen to loiter about saloons, no matter at what hour, day or night. Men who spend much time about such places will spend their earnings there, and then grumble because their pay is not greater.

Added to this is the danger of heavy judgments for damages being secured against a company should a motorman (who is known to frequent saloons) have an accident. All that is required for an average jury to render a verdict for full amount is to have counsel show that such motorman was in the habit of frequenting saloons. You may bring in all the testimony you wish to show he was not under the influence of liquor, if it is shown that he is a frequenter of saloons you have a hard case for a defense with an average jury.

Finally, get your men to thoroughly understand that the company's interests are identical with their own, and whatever they do which is of advantage to the company will be recognized and suitably rewarded. If an employe has suggestions to make, have your foremen consider them. It sometimes happens that the men suggest matters pertaining to time schedules, etc., which are not only practical but tend to considerably improve the service and secure business. A trainman who is of an "observing turn of mind" running over the same route day after day, can naturally see where changes might be made for the betterment of the service which ordinarily go unnoticed.

An electric railway will soon be under construction at Ventura, Cal. John Burson and A. L. Russell are the promoters.

A STUDY OF THE HEATING OF RAILWAY MOTORS.*

BY A. H. ARMSTRONG.

The electric traction problem presents many new features for investigation which are not met with in steam railroading, and upon which little accurate data has been published. This is especially true of that class of service calling for maximum speeds greater than 35 or 40 m. p. h., where stops are infrequent and cars are run singly or in trains of two cars or more. It is the purpose of this paper to enter into a discussion of some of the variables met with and their influence upon the motive power and station output for the higher as well as lower speed schedules.

The electrical engineer has to take care of two factors with which the steam engineer is unacquainted, keeping the temperature of the motive power within reasonable limits and also the

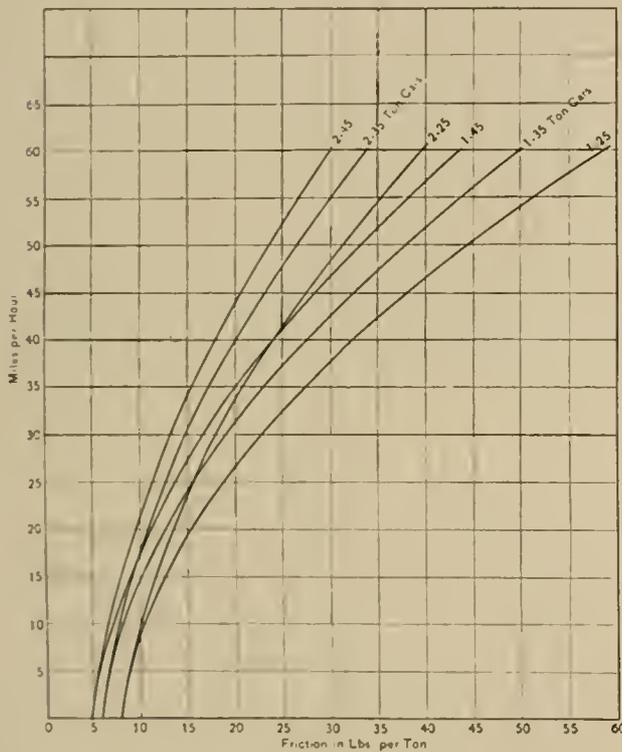


FIG. 1.

operation of single cars at maximum speeds of 60 to 70 m. p. h. That wind friction is a considerable factor with trains operating at high speeds has been abundantly proved by many tests, but these tests are worthless when used to determine the power required to propel a single car at the same high speeds. As the electric motor has invaded the high-speed interurban field and has done so successfully because of the frequency of service furnished with single car tram, it becomes pertinent to inquire into the size of the motive power necessary to prevent overheating and also the amount of power needed with the high speed schedules and frequent stops made.

Regarding the tractive effort required to propel trains of one or two cars at speeds of 60 m. p. h. or more, there is almost a complete lack of experimental data. Formule based upon tests of steam trains made up of a number of heavy coaches cannot be applied with any accuracy to the operation of single car units. A series of tests made by the General Electric Company on the Buffalo and Lockport tracks, with trains of different sizes, provide almost the only data upon which to base such calculations. These tests were carried up to speeds approaching 60 m. p. h. with ordinary steam railway coaches, hauled by a 38-ton electric locomotive. The cars were not vestibuled and the conditions were not, therefore, such as to give results directly applicable to the operation

of single suburban cars of the vestibule type. For want of more accurate data, these tests will be used as the basis of the following calculations, and, as the curves deduced are used for comparison only, it makes little difference if the friction values are not absolutely correct. Fig. 1 shows some of these curves as published in an article by Mr. W. J. Davis, Jr.

The tendency of the electric roads has been toward heavier cars, especially on the higher speed lines, where the car weights run from 25 to 45 tons, including equipment and seated passenger load. Suppose we equip cars weighing 25, 35 and 45 tons with the same four-motor equipment, geared for 60 m. p. h. with the 35-ton

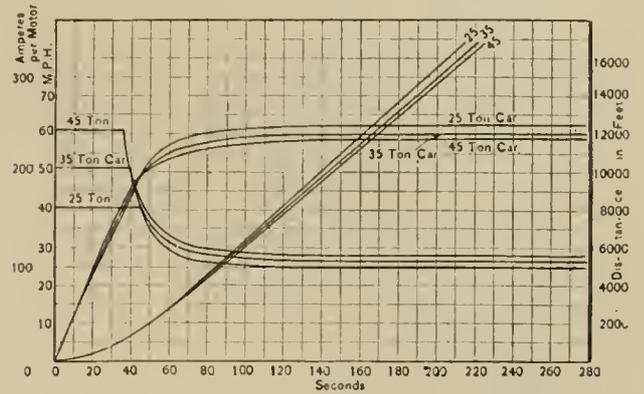


FIG. 2.

car, there would then result speed time-curves as in Fig. 2, the speed curve of the 45-ton car falling below and that of the 25-ton car rising above that of the 35-ton car for the same gear ratio. A tractive effort of 120 lb. per ton gross has been taken with all three equipments, as representing average conditions for this class of work, giving a net acceleration of about 1.06 m. p. h. per second, after deducting friction loss and the power required to accelerate the revolving parts. Any other rate of acceleration could have been taken with little or no effect upon the heating of the motive power or its energy consumption, as will be shown later, the larger part of the energy input being used up in overcoming air resistance at this high speed.

Speed and amperes input are plotted as ordinates with time as abscissa and power may be shut off at any time, the car allowed to coast and brought to rest by brakes, making the enclosed area of

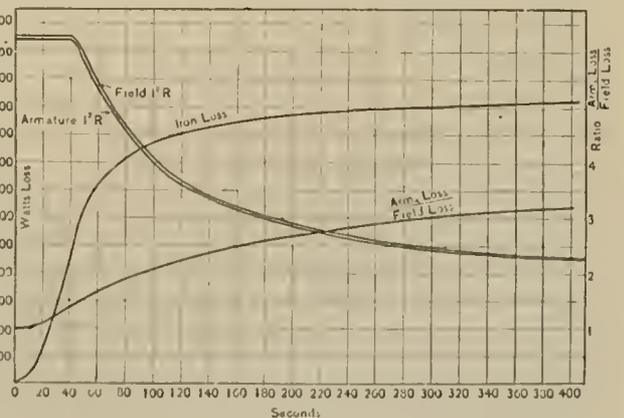


FIG. 3.

the speed time curve proportional to the distance covered, and the area of the ampere time curve equal the ampere hours input. For the sake of simplicity it has been assumed that the friction will be the same at the same speeds during acceleration and coasting; that is, that the energy given up by the rotating parts during coasting will equal the gear and friction loss of the motors running light, an assumption which is approximately correct. The coasting curve will, therefore, follow the shape of the friction curves in Fig. 1, will be curved and show a greater retardation at high than at low speeds.

While power is applied, the motive power has internal losses,

*A paper presented at the 19th Annual Convention of the American Institute of Electrical Engineers, June 20th, 1902.

varying not only in intensity but in their distribution. At zero speed, the losses are all in the copper of field and armature, being divided according to their relative resistances, but as the armature speed increases there is an iron loss distributed between the iron of armature and pole face and tips, depending upon the design of the motor. This iron loss starts from zero at standstill and increases to a maximum at the moment of cutting out starting resistances, after which it falls off somewhat, but this again is a matter of motor design. As these various losses are the cause of our motive power heating, it is necessary to trace their influence upon the individual parts of the motor under study.

As the heating of a motor is the result of the average losses

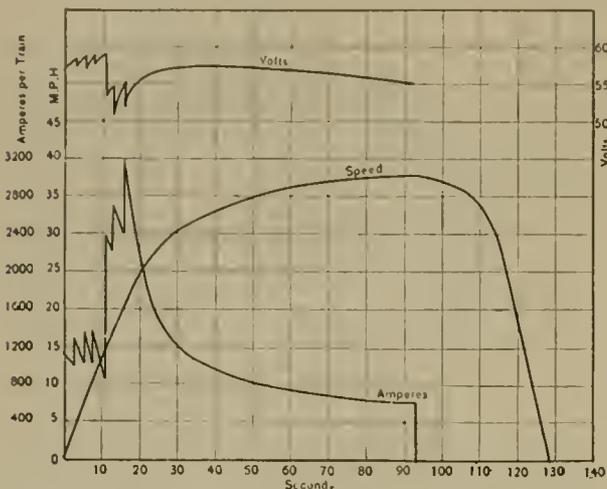


FIG. 4.

within it, the average losses and their distribution up to any moment of shutting off power must be determined. Such losses are shown in Fig. 3 for our 35-ton car equipment, speed and ampere curves of which are shown in Fig. 2. The motor losses for 25 and 45-ton cars have been left off to avoid confusion, but from the shape of the ampere time-curve in Fig. 2, it is evident that the curves will vary greatly from those shown only during the fractional speed or acceleration period, these differences being virtually wiped out with a considerable amount of running upon the motor curve. Thus, while there is a total average copper loss of 5,000 watts during acceleration upon resistance, the copper loss curve becomes flat in about 400 seconds at the value of 1,800 watts in the copper, with the motor constants chosen. As an equipment geared for a maximum speed of 60 m. p. h. would hardly be used for an average run of less than 15,000 feet, requiring power on for fully 160 seconds for its accomplishment, it will be seen that the acceleration losses play a comparatively unimportant part in very high speed work, so far as the motor heating is concerned. That this is not true of low speed work will be discussed later.

The iron loss has been assumed to be dissipated entirely from the armature in arriving at the "ratio of losses" in Fig. 3. This is not strictly true, but the true subdivision of losses, whatever it may be, will be practically the same with the same "ratio of losses," and hence any values of motor heating deduced from curves similar to Fig. 3 must be consistent. For example, if we know the degrees rise per watt loss for field and armature with any given "ratio of losses," the temperature arrived at would be correct, provided the temperature constants were obtained from experimental runs where the motor went through the same cycle as in the run to be determined.

Suppose we take our motor equipment, place it upon a car and run it over a measured length of level track, keeping an accurate record of the current input and voltage per motor at each instant. Then let this sample run be repeated successively for a period of ten hours, or long enough for the motor temperatures to have reached their maximum, and we have the relation between energy lost in the motor and its temperature for a given set of conditions. Vary the length of the test run and repeat the ten-hour test and we have another relation between temperature rise and energy loss for another set of conditions. It is evident that a series of such tests taken on a given type of motor would give material from

which the relation between its internal losses and temperature rise would be known for any set of conditions, and, moreover, these values could be used directly in calculations for any given service as they were obtained under operative conditions, and need no constant applied to make them approximately correct for service conditions.

It may be urged that it is difficult to reproduce with any accuracy the sample run agreed upon, or that it is difficult to follow through and keep an accurate record of just what takes place in the motor during its cycle of operation. If necessary, an automatic device for applying the current could be used, such as a motor to throw on the controller at a pre-determined speed. Sufficiently good results can be obtained, however, by ordinary hand control with a trained operator, while sample runs taken every few minutes by recording instruments, serve as a check and furnish the material upon which to base the motor's performance during the test.

A sample set of curves of such a test is shown in Fig. 4 indicating voltage, amperes and speed upon a time basis, all taken by recording instruments. The voltage indicated is that between third-rail and ground, but the motor voltage during running upon resistance may be taken as proportional to its full internal voltage at the moment of cutting out final starting resistance, without making any appreciable error in arriving at iron loss values. The ampere curves give the means of determining the copper losses by plotting on polar coordinates as in Fig. 5, and determining the area by planimeter, giving directly the square root of mean square value. Both Fig. 4 and Fig. 5 show curves produced by a recording instrument placed directly in the main circuit of the car, thus giving the series parallel effect of the motors so connected. In our motor calculations we are concerned with the amperes per motor which will be independent of the series parallel control. The curves in Fig. 4 and Fig. 5, however, are shown simply to demonstrate the accuracy of the recording instrument, and while Fig. 5 could not be used directly to determine the square root of mean square current per motor, it shows the method used in determining this constant.

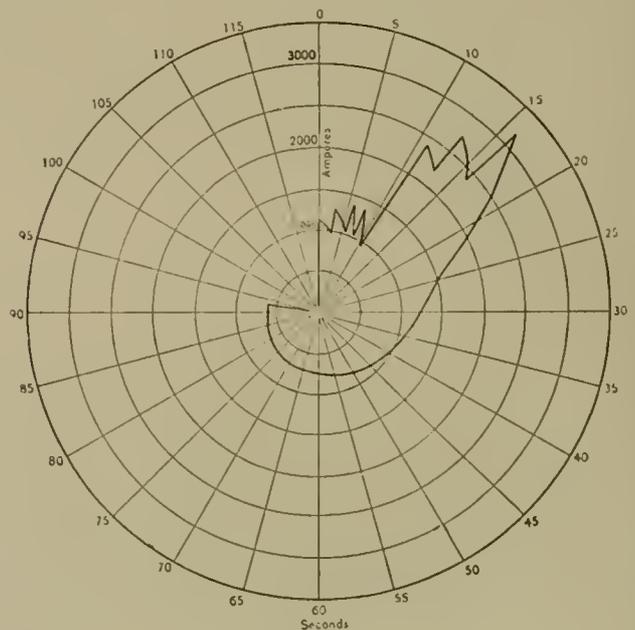


FIG. 5.

It will be seen that by using recording instruments and by taking a sufficiently large number of curves, it is possible to determine very accurately the average losses dissipated as heat by the motor during the test run, and also ascertain the distribution of these losses in the several parts of the motor. The motor ventilation is the same as in a service run; it is operated at varying speeds, remains at rest the required proportion of the total cycle, and in every way the average conditions pertaining to a service run are reproduced in the test run, thus making the data so obtained directly applicable to service problems without the use of any constant.

A curve showing the results of a number of such tests is given in Fig. 6, indicating the degrees rise per watt loss in field copper and

in armature with any relation between total armature and field loss. Here, also, the total iron loss is assumed to be in the armature, and this loss, added to that of the armature copper, gives its total loss, used in determining the "ratio of losses."

Taking up again the study of the motors mounted upon the 25, 35 and 45-ton cars, we are now in a position to apply the motor losses obtained in Fig. 3 with the 35-ton car, and similar curves with the 25 and 45-ton cars. By completing the cycle in Fig. 2 and bringing the car to rest in any given distance, the time

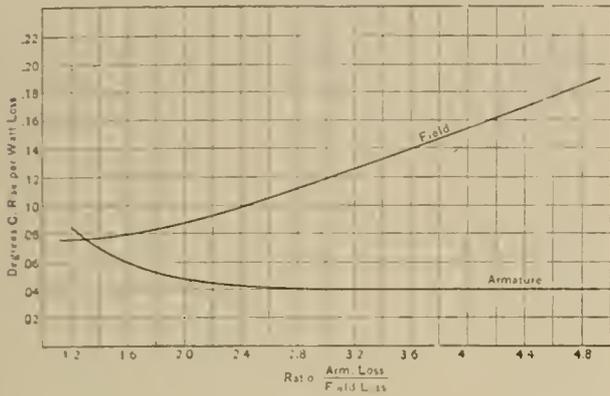


FIG. 6

of shutting off power can be determined, the average losses and their distribution ascertained by curves in Fig. 3, and the temperature rise found out by applying the constants in Fig. 6. That is, for any given schedule, we can determine the temperature rise of field and armature for the three-car train weights and the given gear ratio assumed. By plotting a sufficient number of schedules, a curve similar to Fig. 7 will result, which affords a very interesting study

Such a curve in lieu of a better name might be termed a "service capacity curve" of the General Electric "H" motor. It shows the

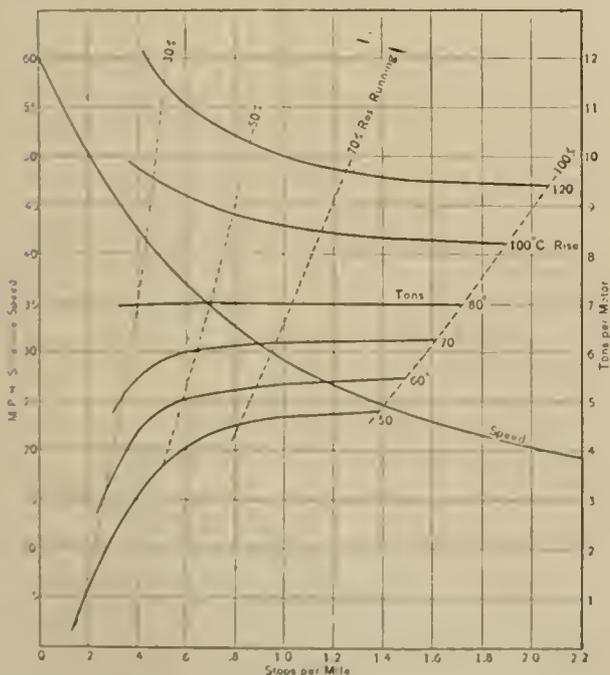


FIG. 7.

temperature rise per motor for any weight of car and the schedule that can be performed with the gear ratio chosen, all plotted in terms of the number of stops per mile. The temperature rise is given as that of the hotter part whichever it may be. The schedule includes stop lasting 15 seconds each. Acceleration is the result of a constant tractive effort of 120 lb. per ton during resistance running, and braking is effected at the rate of 150 lb. per ton. Coasting is

assumed to continue 10 per cent of the duration of the running cycle. Curves of higher temperature cannot be completed without greatly exceeding the commutation limit during acceleration, but would reverse and approach zero the same as those of lower temperature for infrequent stops.

The relation between train weight and temperature rise for a given schedule and frequency of stops is instructive. With one stop per mile and five tons weight per motor, a temperature rise of 54 deg. is noted, while ten tons per motor increases the temperature to 120 deg. rise. That is, the motor temperature increases faster than proportionally to the increase in train weight, due, as we should expect, to copper losses increasing as the square of current; but our friction curves indicate a much larger friction in pounds per ton for the lighter-weight cars, thus bringing the accelerating current required to propel a car at 60 m. p. h. to about that required for cars varying considerably in weight. We would expect, therefore, that for continued runs where the losses due to acceleration are subordinated to the running losses, this increase in

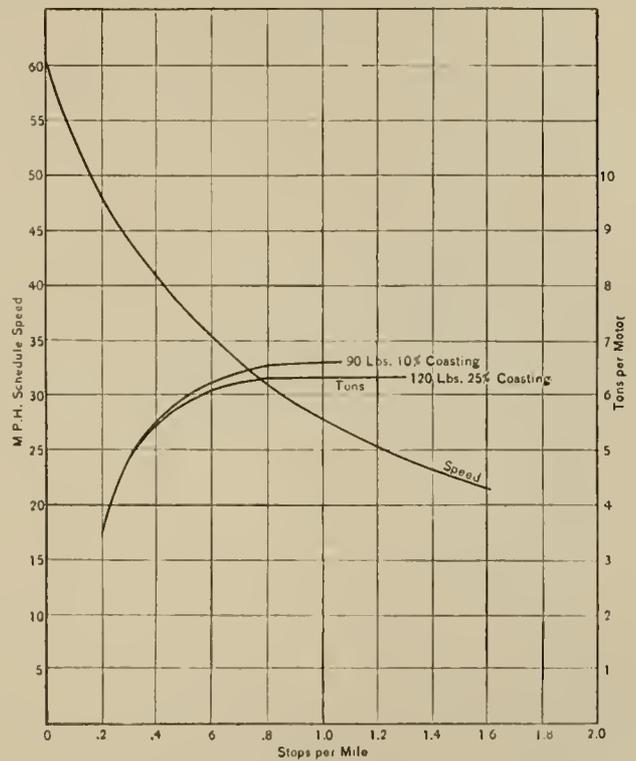


FIG. 8.

temperature with increased car weight would not be so marked. That such is the case is shown by comparing temperatures in the case of train weights of five and ten tons per motor with more infrequent stops, say one stop in four miles, giving temperature rises of 72 deg. and 98 deg. respectively for the same schedule of 48 m. p. h. The curve for 80 deg. rise is very curious, as it indicates a constant weight train with our equipment, regardless of the frequency of stops, while higher temperatures increase and lower temperatures decrease the train weight with the infrequency of stops. The percentage of the time that motors are operating upon starting resistances is indicated by dotted lines.

Curves shown in Fig. 7 are all based upon the same gross tractive effort, giving practically the same rate of acceleration. It is evident that the same schedules could have been made with innumerable other accelerating rates, coasting less with the slower and more with the more rapid rates. In order to make our study of the "H" motor more complete, two sets of curves similar to Fig. 7 were plotted, the first with an accelerating rate of 90 lb. per ton gross and 10 per cent coasting, and the second with 120 lb. per ton and 25 per cent coasting, both making the same schedule with the same frequency of stops. The comparison of these two curves is shown in Fig. 8, plotted for a temperature rise of 60 deg. only in order to avoid confusion. The lower rate and less coasting has some advantage for more frequent stops, but as such an equip-

ment would not be used geared for 60 m. p. h. with much less than a two mile run average, it follows that the temperature rise would be virtually the same with either rate of acceleration.

Lower speed equipments, however, present results differing from this, as is shown in Fig. 9, illustrating the 60 deg. rise curve for a maximum speed equipment of 30 m. p. h. Here 160 lb. and 25 per cent coasting contrast very favorably with 120 lb. and 10 per cent coasting. In other words, the motor capacity is greatly increased by raising the accelerating rate while still maintaining the same schedule and frequency of stops. Increasing the accelerating rate does not necessarily mean going beyond the commutating limit of our motors, as a lower speed gearing can increase the rate of acceleration with the same current flowing in the motors as with the slower rate of a higher speed gearing.

A study of the foregoing curves seems to indicate that so far as motor heating is concerned, it is preferable to use the largest gear ratio and highest rate of acceleration possible for the accomplishment of the service contemplated, provided the maximum speeds are low, but that practically any rational rate of acceleration can be used where speeds approach a maximum of 60 m. p. h. As will be shown later, the energy consumption is less for a higher rate of acceleration permitting more coasting, but unfortunately the fluctuations on the distribution system and the load curve on the generating station may both be much poorer if the accelerating rate is carried too high and the number of units in service is small. In the choice of gear ratio for a given service, therefore, not only must account be taken of the question of motor heating with different rates of acceleration, but due heed must be paid to the question of line fluctuations, station load and energy input. It may be possible that what is gained in car energy by a more rapid acceleration, may be lost by the poorer coal economy resulting from a more irregular load curve upon the generating station.

So far we have considered the question of capacity of our "H" motor for one gear ratio only. It is obvious that similar calculations may be made for any other gear ratio corresponding to a different maximum speed on the level, and by combining the results of several sets of such calculations, it is possible to arrive at a capacity of our "H" motor for any schedule, any gear ratio and any

the motor of 60 deg. C. are shown from one stop in two miles to four stops per mile.

A careful study of the curves in Fig. 10 gives very interesting results. For instance, the "H" motor geared for 60 m. p. h. can operate between the limits of one stop in two miles and four stops per mile, making a schedule of from 40 m. p. h. down to 14 m. p. h., with approximately five tons per motor in all cases and the same temperature rise. In other words, an equipment of this character is protected from overheating by properly proportioning

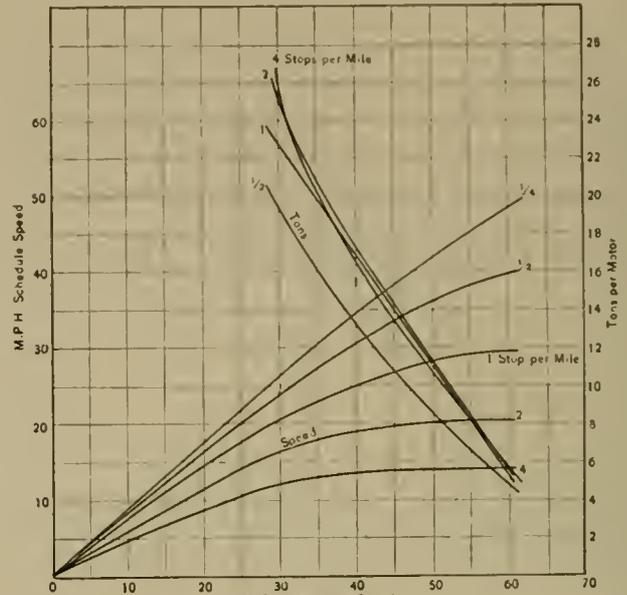


FIG. 10.

its gear ratio to the car weight. The possible schedule speed for a given gear ratio is controlled by the number of stops per mile, but the heating of the equipment, with the proper weight of car, will be the same over a very wide range of schedules and stops. The curves, also, bring out very forcibly the importance of properly gearing an equipment for the work which it has to do. For instance, a gearing giving 60 m. p. h. on a level track can make but 20.5 m. p. h. schedule with two stops per mile with a train weight of 5.6 tons per motor, while the same equipment geared for 47.5 m. p. h. can perform 20 m. p. h. schedule (practically the same), but can do so with a total train weight of 12.8 tons per motor, or more than double the train weight possible for the same temperature rise with the 60 m. p. h. equipment. In other words, the equipment should be geared for the lowest possible maximum speed that will permit the maintenance of the schedule in question, as a gear ratio giving too high a maximum speed for the work to be done not only overheats the motors, but produces needless demands upon the generating and distribution systems.

The curves in Fig. 10 give a fairly complete study of the type "H" motor when applied to the operation of single cars equipped with four motors. All points in the curve except for a maximum speed of 30 m. p. h., are obtained with the operation of single cars, and as our friction curves may be inaccurate, being based upon a single set of tests, or trains of more than one car may be run, it is instructive to reproduce a similar set of curves for two, three, four cars, etc., per train. The motor capacity for a given temperature rise is governed largely by the shape of the friction curve used at high speeds, especially for the longer runs, and in Fig. 11 is shown a comparison between the operation of one and two-car trains making the same schedule, and using the same accelerating tractive effort per ton, braking and stop intervals as in Fig. 10. This set of curves is also plotted for a temperature rise of 60 deg. C., but it is obvious that from the foregoing material we could plot similar curves for any other temperature rise. As the curves showing the relation between tons per motor and maximum speed for a given temperature rise come so close together for the different frequency of stops, this sheet has considered only the relation between tons per motor and maximum speed for one stop per mile. Thus we see that at 60 m. p. h. the type "H" motor

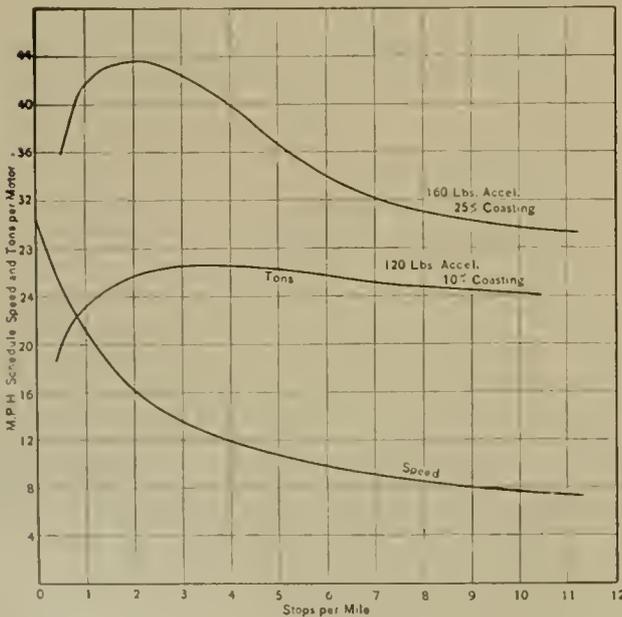


FIG. 9.

frequency of stops. This may be plotted in terms of any temperature rise, and a set of such curves is plotted in Fig. 10 for a temperature rise of 60 deg. This set of curves still retains 120 lb. per ton tractive effort, 15-second stops, 150 lb. braking effort, and is based upon the performance of a single car using a four motor equipment, following the lines of the friction curves given in Fig. 1. The relation between schedule speed and maximum speed on the level is shown with stops varying from one in four per mile, and the tons per motor for a maximum temperature rise in any part of

operating a single car has capacity of but 5.3 tons per motor for 60 deg. rise, while if two cars are coupled together and operated as a single train, the reduction in wind friction per ton of train weight increases the capacity per motor to 7.5 tons for the same 60 deg. temperature rise, an increase of 42 per cent. This opens up a new field of inquiry as to whether it is commercially advisable to run single car units at this high speed when the motive power, and as it will be shown later on, the energy input, are both larger than would result from operating the same seating capacity in trains of two cars or more, with a correspondingly increased time interval between trains. In other words, is the electric traction idea of small units at frequent intervals a proper method of attacking the very high speed electric traction problem, or are we compelled to go back to the steam method of operating heavier trains at more infrequent intervals, in order to prevent a prohibitive investment in motors, and generating and distributing systems, and a ruinous expense for operation? It is true that the electric system, being eminently adapted to subdivision, has created the demand for travel, by means of its frequent service, where none previously existed, but it may be possible that for very high speed work too great a price may be paid for the privilege of operating very frequent small units.

The foregoing discussion has described a method of determining the probable heating of a given motor when operated under any known conditions. The results obtained are so complete and give such a mass of working data directly applicable to service requirements, that the labor of the detailed calculations necessary seems amply justified. Specifications of stationary apparatus are prepared in careful detail and acceptance tests carried out in great exactness, but the tendency to slight the railway motor problem, owing largely to its seeming complexity, is hardly warranted, when it is considered that the capital invested in such apparatus may be double that required for generator power to drive it. Then, too, the generator is carefully housed, provided with an attendant and otherwise taken care of, while the motor is exposed to outside climatic conditions and only gives evidence of being overloaded by burning out. The selection of such apparatus should receive the most careful attention, the proposed service conditions fully worked out and the

servicing commutation at the maximum current for which the motor will probably be called upon in service operation. Some method of rating railway motors which would give an accurate comparison of their service capacity under different conditions, if such a rating is possible, would be of great advantage over the present very general one-hour rating.

The foregoing investigation has pointed out the very variable nature of the work which a railway motor has to do, and the different relations between service performed, distribution of losses and the ultimate heating of the motor. In Fig. 3 the various motor losses are shown for the type "H" motor, taken as an example,

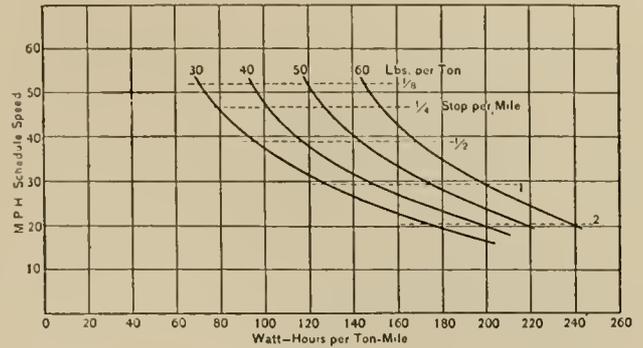


FIG. 12.

but it is evident that different motor loss curves, even for the same service performed, could not be compared directly with any assurance of arriving at their comparative temperature rise. Proceeding further, we come to the values given in Fig. 6, showing the relation between motor losses, their distribution, and the resulting temperature rise per watt loss. Similar curves of different motors could be compared directly and give some means of their relative capacity, but here, also, there is no direct comparison as different motors do not have the same efficiency, and therefore will not give the same loss for the same service performed. In other words, given two motors having the same thermal constants, that is, the same degrees rise per watt loss, the motor having the poorer efficiency will rise to a higher temperature for the same service performed, owing to its greater loss. We cannot, therefore, look to the thermal curves as giving the comparative rating needed.

In Fig. 7 we have a fairly complete history of the type "H" motor operating under a given set of assumptions. These assumptions are those pertaining to service operation, and such a set of curves for another motor calculated for the same conditions would give accurately the comparative size, or in other words, the comparative temperature of the two motors for the same service performed. In Fig. 7, the "service capacity curves" approach much nearer to a basis of comparing different motors, but as a method of rating railway motors it is incomplete. In the first place, we have assumed a given rate of acceleration, while it is obvious that the demands of different classes of service, especially low speed service, will call for different rates of acceleration, and hence a separate sheet would have to be made out for every rate of acceleration. The effect of increasing the rate of acceleration and increasing the time of coasting is shown in Fig. 9, giving such discrepancy between tons per motor for a given temperature as to make sheets similar to Fig. 7 entirely unreliable for comparing different motors, especially when the maximum speeds are low and the acceleration energy is the determining factor in the motor heating.

There is another variable, the rate of braking, which has not been entered into in this discussion, and which also affects the heating of the motor, especially on low speed high acceleration problems. On the higher speed problems, where friction is the ruling factor, it is found that we must also assume a certain friction rate, or in fact a friction curve plotted to a definite formula in order to arrive at consistent results with different motors. Having once determined on this friction curve for a single car, our calculations are immediately disqualified when we couple two of these same cars together and perform the same service, the friction rate at speeds of 50 or 60 m. p. h., falling off considerably as we approach a train composed of several units.

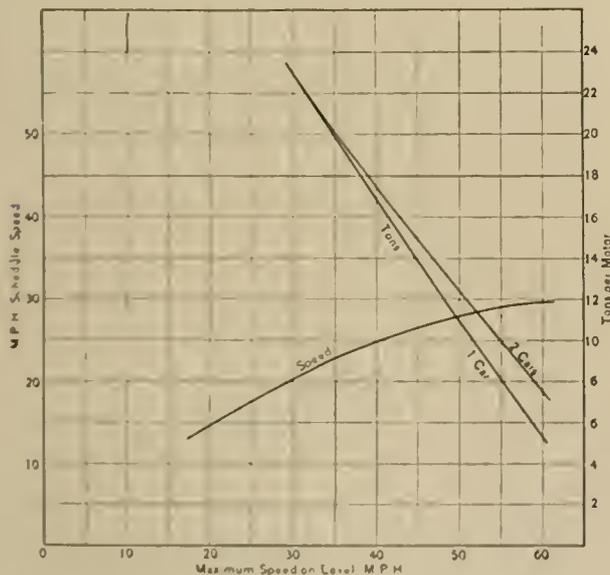


FIG. 11.

proper size of motor and correct gearing chosen to ensure a reasonably small expense for maintenance

The present method of rating railway motors is to determine the current which they will carry at 500 volts on a stand test giving a temperature rise of 75 deg. C. in the hottest part after sixty minutes' run. In other words, the one hour rating of railway motors gives only an indication of the comparative capacity of two motors in actual service, and affords no data to serve as the basis of calculating the service capacity of the motor. It does determine the mechanical qualities of the motor, as the one hour test is generally very severe, and it also affords a means of ob-

In addition to the foregoing variables, we have the element of the energy consumed by the rotating parts during acceleration. This factor is practically negligible at very high speeds, but figures very prominently in acceleration problems with low speeds. In giving the rating of a railway motor, it will be necessary, therefore, to fix definitely upon the weight and center of gyration of car wheels and armatures, and furthermore determine the effect of the motor parts for a given gear ratio.

After all these variables are definitely fixed, we must repeat the same set of conditions for each motor gear ratio, or, as a more general case, for each different maximum speed on level, thus eliminating the question of the total number of teeth in gear

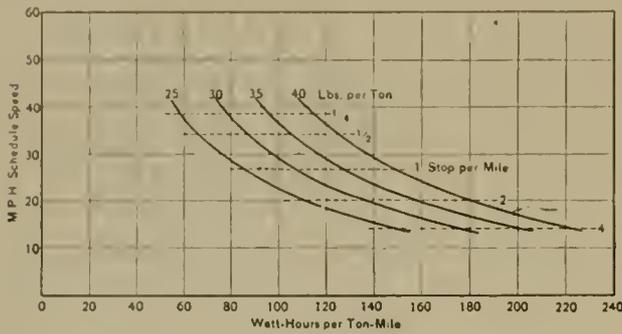


FIG. 13.

and pinion. It is not intended in any way to discourage an effort to rate a railway motor by some method that will give its comparative capacity, but it is well to canvass carefully the large field of variables which must enter into such a rating, and to have clearly in mind the bearing which these different variables have in determining the temperature of the motor. It is evident that by affixing certain values to accelerating rate, train friction, braking effort, energy of rotating parts, etc., it will be possible to prepare a set of curves giving the relations between schedule, frequency of stops and temperature rise for any car weight, which would give accurately the comparative size of a railway motor in relation to any other motor for which curves were similarly plotted. Such work is being done by the General Electric Company on their standard railway motors, and in fact is necessary in order to be able to give the probable performance of a motor under any set of conditions, and follow through the effect of changing the conditions. The method, however, is cumbersome, and has so many factors entering into the case that it probably may never serve as a commercial rating; furthermore, such relation could only be expressed by curves, or a long, tabulated statement, and neither method is short and concise enough for a commercial rating.

As the result of considerable investigation along these lines, the writer has not arrived at any commercial rating of a railway motor which serves its purpose better than the one-hour test now universally used. Admitting that such a test does not give the comparative size of different motors, it does serve the purpose of largely determining its commutating qualities and possesses the advantage of being commercial. Unless a rating can be proposed which will indicate accurately the relative size of motors, the present method of one-hour rating possesses advantages which would hardly warrant its being superseded.

Although insufficient data are at hand from the foregoing calculations to form the basis of a complete treatise on the subject of train energy, sufficient material is provided to furnish some very interesting comparisons. As the basis of calculations, we assume the operation of single car trains composed of 25, 35 and 45-ton cars, geared for a maximum speed of 60 m. p. h. for the 35-ton car. From our friction curves we find that these three cars at 60 m. p. h. require a tractive effort of 59 lb., 50 lb. and 43.5 lb. per ton respectively. The same calculations were carried through for trains composed of two cars or more, the cars being of different weights, so that we are able to plot a set of curves showing the relation between schedule speed and watt hours per ton mile input to the train, virtually ignoring any fixed formula for train friction. Such a set of curves is shown in Fig. 12, being plotted for 30, 40, 50 and 60 lb. per ton friction rate at 60 m. p. h. These curves may be regarded as fairly general in their scope, except that they follow

the general form of the friction curves given in Fig. 1. In other words, we can get from these curves in Fig. 12, the energy consumption for any friction rate at 60 m. p. h., the error introduced by assuming a general shape of curve being very small.

An inspection of Fig. 12 brings out forcibly the fact that the subject of car energy at high speed is most intimately interlinked with the question of train friction. As the schedule speed decreases with the increasing number of stops, or in other words, as the energy of acceleration becomes a more important factor, the per cent difference between the energy values for different train frictions becomes less, as would be expected.

The electric road has almost universally used one car units, and as it has branched out into suburban high speed work, the advantages of more frequent service have made the operators of such roads retain the single car idea. From the curves given in Fig. 12, some figures can be secured of what it costs to operate a single car, and also trains of two or more cars, where the maximum speed is 60 m. p. h., and the stops very infrequent; that is the more advanced type of our private right-of-way suburban road. A single 35-ton car having a friction, say, of 50 lb. per ton at 60 m. p. h., will consume 119 watt hours per ton mile at a schedule of 52 m. p. h. with one stop in eight miles. Let two such cars be coupled together in a train, reducing the friction to 33.5 lb. per ton, and the train will require an input of only 78 watt hours per ton mile, or 65.5 per cent of the energy rate per ton required in single car operation. In other words, single cars on 30-minute headway would require 52.5 per cent more energy for their operation than would two-car trains on one-hour headway. With five-car trains composed of 35-ton cars, the energy is reduced to 56 watt hours per ton mile for the same schedule, or less than half what will be required per ton for the operation of single car trains.

From a purely energy standpoint it would seem that the operation of single-car trains was disadvantageous, but experience has shown that it is not fair to assume that two cars operated every hour will attract the same custom as one car operated every thirty minutes. In other words, the frequency of service creates travel and in many cases warrants the extra expenditure for coal. There is another aspect of the case to be considered and that is that with two-car trains at more infrequent intervals, the load upon the feeding points is more fluctuating, the size of rotary converters must be somewhat increased, and in all probability a larger amount of feeder copper will be required to keep the drop within the same limits. Although a saving may be effected in the coal pile by increasing the train headway and giving the same seating capacity in trains of two or more cars, there is every reason to expect a call for a greater expenditure of money to install the road, and an in-

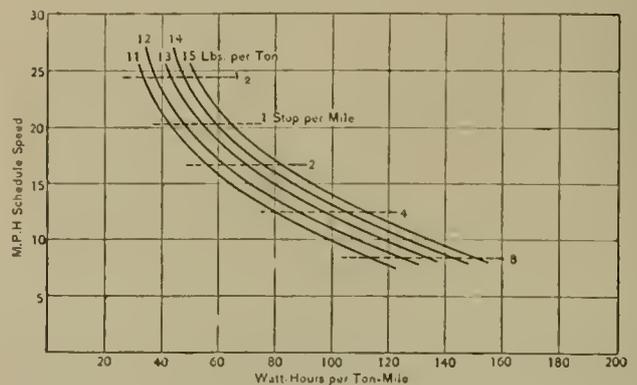


FIG. 14.

crease in interest and maintenance account that may go far toward eating up the saving in the fuel expense.

In Fig. 13 and Fig. 14 are given curves showing the relation between schedule speed and train energy for maximum speeds of 45 and 30 m. p. h., respectively. It will be noticed that, particularly for 30 m. p. h. maximum speed, the train friction becomes a very much smaller factor in determining the energy input, especially as the number of stops per mile increases.

All these three sets of curves are plotted for an accelerating rate, corresponding to 120 lb. per ton, and a braking effort of 150 lb. per ton. The values given will, therefore, be subject to consider-

able variation for different accelerating and braking efforts where the schedule speed is low and stops numerous. The curves are, however, of fairly general use, especially for runs of a mile or more, as the effect of rate of acceleration and braking is not so marked on longer runs.

In Figs. No. 12, 13 and 14 is considered, also, a period of coasting equalling to per cent of the time the train is in motion. While this is a fairly general assumption and will give sufficient margin for a large majority of problems, it will be found in carrying out the subject to a conclusion that the per cent of coasting is a very large factor in determining the train energy input. For instance, a high rate of acceleration with a long period of coasting will demand less energy input to the train than a lower rate and little or no coasting. The reason for this is obviously that the efficiency of acceleration of the two runs may be approximately 70 per cent, while the speed at which brakes are applied is less with a longer coasting period and hence the work demanded by the equipment is less.

In all three of the energy curves given, a variable friction during acceleration and coasting is considered, but straight line braking is assumed. The energy required to accelerate the rotating parts is also considered, so that the curves as given are of fairly general application.

In this paper the writer has attempted to outline a method of determining the probable heating and energy consumption of a given equipment for any class of work, having in mind, also, the possibility of arriving at some short, concise method of rating different railway motors, so that their comparative service capacity might be accurately indicated. As the subject of motor capacity is so dependent upon experimental tests, not only of car friction and braking, but also of heat radiation under working conditions, the conclusions drawn were based so far as possible upon actual experiments made. Were it not for the fact that car friction, or rather, tram friction is such a variable quantity, dependent not only upon the condition of track but upon the speed and composition of the tram, it would be possible to plot a set of curves for a given friction and distance, and apply these curves for similar shaped runs over greater or less distances by taking the coordinates proportional to the square root of the area of the speed-time curves, that is, pro- the wind friction at higher speeds changes the value of friction per portional to the square root of the distances covered. As, however, tion to such an extent, it is only possible to draw up curves for a given set of conditions and generalize, as is done in Figs. 12, 13 and 14 for different friction rates.

While it is thus possible to prepare a set of energy curves which are of fairly general application to all problems, it is only feasible to express the relation between motors of different capacity by a series of curves similar to those described in Figs. 7, 8, 9 and 10. It is entirely possible to approximate the probable heating of motors of different sizes when the resistance, core loss and general construction is known, but such short cut methods are at best only approximations and no true comparison of different motors can be made which will take into account their different losses for the same work performed and their capacity for radiating these losses at different speeds, without considering the subject in detail for each motor alone along the general lines indicated in this paper.

In dealing with the railway motor where the temperatures approximate 60 deg. C. rise in practice, with an air temperature in summer reaching 30 deg. to 35 deg. C., we have not much leeway below a temperature injurious to the insulation, and approximate methods giving rise to errors of 10 deg. or 20 deg. C. in temperature cannot be seriously considered in such important calculations as the determination of railway motor temperature. For this reason the methods outlined, although entailing a large amount of experimental work and subsequent calculation, provide an accurate method of determining the temperature of railway motors operating under any known conditions, and although they fail to provide a method of rating railway motors, it is due to the fact that such a method of rating cannot be expressed by any short term, but necessitates such general curves as are indicated in the paper.

The writer wishes to acknowledge the services of Mr. E. F. Gould in preparing material for this paper, and the kindness of the General Electric Co. in furnishing results of experimental tests which served as a basis of all calculation.

BAY SHORE TERMINAL CO., NORFOLK, VA.

This company has just opened a new 12-mile electric railway from the city postoffice of Norfolk to Ocean View, Va. Although the road is built on standard lines now thoroughly familiar in the north, it is interesting as showing the stage of development reached in electric railway construction in the south.

The road at present is mostly single track, but soon will be double-tracked throughout. In the city a 9-in. Pennsylvania Steel Co. 107-lb. girder rail was used with concrete poured between the ties and up to the base of the rail. In the country a 4½-in. 58-lb. T-rail was laid. With the girder rail "Protected" rail bonds are placed under the 8-hole angle plates at each joint.

A large portion of the track work is laid with oyster-shell ballast, a form of ballast extensively used in the South wherever oysters are plentiful. In building it is customary after grading to dig a trench for the roadbed and fill in with oyster shells to a depth of 6, 8 or 10 in., as the condition of the sub-soil may demand. The shells are rolled down hard and the ties placed on top of this bed. Shells are then tamped in between the ties and up to the top of the rail and a steam roller is again used to give a hard, compact surface.



CAR HOUSE AND POWER HOUSE.

At Norfolk the oyster shells cost from 2½ to 3 cents a bushel. Shell ballast is dusty in dry weather, but otherwise makes a very satisfactory roadbed.

On the Bay Shore Terminal road the ties are Georgia pine, sawed for city work and hewn for T-rail work. The company pays 42¾ cents each for its ties either sawed or hewn. Ties are 6x7 in. x 8 ft. spaced 2 ft. c. to c.

On the business streets of Norfolk the paving is granite blocks on concrete. The company pays for paving its tracks and for 2 ft. beyond each outside rail.

There is considerable single track trestle work along the line that is rather interesting. A representative section of this trestling is found not far from the city terminal where the road crosses a small river. The trestle is 600 ft. long. It consists of 40-ft. 12 in. cyprus piles driven three together every 16 ft. On top of each set of three piles is laid a 12x10 in. x 12 ft. cap piece, and on these are the main stringers which are 6x14 in. x 32 ft. long. The ties are bolted to the stringers. This trestling is strong, substantial and inexpensive to build.

As the piles stand in tide water they required some form of protective coating against moisture and also to keep bugs and worms which are very plentiful in this locality from honeycombing the piles. This protection is gained by charring the outside of the piles to a depth of about ½-in. The piles before driving are rolled into an open fire and frequently turned until an even depth of char has been secured all the way around. It is found that worms and insects can make no impression on piles burned in this way and the treatment is believed to be more effective than creosoting.

The trolley wire is No. 00 with Ohio Brass overhead material. The poles are juniper, 30 ft. long, 7-in. at top and 12-in. at butt, placed 6 ft. in the ground with concrete tamping.

The power house is a model station for a small street railway property. The building is of brick, 45 ft. by 93 ft. and is one story high. The boiler room extends across one end of the building and is 30 ft. wide inside. The boiler room floor is at grade, and that of the engine room 7 ft. higher. Concrete footings are provided for the walls and brick and concrete foundations for the engines and generators.

At present the station contains but one 200-kw. unit but an additional 400 kw. unit will be installed at once.

and in case of fire both pumps could be used to pump water to the fire plug connections.

The car house is built of hard pine and cost \$2,700 complete. The main portion is 175 ft. long by 36 ft. wide, making room for three tracks which are entered from one end only. The center track has a pit 80 ft. long near the rear end of the barn. At the rear end, alongside the car house is the shop, 50x15 ft. In a corresponding position at the front end of the car house are a room 20x15 ft. for conductors and motormen and two rooms 15x15 ft. for offices. The



INTERIOR OF POWER HOUSE.

The present unit consists of a 150-h. p. simple Hamilton-Corliss engine, with cylinder 20 in. in diameter and 42-in. stroke, belted to a 200-kw. Westinghouse railway generator. The engine is run non-condensing but will be changed to condensing as soon as the condensing apparatus can be installed.

The new unit will consist of a 600-h. p. Hamilton-Corliss tandem compound engine, with cylinders 18 and 36 in. x 42-in. stroke, direct connected to a 400-kw. railway generator. There is being installed an independent Wheeler surface condenser. Both engines

car house and power station were both designed by Charles P. Breese, consulting engineer, of Norfolk, Va.

The rolling stock consists of three open motor cars, four closed motor cars and three open trailers. The cars are partly Stephenson and partly St. Louis Car Co. make. The motor cars measure 35 ft. over all and the trailers 40 ft. over all. This running of long double truck trailers attached to double truck motor cars is a practice more frequently followed in the South than in the North. It is in vogue on the interurban lines running out of Washington, D. C., at Norfolk, Va., at Charleston and other Southern cities. It seems to be the opinion that the added carrying capacity per train more than overbalances whatever increased liability to accident there may be, incident to running trailers.

The motor cars are equipped with two Westinghouse No. 56 motors to each car and are mounted on McGuire double trucks. Part of the cars are fitted with Christensen air brakes and part with Westinghouse air brakes, both of the motor driven compressor type. When trailers are run it is customary to have a brake cylinder on the trailer which is connected by train pipe with the main air tank on the motor car, and the brakes on both cars are operated in unison from the engineer's valve on the front platform of the motor.

Until the double track is ready cars will be dispatched by telephone.

The Bay Shore Terminal Co. was organized in 1900, and has capital stock authorized, \$500,000; issued, \$120,000.

The officers are: President, H. L. Page; vice-president, H. L. Smith; secretary and general manager, J. A. C. Groner; treasurer, A. E. Krise; supervisor, L. C. Johnson; chief engineer, C. P. Breese; electrical engineer, A. L. Crater; auditor, Alex. Hart; attorney, J. E. Cole. The company is building the road under the supervision of its own officers without the aid of contractors. The road when completed will have cost about \$220,000, including cost of franchises.

Mr. L. C. Johnson, supervisor, is in charge of the road department including maintenance and operation. All section foremen, conductors and motormen and laborers report to him. Mr. Johnson is a steam railroad man of wide experience, having been with the Seaboard Air Line for five years, and master builder for the Atlantic & Danville R. R. for 12 years.

Mr. A. L. Carter, electrical engineer, has supervision of car barn property, power house and all electric road work. Foremen in charge of these departments report to him.

The Binghamton (N. Y.) Railway Co. has installed a new 750 h. p. vertical engine and boiler and General Electric generator at its power house, and has put four new cars in commission.



INTERIOR OF CAR HOUSE.

are from the works of the Hooven, Owens, Rentschler Co. of Hamilton, O.

There are two 150-h. p. Stirling boilers run under 150-lb. steam pressure. The boiler capacity will be increased to provide for the new unit. The steam piping is extra heavy with extra heavy fittings. The feed piping is of brass, extra heavy. There is a 70-ft. brick stack, 4 ft. in diameter.

Near the power house is a 70,000-gallon tank elevated to sufficient height to give good pressure in the car barn and power station. The tank is supplied with water from driven wells by a small steam pump. This pump and the feed water pump are so connected that either one can be used for feeding the boilers or for storing the tank

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ELECTRIC RAILWAY IN STREET AN ADDED BURDEN.

Peck v. Schenectady Railway Co. (N. Y.), 63 N. E. Rep. 357. Apr. 1, 1902.

The use of a city street for the purposes of a street surface railroad operated by electric power the court of appeals of New York holds, as a settled question in that state, imposes an added burden upon the property rights of the owners of the fee, subject to the public easement for street purposes.

ONE SEEING A MOTORMAN IS NOT GOING TO RESPECT HIS RIGHTS TO CROSS STREET FIRST MUST NOT TAKE CHANCES.

Schwanewede v. North Hudson County Railway Co. (N. J. Sup.), 51 Atl. Rep. 696. Feb. 28, 1902.

If it appears that the trolley car motorman is not going to respect your rights to cross the street first, you must wait, the supreme court of New Jersey holds, or you are guilty of contributory negligence if hurt. A person cannot take chances, and hold himself free from contributory negligence. There is a difference between an unforeseen peril and being overtaken by one recklessly incurred.

INJURY OF PASSENGER IN LOOSENING FOOT CAUGHT ON STEP IN ALIGHTING.

Howell v. Union Traction Co. (Pa.), 51 Atl. Rep. 885. Apr. 21, 1902.

The testimony of a passenger that when, in alighting, he had put one foot on the ground the other caught by the heel in the step of the car and he could not get it loose until he made a second effort with such force that it threw him down and he injured his kneecap, the supreme court of Pennsylvania holds, failed to disclose any negligence on the part of the company, and a judgment of nonsuit was properly entered.

MOTORMAN INJURED BY DEFAULT OF DRIVER OF BEER WAGON ENTITLED TO DAMAGES FROM LATTER'S EMPLOYER.

McCorkle v. Anheuser-Busch Brewing Association (La.), 31 So. Rep. 762. Mar. 17, 1902.

A street car propelled by electricity, and moving at a moderate speed, was run into at a corner by a covered beer wagon, the driver of which, occupying a seat from which his view upon either side was obstructed by the cover of the wagon, drove his mules at a brisk pace along the street which intersected the car tracks, and practically into the car, before looking up or down the track. Upon the facts proven, the supreme court of Louisiana holds, the driver was at fault, and the motorman was entitled to recover from the driver's employer for personal injuries resulting from the collision.

ADJOURNMENT WITHOUT FORMAL POSTPONEMENT OF ACTION ON FRANCHISE NECESSITATES A NEW NOTICE STOCKHOLDERS ON BOARD GRANTING FRANCHISE.

Hugh v. Smith (N. Y. Sup.), 75 N. Y. Supp. 451. Mar., 1902.

Under a statute requiring the local authorities to give public notice of the time and place when an application for consent to build and operate a street railroad shall first be considered, the supreme court of New York, special term, Fulton county, holds that jurisdiction to act upon the application is lost by an adjournment without date and without postponing the subject for future consideration, and no subsequent action thereon is authorized until notice is again given as in the first instance. Moreover, the court holds that good morals, as well as good law, unite in condemning as illegal any contract made with, or consent given to the applying corporation while any of its stockholders continue a part of the board of trustees of the municipality.

AUTHORITY REQUIRED TO OCCUPY PUBLIC ROAD IN COUNTRY.

Norfolk Railway & Light Co. v. Consolidated Turnpike Co. (Va.), 40 S. E. Rep. 807. Mar. 13, 1902.

A street railway company cannot lawfully occupy a public road in the country, the supreme court of appeals of Virginia holds, unless it has authority to do so from the legislature, or from the county, where the power to grant such authority has been delegated to the county by the legislature. The authority must be by express enactment, or by implication so clear as to leave no doubt that it was granted. It cannot occupy a public road under a general authority to extend its lines not exceeding 20 miles into the country from the city limits. And this is true whether the proposed service be a commercial street railway or for the purpose alone of transporting passengers.

DUTY OF DRIVER OF VEHICLE TO LOOK FOR CAR UNTIL TRACK IS REACHED.

Pieper v. Union Traction Co. of Philadelphia (Pa.), 51 Atl. Rep. 739. Mar. 24, 1902.

A driver in a big, high-seated, two-horse wagon, with curtains all down the sides because it was raining, gave one look "out from underneath the cover" of his wagon, for a distance of 50 or 70 feet down the street, to see if a trolley car was coming, when he reached the flag crossing across the street, and seeing no car within the distance named, sat back in his wagon, satisfied that he could cross the track without being struck. The supreme court of Pennsylvania holds that he was properly nonsuited on the ground of contributory negligence. It says that it was his duty, when he was entering the street, to be on the lookout for the approaching car, and, when on the street, to continue to look until the track was reached. A single glance "out from underneath the cover" of his wagon down the street for but 50 or 70 feet was not such a looking as enabled him to see the danger into which he took his wagon an instant later; and this careless looking was in itself negligence. It was a mere heedless glance, and not an adequate performance of the duty required by the situation.

DUTY OF DRIVER OF VEHICLE APPROACHING TRACKS AS TO LOOKING FOR CARS.

Haas v. Chester Street Railway Co. (Pa.), 51 Atl. Rep. 744. Mar. 24, 1902.

The driver of an open carriage, the supreme court of Pennsylvania here holds, was not required to stop before attempting to cross a street railway track, but it was his duty to look, when in a place where he had a view of the track, in the direction from which a car might be expected to come, and to continue to look as he approached it. Ordinarily on a city street the house line is the proper place from which to look, and looking from a point back to the house line where the view is obstructed does not relieve from the charge of contributory negligence. But if the act of looking, commenced at a point back of the house line, continues when it is reached, and until the driver is so far committed to the act of crossing that it is more dangerous to attempt to stop than to go on, he has done all the law requires in that regard. When a clear view of the track for a safe distance cannot be had, it may be the duty of a driver to stop before crossing the track of a street railway. But this is not a fixed legal duty, as it is in the case of steam railroads; and, unless the necessity for this additional precaution is obvious, the question whether, under the circumstances, it should have been taken, is for the jury. The driver in this case had to look both ways, as a car might come from either direction on the single track. While he was advancing slowly, looking alternately west and east, a car running very rapidly came into view in one direction while his eyes were momentarily turned in the other. Whether, under the circumstances, he exercised due care, was for the jury, and a judgment in his favor is affirmed.

LIABILITY FOR INJURIES CAUSED IN CASE OF RUNAWAY BY PROJECTING RAILS.

Gray v. Washington Water Power Co. (Wash.), 68 Pac. Rep. 300. Mar. 19, 1902.

A horse driven by a woman became frightened, and ran away. It turned into a street where there were street railway tracks, the rails of which were required by the grant of the use of the street to be kept flush with the surface thereof, but which projected above the surface of the street from one to three inches, and had done so for a considerable time. When the wheels of the buggy struck these rails at an angle, the woman mentioned and another one with her were thrown out, and the former severely injured. A jury returned a verdict in her favor, and the supreme court of Washington holds that it was error to grant a new trial on the ground that the running away of the horse and the loss of control of the horse constituted the proximate cause of the accident and injuries complained of. In other words, it does not think that the court could say, as a matter of law, in this case, where two causes united to produce an injury, which one of the causes was the proximate cause of the injury. The correct rule of law was stated, and the question properly submitted to the jury, the court holds, by an instruction to the effect that before a recovery could be had it must be proved that the company was guilty of negligence in the maintenance of its track at the point of the injury; that the rails were exposed in such condition as to be dangerous to the traveling public, by the ordinary and usual method, in the ordinary and usual way; and that it was necessary for the jury to find that the accident and injury would not have occurred without the existence of the negligent acts complained of.

LIABILITY OF CONSOLIDATED FOR DEBTS OF OLD COMPANY—ILLEGALITY OF CONSOLIDATION—NO DEFENSE.

Shadford v. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 80 N. W. Rep. 960. Apr. 8, 1902.

If there is in fact a consolidation between certain street railway companies, the consolidated company, the supreme court of Michigan holds, cannot deny its liabilities, either for contracts or torts, or its liability resulting from such consolidation, upon the plea that its organization is illegal, as, for example, because the street railway act under which it is organized does not authorize a consolidation. The legality of its organization cannot be attacked collaterally in suits by and against it, based upon dealings with it. Its legality can be attacked only in a direct proceeding by the state for that purpose. So long as the state chooses to recognize its validity by keeping silence, it is a corporation de facto, or in fact, though not de jure, or of right, and liable the same as any other corporation in its dealings with others. Nor can the consolidated company say that one of the old companies was insolvent, and that therefore a creditor of such old company was not prejudiced by the consolidation or transfer. By the consolidation the new company is burdened with the debts of the old, and the sole question then is, has the new company sufficient assets to pay its debts which then include those of the old companies? The law will not permit the creditors of two corporations to be deprived of the assets of such corporations in payment of their debts, and turn them over to suits in equity against the stockholders, when the union or consolidation with another company is effected without the passage of a dollar or other valuable consideration passing between the corporations themselves.

DUTY OF DRIVER IN COUNTRY TO LOOK FOR CAR UNTIL TRACK IS REACHED.

Keenan v. Union Traction Co. (Pa.), 51 Atl. Rep. 742. Mar. 24, 1902.

A driver, in the country, of a one horse, covered delivery wagon stopped at a distance of about 35 feet from the track, climbed out on the swingle-tree far enough to get clear of the curtains, and look down the road, where he had an unobstructed view of 319 feet in the direction from which a car was coming, but seeing no car got back into his wagon and started his horse on a walk. The supreme court of Pennsylvania holds that at the close of his testimony a verdict was properly directed for the company. It says that had he leaned forward beyond the curtains, without getting out on the

swingle tree, and looked, he could have seen the car, and his failure to do so was negligence per se, or in and of itself. He did not continue to look until he reached the track, and yet that was his duty. Continuing, it says that it was urged that the rule that one about to cross a street railway track must continue to look until the track is reached relates only to electric roads in cities, and does not apply to the crossing of such railway tracks in the country, where the views are much more extended, cars pass less frequently, and the obstructions to travel on town streets are not encountered. The answer to this was that care must always be exercised. The degree required may vary, but want of care under the circumstances is always negligence. It is as much one's duty to look out for danger in the country as it is in the town. Trolley cars run into wagons carelessly driven, not only on the streets of a city, but on turnpikes and rural roads as well. The court has never said that the duty of continuing to look until the trolley or street railway is reached is not binding upon those driving teams in the country. The same degree of watchfulness may not be required there as on crowded city streets, but it will never be held that there need be no care at all in the country, as there was not in this case, after the driver climbed back from the swingle-tree into his seat in the closed wagon, where he could not see, and started for the danger which he would have avoided if he had looked.

DRIVING ON AND ACROSS TRACKS—ATTEMPTING TO CROSS TRACKS AT NIGHT AFTER SEEING HEADLIGHT.

Metropolitan Street Railway Co. v. Slayman (Kan.), 68 Pac. Rep. 628. Apr. 5, 1902.

It requires no citation of authorities, the supreme court of Kansas, division No. 1, says, to prove that persons traveling upon a public street along or across a street railway are not held to the exercise of the same degree of care as when traveling along or upon or across an ordinary railroad. Public streets are intended for public travel, and one who drives a team upon them has the same right to use them as has the street railway company, subject, always, to the duty imposed by necessity upon such driver to turn out for, and not unnecessarily obstruct, the cars, and to use proper care to avoid colliding therewith. For that reason such driver may not undertake to cross the tracks of a street railway company so near a moving car as to impede its passage or incur danger of collision; but even if he does so, in violation of his duty, and those in charge of the car discover his danger, it is incumbent upon them to check its speed, and, if possible, avoid an accident. If to the driver of a vehicle there reasonably appears to be sufficient time for him to cross the track before a moving car will, while running at its ordinary speed, arrive at the place of crossing, and if, in good faith, and in the exercise of due care, he attempts to so cross in front of such car, it cannot be said, as a matter of law, that he is so far negligent in making such attempt as that he cannot recover, should an accident occur because the car was running much faster than usual, and because no effort was made by those in charge of it to prevent disaster. The degree of watchfulness and caution requisite in any case to constitute ordinary care must be commensurate with, and measured by, the danger to be avoided.

Where the driver of a heavy wagon attempts to cross the tracks of a street car company at night, and, before doing so, looks both ways upon the track, and is unable to discover any car approaching, but does see the headlight of one, which he believes to be moving toward him at a distance of three or four hundred yards; and where the evidence justifies the jury in determining that such car was traveling at an unusual, reckless, and dangerous rate of speed, which fact such driver did not and could not know before starting to drive across such track; and when, by reason of such high rate of speed, and the failure of those in charge of the car to make any effort to stop it, such wagon is struck, and the driver is injured,—the question as to whether the latter was so far guilty of contributory negligence as that he may not recover, the court holds, is one of fact, for the jury, under proper instructions of the court. With reference to the statement in this case of the driver that he did not see the car, but saw a light which he took to be the headlight of a car moving towards him, the supreme court says that it thinks, under the circumstances, that the court would have been justified in regarding it as tantamount to an admission that he saw the car. Still it was not error for the court to submit to the jury the ques-

tion as to whether he did in fact see the car, when he, in terms, denied having done so. However, this matter, the supreme court says, was unimportant, for the court plainly told the jury that if the party suing would have avoided the injury which he received, by the exercise of reasonable care and diligence, and he failed to exercise such reasonable care and diligence, and thereby directly contributed to the cause which produced his injury, they should render a verdict for the company. And in other instructions they were advised that, if he failed to exercise ordinary care to avoid a collision, he could not recover in the action.

ALLEGATIONS REQUIRED IN APPEAL FROM REFUSAL TO APPROVE ROUTE—CONTROL OVER HIGHWAYS.

Appeal of Millbridge & Cherryfield Electric Railroad Co. (Me.), 51 Atl. Rep. 818. Jan. 6, 1902.

The supreme judicial court of Maine holds that, in an appeal, based upon the alleged neglect or refusal of municipal officers to approve the proposed route of an electric railroad company, under the provisions of chapter 268, sec. 6, Pub. Laws 1893, as amended by chapter 119, sec. 2, Pub. Laws 1899, relating to the organization of street railroad companies, it is necessary that enough should be alleged to show that the court has jurisdiction, and that the company had the right to apply to the municipal officers for an approval of its route. But it is not necessary to allege all the steps by which the company obtained that right. The statute gives that right to every "corporation organized" thereunder. Under the statute as it existed when the above company was organized, as preliminary to organization, it was necessary that the railroad commissioners should determine that public convenience required the construction of the railroad. But it is unnecessary to allege specifically, in an appeal of the kind stated, that the railroad commissioners had so determined, for it is necessarily implied in the expression "corporation organized," or in any expression meaning substantially the same.

The court holds, too, that chapter 119, section 2, of the Public Laws of 1899, relating to the route and location of street railroads in the ways and streets of a town, to the approval thereof by the municipal officers, and to appeals from their action or refusal to act, is not unconstitutional, as being beyond legislative authority, or as being arbitrary and unjust, or as permitting the property of towns to be taken for street railroad purposes without just compensation. The public has a mere easement in land taken and condemned for a highway or townway. It has the right to use it in certain ways. Within the scope of the easement, the public, which acts through the legislature, may regulate and control, may extend or diminish, the public uses, as it sees fit. The operation of a street railroad is an appropriate public use of a street. While a town is charged with the performance of many duties with respect to roads, and possesses a qualified control over them, it does not own them. When the legislature authorizes a new method of use of the public easement in a way, a town has no such property interest in the way as will entitle it to pecuniary compensation, nor has an injury been done to it of which it can properly complain.

DEFENSE UNDER NEW YORK LAW FOR EXACTION OF EXCESSIVE FARE FROM TRANSFER PASSENGER—REFUSAL TO RECEIVE TRANSFER TICKET FROM PASSENGER NOT NOTICED UNTIL BLOCKS BEYOND TRANSFER POINT—TENDER BACK BY CONDUCTOR OF EXCESSIVE FARE.

Public v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 75 N. Y. Supp. 863. Apr. 18, 1902.

Section 39 of the New York railroad law on "Penalty for Excessive Fare" provides that any railroad corporation which shall ask or receive more than the lawful rate of fare, unless such overcharge was made through inadvertence or mistake, not amounting to gross negligence, shall forfeit fifty dollars, to be recovered with the excess so received by the party paying the same. Section 195, entitled "Contracting Corporations to Carry for One Fare, Penalty," provides for transfer and a forfeiture of \$50 for every refusal to comply with its requirements. The provisions of these sections in respect to excessive fares, the second appellate division of the supreme court of New York hold, are in part *inateria*, or of the same tenor, and must be construed together. They viewed, where the

exaction is in violation of both sections, the defense provided for in section 39 is available, and a railroad corporation, sued as was the company in this case for refusal to honor a transfer and the exaction of an additional fare, can relieve itself from liability for the penalty by showing, as provided for in section 39, that "such overcharge was made through inadvertence or mistake, not amounting to gross negligence."

Under the provisions of section 195 the court thinks it plain that a passenger desiring to make such a continuous trip as that which was contemplated by the party suing could not be deprived of his right to be carried for a single fare by giving him a transfer ticket which should be useless upon the first car which came along after he reached the point at which the transfer was to be made. But the fact that, in this case, the conductor, before the passenger left the car, offered to accept the transfer ticket held by the passenger, and to restore to him the five cents which he had paid, the court holds, warranted and required the inference that the overcharge was mistakenly made, and made under circumstances which did not constitute gross negligence. The omission of the conductor to notice the passenger with the ticket in his hand shortly after he entered the car, it says, might well be regarded as merely an inadvertence, and the conductor's refusal to receive it at first, when the passenger tendered it to him many blocks further on, was a natural mistake, in view of the conductor's supposition that the passenger had then only just boarded the car. If the passenger had accepted the proffered five cents and gone his way, he would have suffered no possible injury; and it would be a very harsh application of the law, and one not justified by the facts, to hold that the statutory penalty was recoverable in such a case.

LIABILITY FOR EJECTION AND SUBSEQUENT ARREST OF HOLDER OF DEFECTIVE JOINT-CONTRACT TRANSFER—RULES WHICH ARE NOT REASONABLE—GOOD FAITH OF CONDUCTOR NO DEFENSE—MEASURE OF DAMAGES.

Jacobs v. Third Avenue Railroad Co. (N. Y. Sup.), 75 N. Y. Supp. 679. Apr. 11, 1902.

The first appellate division of the supreme court of New York reverses in this case the judgment of the appellate term (XI Street Railway Review, 783; IV Street Railway Law, —), which reversed a judgment of the general term of the city court of New York affirming a judgment for the party suing (XI Street Railway Review, 429; IV Street Railway Law, —). The action was brought to recover damages for an alleged assault and false imprisonment, the party suing having been ejected by, and subsequently arrested at the instance of a conductor of the above company sued, who refused to receive a transfer ticket which by mistake had been punched as given at 5:15 p. m., whereas it was then 6:15 p. m., the passenger not understanding the meaning of the numbers and therefore not being aware that the mistake had been made. Between the railroads there existed, it appeared, a traffic agreement, based upon a valid consideration, whereby each railroad company agreed with the other to receive and transport passengers from the cars of the respective companies without further compensation than such as was paid to the company carrying the passenger to the intersection of the two railroads, and that the railroad carrying a passenger who desired a transfer should issue to such passenger a transfer ticket, which should entitle such passenger to carriage from the point of intersection to his destination upon the line of the railroad.

There can be no question, the court holds, but that, under the traffic agreement between these two railroads, each conductor acted as the agent of the respective railroads in issuing transfer tickets for carriage thereon. Each agreed to recognize transfer tickets issued by the other, and such agreement was admitted to be founded upon a valuable consideration. It was therefore clear that the party suing, when he received his ticket entitling him to ride upon the road of the company sued, entered into a contract of carriage with that company, and thereby became entitled to ride thereon to his point of destination. The mistake in punching the ticket was not his mistake. In law, it was the mistake of the company sued, as it was committed by its agent. The party suing could not be charged with contributory negligence in receiving the same, as he was in ignorance concerning whether it was punched right or wrong, and, in the absence of explanation, was unable to discover

that a mistake had been made. Consequently, he was without means of determining it or ability to correct it. Under such circumstances, the company sued was not justified in refusing to honor the ticket. When, therefore, its conductor refused to accept the ticket for transportation of the party suing, ejected him from the car, and caused his arrest and imprisonment, the company was guilty of a wrongful act, and became liable in damages for such injury as he sustained. The refusal to receive the ticket, the ejection from the car, and the arrest and imprisonment were to be treated in law, as they were in fact, as continuous acts, for which the company sued was responsible.

With regard to the contention that the company was justified in making and enforcing reasonable rules and regulations respecting the recognition of transfer tickets, the court holds that there can be no such thing as a reasonable rule and regulation which protects the company against the mistakes of its own agents which result in the invasion of a passenger's rights. And it declares that the good faith of the conductor was of no consequence. It could not authorize or protect against unlawful acts.

Under the circumstances of this case, the court holds, the party suing was only entitled to recover compensatory damages. These embraced loss of time, the amount which he was obliged to pay for passage upon another car, and injury done to his feelings by reason of the indignities under which he wrongfully suffered.

CHALLENGE OF CONSOLIDATION OR LEASE BY STOCKHOLDER—DIRECTORS OF LESSOR COMPANY MADE THOSE OF LESSEE—POWER TO LEASE PROPERTY AND FRANCHISES—WHO TO EXERCISE POWER TO LEASE.

Dickinson v. Consolidated Traction Co. (U. S. C. C., N. J.), 114 Fed. Rep. 232. Feb. 13, 1902.

This suit was brought by the executors of an estate owning 100 shares of the capital stock of the above company to have a lease of its property and franchises set aside and its property restored to its stockholders. But consequences that would involve the destruction of the conditions of comfort and convenience to a large community, and the demoralization of settled plans for the administration of large and valuable properties, with possible serious resulting loss to the stockholders of the two companies, the United States circuit court, district of New Jersey, says, ought not to be lightly incurred. That a wrong and injury had been done by the transactions complained of, to the estate of the single decedent stockholder, whose executors were complainants in this case, or to the corporation of which he was a member, should be made clearly manifest before the asked for interference of the court should be granted. However, though it was true that no pecuniary loss or damage had been shown to have resulted to the holders of these 100 shares of stock, by reason of these transactions, the court must nevertheless consider whether a legal or technical wrong had been done them by reason of some contravention of their legal rights as stockholders, or to the corporation itself, by reason of the alleged illegal action or fraudulent mismanagement of its interests, by those who for the time being controlled it. And the court says that, although the stockholder as an individual can never go into a court of equity, and ask for relief against a third person, upon the ground that the corporation has made a bad bargain, whether by the fraudulent or the illegal action of its directorate, yet, if the corporation ought to bring a suit against such third person, and seek, as against him, to take back property, and if the corporation refuses so to do, the minority stockholder may, in equity, be permitted to assert the right which the corporation ought to assert, by alleging that the corporation so refuses to act, after he has made honest and bona fide efforts to induce them to do so, and by making his corporation a party by bringing it in as a defendant, though its real status is that of plaintiff, and seek to obtain for it the relief to which it would have been entitled, had it itself sued.

That the lessee company was controlled by many or most of the same men who, before the lease, controlled the lessor company, the court says, would seem to be to the advantage of the stockholders of that company, and not to their detriment. This state of things as disclosed by the record, was very far from sustaining the allegations of fraud against the individual defendants, directors in the two companies, or any of them, and nothing but the clearest proof of such fraud would justify the interference asked of the court on that ground. The power of the two corporations, the one to be

lessor, and the other the lessee, of the property, rights, franchises and privileges which the lessor company had acquired by the legislative authority that granted it corporate existence, the court says, was not to be implied from any general power connected with the subject of their creation. As the power to negotiate and execute the lease had been challenged, those who would sustain it, must point to some express authority of the legislature of the state by which these corporations were created. But the court considers that there was the requisite authority where both companies were organized under a statute which provided that any company created thereunder might lease the property and franchise of any other corporation owning or operating any street railway, etc., and that "such other corporation and corporations are hereby authorized to make such lease." Every stockholder, in subscribing for his stock, took it subject to the conditions of the act, under the authority of which it was issued, and of the relevant provisions of law existing at the time, and was bound by their several requirements and conditions. The power to lease having been so given, without prescribing any mode in which it was to be exercised, it must be classed with the general powers conferred by a charter, which are to be exercised by the majority of corporators or stockholders.

DILIGENCE REQUIRED IN EQUIPPING CARS WITH FENDERS WHEN KIND MUST BE APPROVED BY COMMON COUNCIL.

Platt v. Albany Railway (N. Y.), 62 N. E. Rep. 1071. Feb. 25, 1902.

October 7, 1895, a city ordinance was passed requiring electric cars to be provided with fenders, but that no fender should be used until approved by the common council. November 25, 1896, the company presented a communication to the common council stating that, after various tests, it had selected a fender manufactured in Rhode Island as the most suitable to prevent accidents, and asking that its use be approved. This communication was referred to the committee on railroads, which made no report upon the subject until May 17, 1897, when it recommended the use of the fender selected by the company. The report was adopted at once, and on the day after its adoption the company ordered the fender, but the first lot was not received until June 16, 1897. In the meantime, on May 29, 1897, a boy was killed; and this action was subsequently brought to recover damages therefor.

Upon request, the trial court instructed the jury that the absence of a fender from the car was not per se or in and of itself negligence. But it refused to charge, as further requested, that the company was not bound to have a fender on the car at the time of the accident. The court of appeals of New York holds that this last was error. It says that the company had a reasonable time, as was properly charged, to obey the command of the local legislature, and it used that time with diligence. It was under no obligation to order fenders in advance of the approval of the common council, for that might have involved useless expense, as there were several kinds in use. All that was required was prompt action as soon as it knew what fender to order, and prompt action was conclusively proved. As the jury had received no instruction whatever upon the subject, the company was entitled to the instruction prayed for. It did not ask to have the question of liability for failing to use fenders wholly withdrawn from the jury, and it was apparently willing that its alleged want of diligence in selecting a fender should be considered by them. Its request simply involved the proposition that it was not bound, as matter of law, to have a fender on its car at the time of the accident; thus impliedly conceding that its diligence or want of diligence in making a selection should be left to the jury, as a question of fact. It was, at the least, entitled to this, and a failure to charge, either literally or in substance, as requested, was reversible error.

Moreover, the trial court not only omitted to comply with the request stated, but went further, and charged that the jury might find whether the company had used reasonable diligence in equipping its cars with fenders after the fender selected had been approved by the common council, although during the short interval that elapsed between the approval and the accident the railroad company had done everything which, so far as appeared, it could have done to procure fenders. This, also, the court of appeals holds reversible error, for it cast a burden upon the company which the law did not require it to bear. The law required reasonable diligence, but the charge, so far as the evidence permitted the court to see it, required an impossibility.

NEW SHOPS AT LOS ANGELES.

The Pacific Electric Railway Co., of Los Angeles, Cal., the system of which includes the lines of the Temple Street Cable Railway Co., the Los Angeles & Pasadena Electric Railway Co., the Los Angeles Railway Co., and the Pacific Electric Railway Co., of Arizona, in all some 230 miles of track, has practically completed extensive shops at Los Angeles. Locally, this company is perhaps better known as the Huntington-Hellman syndicate. The officers are: President, H. E. Huntington; vice-president and manager, Epes Randolph; treasurer, J. W. Hellman.

The new shops comprise six buildings—machine and blacksmith shop, store and carpenter shop, pattern and lumber store house, paint shop, repair shop and armature winding department, and oil house. To these will soon be added a brass and iron foundry.

The machine and smith shop is 276x100 ft., and 22 ft. high in the clear; the machine shop occupies 200 ft. of the length of the building. Across the machine room, near one end, are three tracks, each with a third rail for accommodating cars of standard gage as well as of 3-ft. 6-in., which is gage of much of the company's mileage. These tracks have cement lined pits 4 ft. 6 in. deep. The machine shop has a 10-ton traveling crane spanning its 35-ft. central bay and running the entire length of the shop. The shop is supplied with modern machinery for making and repairing cars. The blacksmith

is fitted with storage bins and racks. The carpenter shop has 10 tracks, also for both gages, under three of which cement lined



MACHINE AND CARPENTER SHOP, JUNE 3, 1902.

pits 2 ft. 5 in. deep are provided to facilitate work under the cars. In one end of the carpenter shop the mill machinery is located and



NEW CAR HOUSE UNDER CONSTRUCTION, JUNE 10, 1902.

shop has swinging cranes, and besides the usual forges and fires has a double frame 3,000-lb steam hammer.

The building for the store and carpenter shop is 380x100 ft. and is

is complete for the manufacture or repair of cars. These two buildings stand in a line with one another, and from end to end the distance is 711 ft.

Parallel to this line, and 100 ft. distant therefrom, are the three other principal buildings. First, the paint shop, which is 300 ft. long, 100 ft. wide and 22 ft. high, and contains 20 double gage tracks. Next to this is the car repair shop and winding room building, which is 360 ft. long, 100 ft. wide and 22 ft. high. Eighty feet is partitioned off at one end for the armature winding room, and through this room a track is provided. In the car repair department there are 18 tracks, under all of which are cement lined pits. All the pits are connected with sewers for the disposal of wash water.

Between the two rows of shops there is a transfer table 60 ft. long capable of transporting a load of 100,000 lb., that is, a fully loaded broad gage freight car containing supplies. The travel of the table is 806 ft. This table has only four wheels, traveling on two rails, and is driven by an electric motor with overhead trolley.

The fifth building contains an 80-h. p. boiler for the steam hammers and dry kilns, and also contains on the lower floor the hard wood lumber storage, while on the second floor is the pattern shop. This building is 60 ft. wide, 200 ft. long and two stories high.

The sixth building is the oil house, 34 ft. wide and 40 ft. long, with basement 10 ft. high. The oil is all handled by either gravity or compressed air, as may be most convenient. Oil is used for the



INTERIOR OF PAINT SHOP.

also 22 ft. high in the clear. Of this length 100 ft. is devoted to the store room, through which there is provided a broad and narrow gage track for the receipt or shipment of supplies; this room is

ordinary purposes, and also for fuel under the boiler when the mill refuse is not sufficient, and for all blacksmith shop fires.

The seventh building, soon to be erected, is a brass and iron foundry, 200 ft. long, 100 ft. wide, and 30 ft. high.

The company has also built a car house 263 ft. long and 264 ft. wide, with 20 tracks, each 257 ft. long. This is used for storage and inspection and pits are provided under all tracks.



INTERIOR OF CARPENTER SHOP.

All the buildings are of brick, with trussed roofs, no purlins or jack rafters being used. The roof planks, which are 2x12 tongue and groove Oregon pine, are spiked directly to the trusses. The brick walls extend directly up to this planking, and thence there are no pockets or draft runs for the spread of fire. The inside of all the shops and the car house is coated with white magnite, thereby diffusing the light and also rendering the spread of fire more difficult.

The shops are provided with full fire service of hydrants and hose. No care or expense has been spared to make the buildings complete in every respect and adapted to their purposes.

In the construction of the buildings there were used 3,000,000 ft. of lumber, 3,000,000 bricks, and 8,000 barrels of portland cement.

to the lay of the land, more than 20,000 cu. yd. of earth filling have already been put in place in and around the buildings.

Our correspondent is indebted to Mr. Epes Randolph, vice-president and manager of the company, for the photographs from which the accompanying engravings were reproduced.

NEW KANSAS CITY FRANCHISE.

The agreement between Kansas City, Mo., and the Metropolitan Street Railway Co., which has been under consideration since June 1st, was signed by the mayor and accepted by the company on July 28th. The agreement consists of 41 sections and in substance is as follows:

In lieu of all state, county, city, school and municipal taxes of every kind and character, the company will pay to the city 8 per cent of its gross receipts.

The company is granted franchises that will enable it to make much desired changes in routes and abandon some steep grades. The new franchises include the following lines: Troost Ave. to 40th St., to be completed by December, 1902; Vine St. to 44th St., to be completed by December, 1903; 15th St. to Crystal Ave., by December, 1904; Prospect Ave. from 15th and Prospect to the east bottom connecting with the East 5th line near Electric Park. Where practicable the grades will be changed so the whole system may be operated electrically. The 8th St. tunnel, built for a cable road and with a grade of over 8 per cent, will be changed so as to make it more practicable for electric cars, and 9th St. incline will be abandoned.

The company will pave between rails and 18 in. outside with the same material as the rest of the street.

The company will give universal transfers.

OXFORD LAKE PARK.

The Anniston (Ala.) Electric & Gas Co. has recently published a descriptive pamphlet on Oxford Lake Park which is a high-class recreation resort, established by the street railway company in connection with its lines. The company provides swimming resorts,



NEW CARS FOR LOS ANGELES RY.

The shops contain about 10,000 lineal feet of track for the reception of cars under construction or repair, and the car house contains about 5,200 lineal feet of track for the storage and inspection of cars. The first floor area of the shops is over 3 $\frac{3}{4}$ acres, and that of the car house over 1 $\frac{1}{2}$ acres. There are 59 doors 16 ft. high and 12 ft. wide for the admission of cars to the shops. The roof trusses are combination wood and iron. All machinery, except the steam hammers, is driven from electric motors. The first work on the design and construction was done last October. Owing

to tennis courts, ball grounds and other amusement features for its patrons at the park, and it has erected bowling alleys, boat houses, bathing houses, pavilions, etc.

An agricultural fair is usually held each year at the Lake, which provides a large patronage to the park, and recently a new amusement resort has been started in which vaudeville entertainments are given every night during the summer season. The grounds, buildings and all points of interest throughout the park are brilliantly lighted during the summer season with electric lights.

THE EDUCATION OF THE ELECTRICAL ENGINEER.*

BY H. W. BUCK.

Electrical engineering is probably the youngest of all the professions, for it has hardly been recognized as a regular profession for more than fifteen years past. As a result, the men who have reached prominence in it today have attained their positions from widely differing courses of preliminary training; many of them are men who started life in other lines of work and afterward turned to electrical pursuits on account of the sudden growth and importance of the business. In consequence of this, all methods of preliminary education are represented and their relative values can be estimated.

The argument runs largely between two classes of men, one represented by the so-called "practical man," and the other by the theoretical electrician; the graduate of the machine shop and the graduate of the university. Both of these types have attained success, but the correct answer to the argument will probably be found in a proper combination of the two types. In the past some of the most successful electrical engineers have belonged distinctly to the class of practical men with little theoretical training, but the conditions have changed. In the early days of the profession there was little theory or pre-determination of results and work was carried on largely by guesswork or by cut and try approximations. At the present time, however, such a state of development has been reached that exactness of result is essential to success and work based upon exact theory becomes imperative.

In a stationary condition of an art a man with practical experience only may become very familiar with all the existing types of apparatus, and, knowing their various applications, may qualify, to an extent, as an engineer. But the extraordinarily rapid growth of the electrical arts places electrical engineering apart from all the other engineering branches, for new discoveries and theories make radical changes from year to year in the construction and operation of electrical machinery. The engineer, whose education is based only upon practical experience, cannot keep up with the progress and change resulting from it, and falls behind, whereas the man, with knowledge of the theory and a mind trained by the theoretical studies and scientific reasoning, easily grasps the theory of the change and readjusts his mind to the new without difficulty or delay. Many instances can be cited of men who have been prominent as electrical engineers who have been dropped out of place in the course of the rapid progress which has been made on account of a lack of theoretical foundation in their knowledge. Those who have retained their positions throughout the growth of the art have done so by persistent study along theoretical lines.

In its present state electrical engineering is the most scientific of all engineering professions. A man must be, to a great extent, a physicist, a chemist and a mathematician, as well as be familiar with machinery and its design, in order to be a worker in the broadest field. Many of the problems connected with other branches of engineering can be solved by common sense and by one's sense of proportion as guided by experience and by the eye. But most of the problems in electricity are invisible, so to speak, and can be understood only through their expression in the form of symbols.

Probably no one will dispute today that the preliminary education of an electrical engineer demands a special training in those theoretical branches—mathematics, physics, chemistry and mechanics—sufficient to train his mind into accurate methods of thought and reasoning and to supply him with the actual technical information which he will need in the practice of his profession. But theory alone is not all. The human mind is such that it works with difficulty in pure theory without a series of mental pictures to fix and coordinate the ideas, and the study of theory is likely to make little lasting impression unless the physical meaning of the theory is brought out by constant association with actual apparatus which demonstrates the application of the physical law.

The best course of training for an electrical engineer would seem to be a broad course of education in general subjects at the preparatory school before entering college, with practical work if possible, along lines of simple mechanics, such as carpentry, in order to

train the mind into a sense of proportion and the relations of parts, which is the basis of all engineering.

Next a college course with general subjects the first year; and afterwards, for the remaining years of the course, those general and theoretical subjects which have a direct bearing upon the practice of the electrical profession, such as mathematics, mechanics, physics, chemistry, theoretical electricity and magnetism and thermodynamics. This should be supplemented by actual daily practical work with machinery operating by the principles covered by the theory studied, and demonstrating all the phenomena incident to the theory.

After graduation an apprentice course should be pursued in some large electrical manufacturing establishment where the commercial relations of the knowledge acquired in college can be clearly set forth. Large machines can be operated which are not available at a college and experience in the installation of large plants can be obtained, and experience gained in the designing departments where all kinds of commercial apparatus are laid out.

After a few years of this training, specialization may begin along the lines selected for the life work, but preferably not before. A man makes a mistake to consider himself a qualified electrical engineer after he has been graduated from college, for he is not one. His mind has been trained into a condition where he can readily absorb the principles of the electrical profession, but that is all, and the subsequent apprentice training is as important as the college course, in order to acquire the broad view-point from which to make the correct start in the direction in which a man is best fitted. It perhaps means a smaller income the year after graduation from college, but it means much more at the end of five years.

But theory and practice are not the only elements necessary for the successful engineer. There are many qualities required in common with other professions; executive ability, business knowledge, presence of mind and ability to handle men, nerve and resourcefulness in handling machinery in times of emergency, are all necessary to the successful engineer. These elements cannot be acquired in the study of theory and practice alone, and many men who have stood high in their college courses have failed afterward in the practice of their profession because of a lack of these qualities.

The study of chemistry becomes more and more important as the profession advances, for the branch of electro-chemistry is rapidly developing and is likely to become one of the largest fields in the application of electrical science.

And almost above all comes a training in the English language. No man who cannot express himself clearly and concisely in writing or in conversation can hope to attain a prominent position in his profession.

The education of an electrical engineer, however, must never be considered as completed. The art advances so rapidly that constant study is necessary, even to keep up with the progress of the times. But an electrical engineer should be willing to do more than this. He should study to keep ahead of progress and do his share toward the instruction of others.

ST. LOUIS & SUBURBAN REORGANIZED.

The reorganization of the St. Louis & Suburban Electric Railway Co. was effected July 1st at a meeting at which all of the old officers and directors resigned and an entire new board was elected. The reorganization includes in its plans the issue of \$7,500,000 of bonds, which will cover all the indebtedness of the old company and leave a surplus of over a million and a half for improvements and extensions. An important feature of the reorganization is the formation of a voting trust, which is composed of five men from the board of directors. These men control about 20,000 of the total 25,000 shares of stock, and they will have absolute power in voting upon all propositions in regard to the property for three years, both as to financial and physical questions. The board of directors was elected as follows: S. M. Kennard, Julius S. Walsh, Breckenridge Jones, Ben Alheimer, Charles H. Huttig, T. Marquard Forster, Harrison I. Drummond, William F. Noller and Frederick C. Orthwein. Mr. Kennard and Mr. Forster were re-elected as directors, and Mr. Thomas M. Jenkins remains as general manager of the company. Mr. Kennard was elected president, Julius S. Walsh vice president, and Thomas C. Kinder, secretary and treasurer, the latter being re-elected.

*Paper read at the 19th annual meeting of the American Institute of Electrical Engineers, Great Barrington, Mass., June, 1902.

COMMUTATOR TURNING ON GENERATORS AND ROTARY CONVERTERS.

BY A. B. WEEKS.

If proper provision has not already been made, when it becomes necessary for the first time to turn a commutator for a rotary converter or large generator, it will be found no simple task to devise and erect a wooden structure which can be depended upon and will not give away when the critical point in the turning is reached. These contingencies should be provided for beforehand. A considerable outlay in expense will be required, but must be made; especially where no machine shop with a lathe large enough to swing the armature is available. Manufacturers can supply the necessary apparatus on order.

If a belt-driven generator and a General Electric Co. lathe be used, place the lathe on the proper side of the commutator, parallel



FIG. 1.

thereto, and as close as is thought advisable. It will be necessary to remove those adjacent brush holders which interfere with the fitting, as well as those which prove an obstruction in turning. Run the tool as far as it will go laterally in both directions, in order to see that it will make a cut the entire length of the commutator, if possible, without resetting. Arrange a brace at the end of the armature shaft to prevent endwise movement; otherwise the tool may gouge into the commutator, and perhaps do material damage.



FIG. 2.

With suitable arrangements for a base for this turning device it may be used also for machines having open-work bases. Better still, the device shown in Figs. 1 and 2 is especially well adapted for rotaries. The box cap screws are removed, and special bolts and spacing nuts used. The lower part has an arm extending to

the end of the shaft, and, by means of a center and lock nuts, the end thrust is taken up.

Some means other than the alternating current ordinarily applied at the a. c. end of the rotary, must be provided for driving the rotary converter at slow speed. The machine illustrated is for 500-volt railway use; therefore, the field is to be charged with 500



FIG. 3.

volts, and a 220-volt circuit used for the armature current. But first of all, open all switches, both a. c. and d. c. Remove any brush holders and yokes that may interfere with the lathe. Two lower arms only, positive and negative, will be required. Disconnect the other cables and tape over their copper terminals. Use only two or three of the several brushes in these arms, removing the others. In the series field and armature circuit, have a water

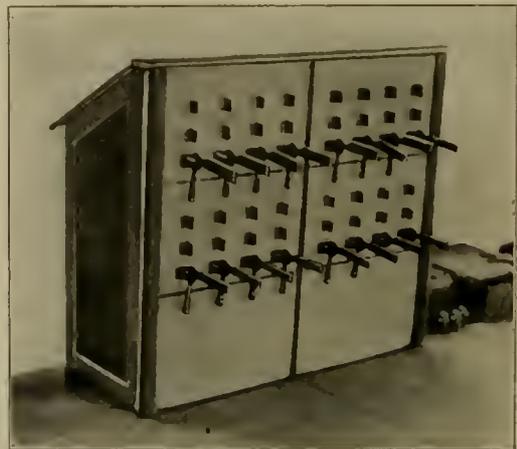


FIG. 4.

rheostat with an ammeter in circuit. It should take from 20 to 30 amperes to drive the armature. In making the shunt connections, if it is not applied by means of the rheostat, perhaps because of connections at the switch board preventing, see that the shunt does not oppose the series coils.

It is better to use only the two lower brush arms, in order that everything may be clear above, to enable one to work freely. There will be a small spark at the brushes, caused by the copper and dust; but this will do no harm. Little current is required to revolve the armature,—between 20 and 30 amperes in the case under discussion, as stated. After turning, sandpaper as usual, to finish smoothly.

The water in the barrel of the water rheostat may become very warm. It is therefore a good plan to keep it in circulation, if there is a drain pipe. First put on the field current; next complete the

armature circuit through the water rheostat, lowering the plates until the proper results are obtained. Set the tool and feed slowly and steadily, removing as soon as the tool drags or forces with difficulty, as it is then dull. There is usually somebody about a plant of this kind who knows how to sharpen a tool in a way to gain the best results. It is not a simple matter to grind one properly for turning copper.

Fig. 3 shows a rotary converter armature which has been re-wound; also a method of putting on the band wires. A rope is passed around the armature several times, and the free end secured to a winch. At the right of the figure is shown a testing transformer mounted on wheels, making it easily portable, and valuable for use in a large station. The engraving shows a familiar scene in the Niagara Falls power plant, the testing transformer being used periodically to test the generators between phases, and from copper to ground, at a pressure of from 3,000 to 6,000 volts, according to the condition of the generator being tested.

When first installed an artificial load was put on each dynamo as needed; a water rheostat of 5,000 h. p. being used for the purpose. Fig. 4 shows the two-phase panels and switches for the rheostat. The coils of wire are located in a rectangular space below the floor outside of the power house, the space being filled with water when needed. By means of the several switches the load can be changed on either phase as may be required, to test the variation in generator speed as well as the governor regulation.

CONSOLIDATION AT MACON.

The Macon Railway Co. is the name of a new organization which has purchased all the street railway and electric lighting properties in Macon, Ga. Mr. T. A. Carling is president and manager of the new company, J. H. Hertz, secretary and J. T. Nyhan superintendent. The new officers state that \$150,000 is to be expended in developing and improving the properties as fast as the work can be accomplished, and transfers are to be allowed on all intersecting railway lines in the city. The properties merged are the Macon Consolidated Street Railway Co. and the Macon Electric Light & Railway Co. The former company commenced some 14 years ago with a small mule line representing a capital of \$37,000 and has added to its lines and developed its property from time to time until in the present deal it sold for half a million dollars. All of the improvements have been paid for out of the earnings of the company with the exception of about \$75,000. Mr. E. E. Winters, who has been in charge of the property as superintendent, has

served under four different ownerships and has also been vice-president and general manager as well as receiver for a period of 10 months when the reorganization was effected. Mr. Winters has been general superintendent since the reorganization with full charge of the property and the other officers of the company who were in Boston have been in Macon only twice in seven years. Mr. Winters is recognized as one of the pioneers in the development of park theatrical attractions in the South, and organized Crump's Park in connection with the street railway property which has proved



E. E. WINTERS.

a wonderful success. The summer theatre of this park has run for 20 weeks every season for the past seven years and has proved a paying investment.

NEW ROAD IN INDIAN TERRITORY.

The Choctaw Construction Co. has been organized to build the power house, railway, etc., for the Lehigh Traction Co., Lehigh, I. T., and the Lauffetter-Bendit Mercantile Engineering Co., of St. Louis, has been retained as consulting and contracting engineer on this work. The Lauffetter-Bendit company is proceeding at once to prepare the plan and specification, and will shortly be in the market for about 20 miles of rail, power house equipment, etc.

A. S. R. A. CONVENTION ANNOUNCEMENTS.

Secretary Penington has made the following announcements concerning the 21st annual convention of the American Street Railway Association to be held in Detroit, October 8th, 9th and 10th, next:

The program includes the following papers and reports:
 "Registration of Transfers." Brooklyn Heights Railroad Co., by C. D. Meenely, secretary and treasurer.

"Benefit Associations." Metropolitan Street Railway Co., of New York, by Orin W. Root, assistant general manager.

"Discipline of Employes by the Merit System." Metropolitan Street Railway Co., of Kansas City, by W. A. Satterlee, general superintendent.

"Transportation of Light Express and Parcel Delivery." Detroit United Railway, by George W. Parker, general express agent.

"Steam Turbine Engines." E. H. Sniffin, of Westinghouse, Church, Kerr & Co., New York.

"Signals for Urban and Interurban Railways." Old Colony Railway Co., Boston, by C. F. Baneroff, electrical engineer.

"The Adjustment of Damage Claims." Chicago City Railway Co., by M. B. Starring, assistant general counsel.

Report of Committee on Standards. N. H. Hest, president Meriden (Conn.) Electric R. R., chairman; E. G. Connette, vice-president and general manager, Syracuse (N. Y.) Rapid Transit Co.; C. F. Holmes, Kansas City; John I. Beggs, president and general manager Milwaukee Electric Railway & Light Co.; E. A. Newman, general manager, Portland (Me.) Railway Co.; R. T. Laffin, general manager, Worcester (Mass.) Consolidated Street Railway Co.; Will Christy, vice-president Northern Ohio Traction Co., Akron, O.

Report of Committee on Rules for the Government of Employes. J. C. Brackenridge, general manager Brooklyn Heights R. R., chairman; E. C. Foster, general manager Old Colony Street Railway Co., Boston; T. E. Mitten, general manager Buffalo Railway Co.; W. E. Harrington, general manager Camden (N. J.) & Suburban Railway Co.

The annual banquet will be at the Hotel Cadillac, the association headquarters, Friday evening, October 10th.

Thursday, October 9th, has been set apart as "Exhibitor's Day," and no meetings of the association will be held on that day.

All of the exhibit space has been allotted, and in addition to the Exhibit Hall and Annex permission has been received from the city to lay temporary tracks in the streets adjacent to the building. (Plans of the Hall and Annex, showing the assignment of space, were published as a supplement to the "Review" for July 20, 1902.—Ed.)

The executive committee of the A. S. R. A. has passed the following resolution:

"Resolved, That the secretary be directed to request the chief executive officers of the different companies to notify all delegates and heads of departments attending the convention that they are expected to be present at all sessions of the meeting and take part in the discussions."

The citizens of Detroit are doing all within their power to make the social part of the convention pleasant for all.

The steam railroad associations have agreed to sell tickets to Detroit at the rate of one and one-third fares for the round trip to all who get certificates, which must be countersigned by the secretary of the American Street Railway Association.

Mr. John H. Fry, chairman of the exhibit committee, has made the following announcements concerning the rules and regulations governing the exhibition at the convention of the American Street Railway Association to be held in Detroit in October:

1. The exhibition will open Oct. 8, 1902. The building will be open for the reception of exhibits commencing Monday, October 6th. All articles intended for exhibition shall be delivered at the Light Guard Armory by the agent or owner and at his expense; but the local committee has made arrangements with the Riverside Storage & Cartage Co. to haul and deliver all shipments to and from the building, if desired, at low rates. Mark goods to yourselves, care of Riverside Storage & Cartage Co., Detroit, Michigan, send this company bill of lading, or advice of shipment, and prepay charges. Under no circumstances will exhibits be received on which there are charges of any kind.

Ship all goods early to insure delivery in time. All apparatus or material for exhibits should be shipped so as to arrive in Detroit not later than Saturday, October 4th.

2. The building will be well lighted, but any exhibitor so arranging his exhibits as to shut off the light must provide interior lighting at his own expense. Current for special lighting or power will be furnished at the lowest market prices.

3. All electrical construction must be done in strict accordance with the rules of the National Board of Fire Underwriters and Detroit Municipal Departments covering such work, and certificates for same must be secured prior to the opening of the exhibition.

4. The floor of the Exhibition Building is constructed so as to support fairly heavy weights, but in order to insure the safety of apparatus exhibited, and to prevent any damage to the floor, exhibitors should submit to the chairman of exhibits by Sept. 1st a floor plan diagram showing proposed arrangement of their exhibits, and in the case of heavy apparatus, description of the articles to be exhibited with their weights.

5. Height of platform shall not exceed five inches unless by special permission. Decorations, booths or other structures shall be so arranged as not to exclude the light from adjoining exhibits, and in every instance the sides of these decorations, booths or structures facing an adjoining exhibit shall be neatly finished so as not to present a bare or ugly appearance in the adjoining exhibitor's space.

6. It has been considered advisable to adopt rules to govern the size, appearance and location of signs so as to bring the signs into some sort of uniformity and prevent one exhibitor's sign from interfering or shutting out the view of signs in the adjoining exhibits. Signs, banners, etc., containing advertisements thereon will not be allowed except upon space of exhibitors to whom they belong, and no exhibitor will be permitted to display advertising signs or decorations beyond the line of his exhibit. Signs shall not exceed two feet in height. Signs of oil cloth with brown flock ground and gilt letters are recommended.

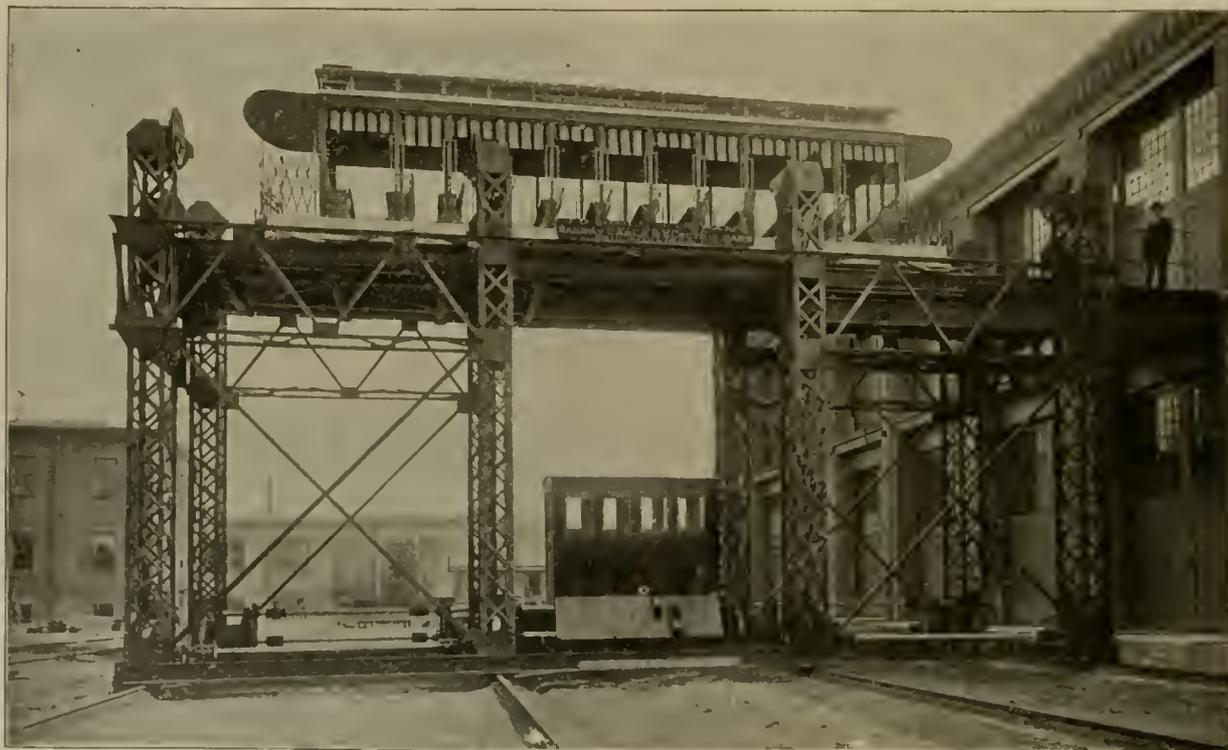
7. No nails, tacks or screws shall be placed or driven into the floor or walls, and all decorating or signs must be put up without

NOTES FROM ENGINEERING SCHOOLS.

PURDUE UNIVERSITY—Mr. J. R. McColl has been appointed associate professor of thermodynamics and Mr. Fritz B. Ernst instructor in car and locomotive design. Professor McColl is a graduate of the Michigan Agricultural College, class of 1890, and has done work as a graduate student both in that institution and at Cornell University. After serving for a time as an assistant, he was in 1892 placed in charge of the Department of Mechanical Engineering of the University of Tennessee, at Knoxville, and for ten years has devoted himself to its development. The University of Tennessee is a most progressive one, and Professor McColl has done his full share in advancing its growth. Mr. Ernst is a graduate of the Department of Civil Engineering of Purdue University, class of 1900, and since graduating has been a member of the editorial staff of the *Railway Age*, of Chicago, in which position he has had much to do with certain phases of railway design.

A COMBINED CAR ELEVATOR AND TRANSFER TABLE.

The accompanying illustration shows a novel style of car transfer table which, besides transferring cars from track to track serves also to elevate cars to the tracks upon the second story of the building. This table is in use at the car works of the J. G. Brill Co., of Philadelphia, Pa., and was designed to serve a two story paint shop built to economize the limited ground space available. The device consists of a steel frame mounted on wheels and having a number of steel columns surmounted by rope sheaves. The platform is suspended by wire cables drawn over the top sheaves and down through the lower sheaves to winding drums operated by an electric motor. When the cars are finished they are hauled



COMBINED CAR ELEVATOR AND TRANSFER TABLE.

defacing the building. Exhibitors will be held responsible for any damage to the floor, walls or other parts of the building caused by the act or negligence of the exhibitor or his agents.

The committee reserves to itself the right to cancel applications for space not paid for by Oct. 1, 1902. Payment should be made to Mr. T. C. Penington, treasurer American Street Railway Association, 2020 State St., Chicago, Ill.

from the car shops to the tracks leading to the transfer table and the car is placed upon the latter. The table is then moved along the building to the track on which the car is to be set. If this track is on the first floor the car runs directly upon it from the table in the usual way, but if it is on the second floor the winding drums are used to elevate the platform and car to the upper floor, the lift being 19 ft. 6 in. The table is 50 ft. long over all and has

a platform at the upper level which overhangs 8 ft. It runs on four lines of rails laid on timber stringers. Its hoisting capacity is rated at 30,000 lb., but it has lifted approximately 40,000 lb. under test. The hoisting speed is 15 ft. per minute. The table is also provided with a winding drum for carrying cars on or off when it is either at its upper or lower position. Automatic stops are provided so that the current is cut off from the table when it reaches both its top and bottom position, and the brake is set at the proper point in every case.

The hoisting drum is operated from a motor through a train of spur gearing and a mechanical load brake is provided in this train



END VIEW, COMBINED TRANSFER TABLE AND CAR ELEVATOR.

so that when the load is being lowered this brake is engaged and requires a slight amount of power from the motor to stop its action. This makes it impossible for the load to get beyond the operator's control. A solenoid motor brake is used to stop the momentum of the armature when the current is cut off by the controller of the automatic stop. An auxiliary hand brake is also provided for additional precaution. The power is taken from a trolley wire placed along the front of the building. The table was designed and erected by George P. Nichols & Bro., of Chicago.

ANOTHER CONSOLIDATION.

Following the many announcements made during the last three months concerning the consolidation and merger of many of our large manufacturing interests, comes one of peculiar interest to the street railway trade, the merging of the United States Projectile Co. into the F. W. Bliss Co., both of the Borough of Brooklyn, New York.

The United States Projectile Co. manufactures the well-known "Projectile Brand" gears and pinions, and has been compelled the past year to double its capacity in order to care for the constantly increasing demand for these products, and it now has one of the largest and best equipped plants in this country for producing motor gear and pinion. The F. W. Bliss Co. is probably the largest manufacturer in this country, or in the world, of presses, dies and special machinery for metal working. It also manufactures the Whitehead sub-marine torpedo for the United States Government. The plant is one of the largest in the east, and is thoroughly modern in all its appointments.

The controlling interest has always been the same in both companies, and the change will be in the ownership of the stock rather than in the management, which will remain the same as in the past. The United States Projectile Co.'s plant will be known hereafter as the F. W. Bliss Co., Projectile Department. The enlarged

facilities should assure the trade prompt and efficient service with such products as the company manufactures.

BABCOCK & WILCOX BOILERS IN MARINE SERVICE.

The following is an extract from the report of the committee appointed by the British Admiralty to investigate questions respecting modern types of boilers for naval service:

"In the course of its investigations the committee has watched the Babcock & Wilcox boilers fitted in the S. S. Martello, of the Wilson Line, employed in the Atlantic trade between Hull, Boston and New York, and copies of the reports of inspections have from time to time been forwarded to their lordships. These inspections have taken place at the end of every round voyage for 14 months, and the committee's opinion is that these boilers have stood the test of usage in the mercantile marine extremely well. The vessel has run about 91,000 miles since the boilers were put in, and has usually been less than a week in port at either end; the only repairs required have been those of the ordinary upkeep of any boiler, such as fire-bars, brickwork, etc., and only six tubes have required renewal. This opinion is strengthened by the inspections of boilers of the same type fitted in the 'Numidian,' the 'Buenos Ayrean,' and the 'Turret Cape.' In the case of the last-named vessel, the boilers have been in use seven years, and cannot have been as well looked after as they would have been in the navy, and their condition when examined recently was satisfactory. The committee has also examined and tested boilers of the same type in H. M. S. 'Sheldrake,' and finds that, although they have been in use for four years, their condition is good and they have given little trouble.

"From the information which has been brought to the notice of the committee, it appears that water tube boilers are being very little used in large ships belonging to the mercantile marine, and that their use in such ships is increasing very slowly. In the British mercantile marine, the only type of water tube boiler installed in ocean going vessels is the Babcock & Wilcox, in some ships of the Wilson and the Petersen-Tat Lines, and in three ships of the Allan Line; in these last, however, only one water tube boiler is fitted in each vessel, to assist the original cylindrical boilers. In the United States mercantile marine, Babcock & Wilcox boilers are used to a small extent, principally in the ships plying on the Great Lakes, and in the American Navy many Babcock & Wilcox boilers are in use."

ELECTRIC RAIL WELDING.

We are advised that the improved process of the Lorain Steel Co. for electrically welding rails and bonds has given the very best of satisfaction wherever it has been used. The Lorain Steel Co. now has an equipment at work on the tracks of the Worcester (Mass.) Consolidated Street Ry., and one on the Columbus (O.) Ry., and has completed a contract for welding at Rochester, N. Y. The Worcester Consolidated was so pleased with the results that it has decided to have twice as many miles welded as originally contracted for.

AIR BRAKE CONTRACTS.

The use of the Christensen Engineering Co.'s air brake equipments on electric cars is constantly increasing, and during the past few months the company has received a large number of orders, including one for 50 complete equipments for the Government Tramways, Sydney, Australia. Before this order was received the Government Tramways had over 125 Christensen equipments in use. Recently secured contracts in this country include the following equipments: Manchester Street Railway Co., Manchester, N. H., 15; Los Angeles Ry., 70; Twin City Rapid Transit Co., Minneapolis, 50; Middleboro, Wareham & Buzzards Bay Street Ry., 11; Stony Brook Valley Street Ry., Stony Brook, Pa., 18; Greenwich Traction Co., Port Chester, N. Y., 12; Seattle Electric Co., 22; Boston & Northern Street Ry., 30; Middleton & Danvers Street Ry., 16; Old Colony Street Ry., 24; Atlanta Railway & Power Co., 10; Portland (Me.) R. R., 10; Pacific Electric Ry., Los Angeles, Cal., 105; Citizens Traction Co., Oil City, Pa., 14; Los Angeles & Redondo Ry., 10; Worcester Consolidated Street Ry., 82; Los Angeles & Pacific R. R., 28; Cincinnati Traction Co., 20. Many of these roads had other Christensen equipments in operation before placing these orders.

UNION INTERNATIONALE PERMANENTE DE TRAMWAYS.

In addition to the papers given in abstract in the last issue of the "Review," the International Congress discussed among others the question of transfers. This subject was reported by M. Lavalard, of the General Omnibus Co., Paris. A large number of replies were received from street railway companies in regard to the use of transfers and the question was dealt with at considerable length by the reporter. The conclusions reached were that transfers are to be generally recommended as they usually lead to increase of traffic and of receipts; they are advantageous for the passenger as they permit him to make two trips and to travel on crossing lines for a single fare; where one transfer only is given between two cars it facilitates checking accounts; transfers should not be given out for a line running parallel to the one which has been left by the passenger, and only one transfer should be allowed, as if several changes are permitted it gives rise to frauds; they should only be used at points of junctions or inter-sections. The date and hour should be indicated on the ticket and different colors of paper are always important to indicate the direction of traveling; it is important to limit transfers to the limits of towns, and for suburban lines there should always be an extra fare. Transfers should be suppressed on extra busy days and holidays if possible. In discussing this report it was brought out that in many localities transfers were obligatory by law and it was therefore not a question of whether they should be free, but the main question was how to check the tickets. It was pointed out that the two main abuses to which transfers are liable are first on the part of the public and second on the part of the employe of the company. Passengers frequently obtain transfer tickets and instead of making a through journey they stop off to do shopping or other business, thus abusing the idea of the transfer. The other abuse consists in the exchanging of transfers between employes and defrauding the company of cash fares; a committee was appointed to study this subject of transfers further and to report at the next Congress.

Another question discussed was the basis to be adopted for ascertaining the power of motors and generators, considering the speed, torque, the heating, etc. The replies to this question from various roads suggest that the power of a motor should be as small as possible consistent with obtaining the maximum speed and tractive power without prejudicial heating. The motors should work properly without heating more than 70° C. Some of the roads consider it a mistake to use tramway motors having an excessively high yield as they cost more for repairs, etc., than less efficient ones.

M. Rasch, of the Polytechnic School, Aix-la-Chapelle, contributed an interesting report on this subject which covered the subject very fully and supports the rules and regulations in use by the German Association of Electrical Engineers.

In reply to a request for technical information concerning the maintenance, consumption and output of boilers, steam engines, gas engines, accumulators and other generating machinery, the responses were given in tabular form at great length. M. Thonet, of the General Enterprise Co., of Liege, reported on this question and also in regard to the cost of power in a single paper. His deductions were as follows:

For central stations of large size with machines of over 1,000 h. p. and with fuel at from \$3.00 to \$4.00 per ton, the cost per kilowatt hour will be .8 to 1.2 cents; with stations of medium size with machines of 300 to 600 h. p., with fuel at the same price, the cost will be 1.2 to 1.6 cents; for stations of slight importance with machines of from 100 to 200 h. p., and the same fuel, the cost will be 1.6 to 2.0 cents; for stations with poor gas and with machines from 150 to 200 h. p., and fuel at \$6 to \$8 per ton, the cost will be 1 to 1.4 cents, and with fuel at \$3 to \$4 per ton, the cost will be .8 to 1.2 cents per kw. h.

The method of compensation for franchises was the subject of a report by M. Janssen, of the Brussels Tramways, who in summing up stated that the simplest basis to take for the compensation for franchises is the return of the dividends paid. The stockholders have an interest in seeing everything distributed which is distributable, taking into account the sinking fund and other necessary provisions. The authority granting the franchises will find in this very interest their best guarantee and the owners of the

franchises will not have to submit their books to be audited by the public authorities or have discussion with them. If the arrangement between conceding authorities and companies cannot be made on this basis, which appears the most desirable, an alternative basis was submitted. From the gross receipts there is first withdrawn for the account of the company a sum proportional to the car miles run. This sum is intended to cover the operating expenses. The amount per car-mile should be determined upon between the company and the authority granting the franchise. Of the surplus a certain proportion should be allotted to the authorities, the amount of which must be left to the experience of the company, which before negotiating with the authorities should study the conditions under which other companies are making payments. In Germany the principle of paying for franchises on the basis of profits earned is already established by law. In that country a tax is not imposed for the use of roads unless the railway which uses them realizes a net profit of more than 6 per cent. Mr. R. H. Scotter read a paper upon the same subject in which he recommends that a complete set of laws, rules and regulations of different places should be collected and deposited at the head office of the International Union; that translations of the most useful and the most harmful points and causes should be made available; that an effort should be made to gradually standardize all regulations connected with electric tractions.

The location of car barns in relation to the routes of a tramway system was reported upon by M. Trautweiler, of the Tramways Co., of Strassbourg. Considerable diversity of opinion is found in the answers to this question but the reporter agrees with the advice to establish a small number of large car barns permitting at each one a group of from 100 to 150 cars. A group of 50 cars he considers too small, as a line operating 300 cars would require 6 car barns and this would greatly increase the expense for wages, and would lead to too much splitting up of the service. He admits, however, that the matter must be settled in any case by the local circumstances. As a large number of tramways grow out of the consolidation of old horse car lines the placing of the car barns in such cases necessarily depends on the local circumstances. The question of expense is dealt with at some length, and the reporter concludes that the American experience with very large systems can hardly be applied to European conditions.

The subject of the system of traction, other than the overhead trolley system, was reported on by M. Ziffer, of the Railway Companies of Vienna. Very few replies were received on this subject as most of the companies are using either the overhead trolley or conduit systems. The reporter believes that the conduit system is preferable to surface contact systems which, up to the present time, have not shown sufficient reliability in service. The report was a valuable one, which, however, does not permit of being readily abstracted.

The subject of gage of tracks was reported upon by M. De Burelet, of the National Railroads of Belgium. The question of the relative advantages and drawbacks of narrow gage and standard gage for suburban tracks was responded to by a number of roads, some of which favored the standard gage only, while others believed that a narrow gage is specially advantageous for local railways. The reporter states that the experience of the past 17 years has confirmed the opinion that for local railways in country districts, designed to carry passengers and freight towards the large centers or to the stations of long lines, that a narrow gage presents in most cases advantages which gives it the preference over the standard gage. Its principal advantages are stated to be the economy in the cost of construction and operation and the ease with which topographical difficulties may be overcome. The only inconvenience of a narrow gage is that of transshipment, but this is not really of great importance as experience has proved that it does not constitute an obstacle to the development of traffic. At the same time there may be advantages in the use of a wide gage for the local railway when applied to a line of very short length which connects with a large railway system and is designed especially for heavy freight traffic. The reporter, however, laid stress on the fact that he has not discussed the question of electric tramways but it was a simple question of light railways, and it was not possible to argue from the one to the other.

The subject of heating street cars was reported on by M. Peiser, of the Tramways Co., of Berlin. Comparatively few replies were received in regard to this question and the reporter in summing up

the subject states that serious drawbacks exist in the case of electric heating, owing to the high first costs and the cost of operating, owing to the large consumption of current. The question of the electrical heating of cars is to be brought up at the next general assembly in order to obtain particulars of the results which the different companies may obtain in the meantime. The system is comparatively new in European countries and as yet little comparison between this and other systems could be drawn.

The ratio between the number of passengers carried and the seats available on the cars at different times of the day, and the question of the advantage of employing cars of different size to meet the requirements of the traffic was reported on by M. Neiszen, of the Amsterdam City Tramways. Most of the replies to this question show that the ratio between the number of passengers and available seats is extremely variable and in general it is not considered that reduction in fares would make much difference in it. The reporter in summing up finds that only in very special cases it would be possible to deal advantageously with fluctuations of traffic with cars of different sizes, and with mechanical traction it is greatly preferable to use trailers. It was decided that tramway companies should communicate to Union the measures which they take to deal with rushes of traffic at certain hours of the day, and the results obtained by reducing fares at special times.

STREET SPRINKLING BY STREET RAILWAY COMPANIES.

The subject of street sprinkling by street railway companies is one which has not been very generally considered up to the present time but which we believe will be found to be of growing importance. There seems to be no question that in many cases street sprinkling would be of great benefit to the railway companies themselves as it would undoubtedly increase pleasure riding on open cars in the summer time to a very considerable extent. One of the principal difficulties in the way of this practice has heretofore been that the railway companies believed that they would be compelled to do the whole sprinkling business gratuitously if they showed any disposition to take up any part of it, but at the present time many of the companies are beginning to look upon street sprinkling as a good investment. There are a number of points of advantage which the street railway may derive from sprinkling; the comfort of passengers is increased by preventing the dust and this makes riding inviting, and incidentally increases the number of pleasure riders; when the surface of the street

paved with brick. This company, however, only sprinkles where the owners of the abutting property pay for the sprinkling which is about one half of the length of the company's tracks. The railway company provides storage room for the sprinkling car, power, trackage, etc., at a cost of 3 cents per car-mile. In Davenport the city has purchased a sprinkling car and does the sprinkling on all of the brick pavements covered by the tracks of the Tri City Railway Co. In this case the cost of sprinkling is assessed with the regular taxes. The city ordinance requires the



BRILL STANDARD SPRINKLING CAR.

street railway company to haul the city sprinkling cars free of charge, to house them and keep them in repair, and this arrangement is considered very satisfactory by the company.

The Studebaker Brothers Manufacturing Co. has built a number of electric sprinkling cars which are in use in different parts of the country. This company's wide sprinkling cars are in use on the Colorado Springs & Suburban Railway Co's. lines and have given satisfaction in service. The difficulties in keeping the streets sprinkled in Colorado Springs are greater than in most cities on account of the universally broad thoroughfares. The warm climate, dry air and wind storms to be found there make sprinkling a necessity the year around and it is necessary to have a machine that will throw a body of water a sufficient distance to spread from curb to curb. The Studebaker car is very much the same in ap-



STUDEBAKER WIDE SPRINKLING CAR.

peared thoroughly dampened grit and dirt causing wear of the moving part will not so easily reach the bearings; it has also been noticed that when the rails are thoroughly wet there is an economy in the use of current owing to the better electrical contact between the wheels and the rail. In case of very dirty roads this has been found to produce a marked difference in the cost of operation.

In a number of places the sprinkling is undertaken by private companies who supply their own cars and make arrangements for operating them over the tracks of the street railway companies. In Rock Island and Moline the tracks of the Tri City Railway Co. are sprinkled by an independent company where the streets are

pearance as an ordinary car, both ends being vestibuled and the motorman operating in the usual position. The car is mounted on a single truck and driven by two 60 h. p. motors of the General Electric make. The load is carried on graduated springs and consists of a steel tank holding 2,600 gals. of water. This is enclosed in a car body so as to leave sufficient room for a person to pass from end to end of the car on either side of the tank. The water is thrown from the sides from two sprinkler heads located near the center of the truck. It is forced from these heads by two individual force pumps operated by a 30-h. p. motor located at the end of the car. The amount of water thrown as well as the width

of the spray is governed by levers on either end of the car. An emergency brake is also used for quick stopping in passing a moving vehicle when running at high speed. The third sprinkling head is located in front of the center of the truck for flushing the tracks. With the car standing still a spray 78 ft. in width from the center of the track can be thrown from one sprinkling head, while with both heads open a width of 120 ft. can be covered. This company also builds gravity sprinkling cars which depend entirely upon the water pressure for the width of spray. These are useful where it is desired to flush the rails and from 12 to 15 ft. on either side of the track. For this service the gravity sprinkler answers the purpose at much less cost than the wide throwing sprinkler.

The J. G. Brill Co. has also supplied a large number of sprinkling cars to the various street railways in this as well as foreign countries. Among the roads which are using sprinklers of this make may be mentioned the Cincinnati Traction Co., the Pittsburg Traction Co., Orange & Passaic Valley Railway Co., the Perth (Australia) Electric Tramways Co., Cape Town (Africa) Tramways Co., Port Elizabeth (Africa) Tramways Co., Cleveland Electric

the amount of dust in the road. For city use sprinklers are built with enclosed tanks making them appear as much as possible like an ordinary car in order to avoid frightening horses.

This company is now building a new form of sprinkling car, the "Geyser," which is capable of distributing water over the widest as well as the narrowest streets. The water in this car is



BRILL SPRINKLING CAR WITH ENCLOSED TANK.

Railway Co., Chester (Pa.) Traction Co., United Railways & Electric Co., Baltimore, New Jersey Street Railway Co., Newark, Camden & Trenton Street Railway Co., Bordentown, N. J., Jersey City, Hoboken & Patterson Ry., Bergen Turnpike Co., United Traction Co., Philadelphia, and many others.

The Brill Co. were pioneers in the building of street railway sprinklers and their products have kept well abreast of improvements in this line. The company builds cars having tank capacities of 1,800, 2,500 and 5,000 gals. The smaller capacity tanks are mounted on four-wheel cars and the latter on double truck cars, being too heavy for operation on four wheels. The valves and fittings of these sprinklers are made of brass or composition in order to overcome any difficulty with corrosion. The running gear of the single truck sprinkler consists of a solid forged frame truck and upon the truck frame are eight helical springs that carry the body of the car. The sprinkling heads used on these cars are novel as they have no holes or perforations which are liable to become clogged, but the head consists of a cone adjusted in the mouth of the discharge pipe which forms a spray nozzle through which water is discharged in a thin film. The stream maintains its unity for a distance of about 18 in. from the nozzle when it breaks up in a series of streams producing regular distribution of water. The opening which is annular and continuous is not liable to be obstructed.

The 2,500-gallon tank carries a sufficient supply of water to sprinkle from 5 to 8 miles of roadbed with one filling. The distance depends upon the amount of water and speed of the car and



TAUNTON SPRINKLING CAR.

distributed from the nozzle by means of compressed air which allows any desired pressure to be maintained with practically no variation whether the tank is full or nearly empty. The apparatus for furnishing compressed air consists of an axle driven compressing pump. The pump is designed to handle a large volume of air at comparatively low pressures. When the car begins to move, the pump furnishes the required air pressure upon the water in the tank and when it has reached the desired amount of pressure further rise is prevented by an automatic valve which allows the air to be blown off. The valve controlling the air pressure can be set to any point from 2 lb. up to 20 lb. With 15 lb. pressure per sq. in. water can be distributed from 30 to 35 ft. outside of the rails with an even distribution over the whole distance. Either or both sides of the street may be sprinkled as desired.

The Taunton Locomotive Manufacturing Co. has built street car sprinklers which are in use on a number of street railways, among which may be mentioned the Quebec Railway, Light & Power Co., the Westfield & Elizabeth Street Railway Co., the Cincinnati, Lawrenceburg & Aurora Street Railway Co., Patterson Railway Co., the New York & Queens County Railroad, Charleston Street Railway Co., Steinway Electric Railway Co., Transit Equipment Co., Bridgeport Traction Co., etc. The Taunton Sprinkler carries its tank pretty high on the car and is equipped with large



MCGUIRE WIDE SPRINKLING CAR.

sprinkling pipes and large valves which tend to reduce the losses by friction and which permit the water to be thrown a long distance. For broad boulevard sprinkling an auxiliary pump and motor is used to throw the water under pressure. These sprinklers are made with steel tanks mounted upon platform cars and are also made covered over so as to present the appearance of an

ordinary car. The sprinkling heads of these cars are situated at the ends near the car platforms. The tanks are made both of steel and cypress and in capacities from 2,500 to 4,000 gallons.

Sprinklers for street railway service have been built by the McGuire Manufacturing Co., of Chicago, up to 5,000 gallons capacity; for capacities of 4,000 gallons and less the tank is usually mounted on a single truck car, but 5,000-gallon sprinklers are mounted on double trucks. Compressed air is used to throw the water to the distances now demanded in street sprinkling. The air reservoir is filled by a compressor driven by an electric motor; and in the pipe connecting the air reservoir with the water tank is a regulating reducing valve by which the working pressure and consequent throw of the sprinkler can be easily adjusted.

The McGuire company has just completed two pneumatic sprinklers for the railways at Durban, Natal, South Africa; these have a capacity of 3,000 gallons and are designed to throw a spray of water for 50 ft. on each side of the track.

NEW CARS FOR PITTSBURG.

The accompanying illustration shows the type of open car built by the St. Louis Car Co. for the Pittsburg Railways Co. These are 11-bench cars six of which have just been completed. The total length over the buffers is 24 ft. 3 in. and the width of the body at side posts is 7 ft. 4 in. while the width over all is 7 ft. 10 in. The height from the bottom of the side sills to the top of the roof



OPEN CAR FOR PITTSBURG ST. LOUIS CAR CO.

is 8 ft. 8 in. The cars are finished in ash, are provided with solid bronze trimmings throughout and are fitted with pantasote curtains.

NORTHWESTERN DONATES PARK TO CHILDREN.

The Northwestern Elevated Railroad Co., Chicago, through its president, Mr. Clarence Buckingham, has given a space of ground 80 x 300 ft. at Larrabee and Town Sts. to be used as a playground by the children of the congested northside district. The gift of this park has been supplemented by a donation of \$500 which will be invested in swings and other conveniences of a children's playground. The park, which lies partly under the Northwestern elevated structure, will be enclosed in a high fence of ornamented design and it is the intention of the company that it shall be well kept and devoted exclusively to the children's use.

ACCIDENTS AND BRAKES.

The Sterling Meaker Co. enters its protest against the action of the daily press in including such sentences as the following in its accounts of street railway accidents: "Effective brakes would prevent such accidents, but very few cars are equipped with powerful brakes or more than one device for checking speed, although they are run up and down hill which would be impracticable for the more solidly built and better controlled rolling stock of team road."

It is considered that this is hardly fair, as not "very few," but

very many cars are equipped with powerful brakes, among which the Sterling safety brake must be reckoned, as thousands of them are in use and have proved their efficiency in years of constant service.

NEW INTERURBAN OPENED.

The Rockford, Beloit & Janesville Electric Railway Co. opened its newly completed line between Rockford, Ill., and Beloit, Wis., a distance of 18 miles, August 4th, two cars being put in service and a regular hourly service inaugurated. The company has purchased eight handsome parlor cars, two of which were delivered and put in operation over the line August 11th. So soon as the remainder of the rolling stock is received the line will be opened to Janesville, a total distance of 35 miles, and cars will run every half hour. The line passes through the towns of Rockton and Roscoe, and the trip between the Rockford and Beloit is made in 48 minutes. The road is substantially built and ballasted with gravel. H. H. Clough, of Elyria, O., was interested in this company, and is now its general manager, with headquarters at Beloit.

THE GAME PRESERVES OF THE NORTHWEST.

The Northern Pacific Ry's. latest publication is a sportsman's manual of the northwest entitled "Where to Hunt and Fish." The

book contains some 30 admirable half-tone illustrations of game, several of the pictures being reproductions of Thompson-Seton's work. The cougar, mountain goat, elk, moose, grizzly bear and many other native burghers of mountain, plain and forest are represented in the collection, which also comprises a number of charming vignette pictures of mountain scenery and camp life. Of the many appropriate souvenirs issued by the passenger department of this railroad, "Where to Hunt and Fish" is, perhaps, the most noteworthy from an artist's as well as a sportsman's point of view.

The book also contains a collection of reliable data concerning the extent and variety of the game to be found in the region between the Great Lakes and the western coast, and the 45th parallel of latitude and the Canadian boundary, and gives in addition a digest of the game laws in every section and notes concerning hotel accommodations, the employment of guides, etc. In Montana the large game has multiplied and replenished since the Alaskan exodus called the native hunters and trappers to other conquests. Here are found the moose, elk, mountain sheep, deer, bear, cougar, lynx, high-climbing mountain goat and other gentry of the wilderness, while the foothills abound in blue grouse and the streams teem with trout. The adjacent parts of British Columbia afford caribou, while the Big Horn and Bitter Root ranges are pre-eminent for the hunting they furnish. This section comprises without doubt a game preserve unsurpassed by any in the world.

Since the interurban electric lines in Michigan, connecting Grand Rapids and Grand Haven and Grand Rapids and Holland, have been put in operation business in the small villages between the terminal cities is reported to have more than doubled.

ANNUAL MEETING OF THE CHICAGO UNION TRACTION CO.

The financial statement for the year ending June 30, 1902, which was submitted at the annual meeting of the Chicago Union Traction Co., held July 23d, shows a deficit of \$247,527.68 for the year. Compared with the statement for the preceding year it is as follows (omitting cents):

	1902.	1901.
Gross earnings from operation.....	\$7,825,120	\$7,289,139
Operating expenses	4,570,719	3,942,194
Net earnings from operation.....	\$3,254,400	\$3,346,945
Other income.....	117,350	103,579
Gross income.....	\$3,371,750	\$3,450,524
Fixed charges.....	3,619,278	3,291,949
Deficit.....	\$247,527	*\$158,575
Dividend on preferred stock.....		150,000
Deficit	\$247,527	**\$8,575

*Surplus. **Balance.

Additions to the property during the fiscal year were as follows:

Construction: Track and roadway.....	\$5,915	
Electric line.....	2,474	\$8,389
Real Estate: Buildings.....		\$4,597
Equipment: Power plant equipment.....	\$4,098	
Shop tools and machinery.....	2,077	
New cars.....	65,108	
Electric equipment of cars.....	31,443	
Mail cars.....	294	
Total.....	\$103,021	
Less credit from sale of wagons and coal motor....	2,653	100,368
Other property:		
Furniture for Law Department.....		395
Reconstruction		159,987
Total.....		\$273,646

In presenting the report to the stockholders President Roach said:

"The business done by your company during the fiscal year closing June 30, 1902, so far as increased earnings are concerned, was all that your management could reasonably expect under the adverse conditions with which we had to contend. Briefly, however, the financial statement will show that prospective profits have been taxed into a deficit.

"That this is not an overstatement will sufficiently appear by reference to the enormous amounts paid out for taxes during the past year, viz.:

Personal property taxes.....	\$112,492.50
Real estate taxes.....	60,428.61
Capital stock tax.....	311,567.33
Car licenses and amounts paid to city as per requirements of different ordinances.....	64,892.87
Amount paid account taxes reassessed for 1900, as directed by United States Court.....	134,350.03
Total	\$683,731.34

*This is equal to about 8½ per cent of the total gross receipts of the company for the year, and to about 21 per cent of the net receipts for the same period, counting as net receipts the gross receipts less only operating expenses, and not including in operating expenses either interest on bonded indebtedness or rentals paid to underlying companies. We have some reason to hope that for the current year the company may have its property, including capital stock, assessed upon the basis of its earning capacity, the only just method. If this hope shall be realized, the capital stock tax ought to be, and doubtless will be, greatly reduced. The item of \$134,350.03 additional tax for 1900, of course, will not occur this year, and upon the basis of earning capacity the item of \$311,567.33 capital stock tax for 1901, would be reduced by at least \$100,000.00, and should be reduced by \$125,000.00.

"The percentage of operating expenses to increased receipts has been much higher than anticipated, owing to a combination of unavoidable embarrassments. A number of important river bridges over which trunk lines are operated have been entirely out of service, while others have been damaged at frequent intervals, causing temporary shifts of terminals on short notice, much to the inconvenience of the traveling public. This, in the aggregate, amounted to a loss of thousands in receipts, patrons of the road seeking other methods of transportation, sometimes at great inconvenience to themselves, owing to the uncertainties of travel on river-bridge lines. These conditions, however, are temporary. New modern bridges are being erected, river channel obstructions are being removed, and the entire problem of bridge transportation promises shortly to be in a much better condition than ever before, benefiting the public and company jointly.

"Large sums were expended in permanent improvements in right of way, rolling stock and power plants. Several miles of new track have been laid, thousands of rail joints have been cast-welded, and upon streets where city improvements have been made we have resurfaced our tracks, substituting a granite, asphalt or brick pavement in place of cedar block or cobble-stone. The improvements when completed will lessen the cost of operation and improve the service to the public, but at present they eat heavily into the receipts with no immediate financial return. Our rolling-stock has been maintained at a high standard and increased by a large number of new cars. Power houses are now more efficient than heretofore, and contemplated improvements will place the operating department in a position to better care for the traveling public.

"In view of our heavy expenses for improvements, the early settlement of the river-bridge problem and the general prosperity of the community, the management confidently expect (barring unforeseen contingencies) that the ensuing fiscal year will show results more satisfactory to the stockholders of this company."

The treasurer reported that by applying \$74,000 received from the sale of unused real estate reductions amounting to \$3,430 in interest charges had been made and that the income from property leased from the company had been increased by \$5,211, making an annual saving in the fixed charges of \$8,641.

The directors elected were: Jesse Spalding, Walter H. Wilson, James H. Eckels, John V. Clarke, John M. Roach, John Lamson, Henry G. Foreman, Joseph Downey, R. A. C. Smith, H. B. Hollins, W. F. Harray. Four changes were made in the board, William Dickinson, G. K. C. Billings, Charles L. Hutchinson and P. A. B. Widener retiring.

The directors met and elected all of the old officers.

McGUIRE SNOW PLOWS AND SWEEPERS ABROAD.

Engineering, of London, thus describes the McGuire exhibit at the International Tramways and Light Railways Exhibition:

Amongst the striking features at the stand of the European McGuire Manufacturing Co., of Elton Fold, Bury, is a snow-sweeper and plough built for the Bolton Corporation, and intended to keep the electric tramway tracks open throughout all the winter snows. The machine is motor driven, picking up its current from the overhead trolley wire. In front it carries a rotary brush, which is driven by a pitch chain from an electro-motor. This chain drive enables the level of the brush to be readily adjusted within a considerable range. The "bristles" of the brush are of rattan canes. This brush is guaranteed to remove snow from the tracks up to 18 in. deep, and it throws it in the way of a movable and adjustable plow plate secured to the side of the car. When not in use this plow plate can be folded up flat against the car, which then occupies no more space than an ordinary tram car. A specimen of the motor trucks supplied by the company for the Great Northern and City Railway rolling stock is also shown. These trucks are largely built of steel castings. They weigh 4 tons each, and a pair will carry safely a load of 80 tons. Mention should also be made of a very compact form of rheostat, in which the resistances are simple rectangular rods of carbon, with terminals fitted at different points along their length. For a 3-h. p. rheostat a single rod about 7-in. long suffices. By making connection to one or other of the several terminals mentioned above, a greater or lesser length of the rod is thrown into circuit and the resistance of the latter correspondingly varied.

THE LINCOLN POWER STATION OF THE BOSTON ELEVATED.

The Lincoln Station of the Boston Elevated Railway Co. differs in many respects from the various other power plants of the system. It is the most recent addition to Boston's numerous electrical power plants and is located on the lot known for many years as Lincoln Wharf; this is on the water front of the harbor, and in the heart of the old city, near the junction of Commercial St. and Atlantic Ave., where there are excellent facilities for the docking of coal and



LINCOLN STATION, BOSTON ELEVATED.

other supplies. The general appearance of the building is imposing, and the chimney, which is 250 ft. high, is said to be the tallest stack in the city. The building is divided into two longitudinal sections, the boiler room and all apparatus pertaining thereto being in one section and the engines, generators and condensing system in the other. The engine room is served by an electric crane of 40 tons capacity. The walls of this room are faced with white enamel brick, adding much to its general appearance and illumination. The present station contains three units, aggregating about 13,500 h. p. While it is now complete in itself, ample ground area has been provided for the extension of the building and plant on harmonious lines to accommodate four additional units, thus permitting an ultimate equipment of about 30,000 h. p.

The boiler installation consists of eight 468-h. p. and four 490-h. p. Babcock & Wilcox boilers. An equipment of Roney mechanical stokers of the same type as those in the large power houses in New York City has been installed by Westinghouse, Church, Kerr & Co.

Coal will be automatically unloaded from vessels and stored in a large pocket holding 5,000 tons, with a further storage bin of 3,000 tons in the boiler house, or a total storage capacity of 8,000 tons. It is carried to the boilers by a coal and ash conveying system which conducts the coal into overhead conveyors leading to the stokers. The coal may be taken from the pocket to the storage bin in the boiler house, and, in addition, tracks are located on either side so that coal cars can be automatically loaded to carry coal to the various other power stations or to any of the thirty or more car houses situated in different parts of the city. The plant is equipped with Green economizers.

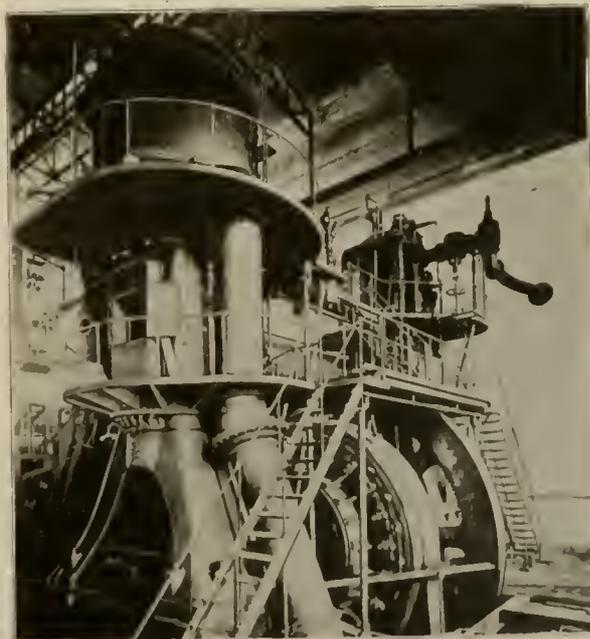
The original engine installation consisted of two vertical cross compound units of 4,500 h. p. each, with the generators and fly wheels carried on the shafts between the high pressure and low pressure cylinders, the generators are direct current machines, rated at 2,700-kw. each. A third unit which has just been completed consists of a vertical cross compound engine of about 4,500 h. p., designed and built by the Westinghouse Machine Co. and installed by Westinghouse, Church, Kerr & Co. It is of the same design as

the one recently furnished for the Charlestown Power Station and is direct connected to a Westinghouse direct-current generator of 2,700-kw. capacity of the same make and similar to one of the two machines mentioned. The engine, however, differs considerably in design and construction from the two engines first installed. The high-pressure cylinder is fitted with poppet valves for use with superheated steam, which is supplied by superheaters built by the Babcock & Wilcox Co.

Steam is conveyed from both sides of the boiler room by 8-in. mains to a 16-in. drum, from which it is conducted by 12-in. risers to receiver separators and thence to the engines. All the live steam drips from the steam drums, separators and reheating receivers are carried back to the boilers by the steam loop and Holly gravity return system.

Ingersoll-Sergeant air compressors, each driven by a 50-h. p. Westinghouse 500-volt motor, supply compressed air for the block signal and switching system, used by this road. Early in the conception of the scheme of running trains at high speed under the rather complex conditions here existing, the engineers of the Boston Elevated Railway Co. realized that a block system was necessary as a safeguard against accident, and the Westinghouse electro-pneumatic interlocking system, made by the Union Switch & Signal Co., of Swissvale, Pa., was chosen.

The elevated road includes some 14 miles of trackage. The switches and signals are controlled from four switch towers and the automatic block signals are located at distances of about 800 ft. apart. Each tower is supplied with indicators showing the approach of trains. The towers at the junctions of the Atlantic circuit and main line control some 1,200 elevated trains daily. The largest tower is located at the Sullivan Sq. terminal, where some 500 elevated trains and 700 surface cars pass in and out daily, involving 6,000 switch and signal movements. A force of only two men on duty is required to operate the switchboard mechanism consisting of 35 pneumatic levers. The terminals are also supplied with lamp indicators showing the relative location of approaching trains. While



2,700 K. W. WESTINGHOUSE UNIT.

the tram movements at Sullivan Sq. are not so complicated as those at the Boston South Terminal Railway Station, the Elevated company has less track room at its disposal and handles a much larger number of trains for a given number of tracks.

The Metropolitan Street Railway Co., of Kansas City, has recently revised its system of discipline, making the demerits awarded less severe on the men. The company has begun work on its new power house, and August 1st commenced changing the Troost Ave. line for electricity.

PERSONAL.

MR. W. S. HUFF has been appointed general manager of the Richmond Passenger & Power Co., of Richmond, Va.

MR. GEORGE F. McCULLOCH, president of the Union Traction Co., of Indiana, left New York on August 13th for an extended trip in Europe.

HON. W. F. BAY STEWART was born in Chanceford Township, York County, Pa., Feb. 25, 1849, and is of Scotch-Irish extraction, his father being Thomas R. Stewart and his mother a daughter of Judge Thomas Bay, of Cooptown, Md. He attended the district school in his neighborhood until he reached the age of 17, when he learned the trade of blacksmith, at which he worked for a short time. He was compelled, on account of his health, to abandon his trade, and he then attended Pleasant Grove Academy, and later the York County Academy, where he afterwards taught.

He next began the study of law with Col. Levi Maish, then a member of Congress, and was admitted to the bar in 1873. He formed a partnership with John Blackford, then district attorney, who shortly afterwards died, and he next became head of a firm including H. C. Niles and George E. Neff, which soon met with notable success. In 1895 he was elected judge, and has made an enviable reputation as a capable jurist. Judge Stewart has been extremely active in business enterprises aside from his legal work. He became one of the firm of Baugher, Kurtz & Stewart, founders, which is one of the most prosperous in the city of York and employs several



W. F. BAY STEWART.

hundred men. He reorganized and became president of the York Card & Paper Co., established the York Knitting Mill, and organized and built the York Match Factory, all of which proved successful. He organized, built and largely owns the Norway Iron & Steel Co., and was chiefly instrumental in organizing the present York County Traction Co., which is a consolidation of all the street railways in York and York County, and the electric light and steam heating companies. He was the organizer of the Security Title & Trust Co., a banking institution of which he was president until obliged to resign by reason of going on the bench. He also organized and is the vice-president of the Standard Plaster Co., located at Buffalo, New York.

His most recent enterprise is the development of the falls in the Susquehanna River near York Haven, and for this purpose he organized the York Haven Water & Power Co., which will furnish electric current to all the important towns, street railways and electric light companies in the counties of York, Lancaster, Dauphin and Cumberland. Within the near future the lines of the York County Traction Co. will be extended from York to York Haven, and thence to Goldsboro, from York to Wrightsville, a distance of eleven miles, and from York to Hanover, where it is possible a junction will be formed with the McSherrytown Street Ry. This company has already extended its line as far south as Windsorville, a distance of 14 miles, and northwest as far as Dover. The latter line will be extended on through to Dillsburg. The entire system will be operated from the plant of the York Haven Water & Power Co. upon its completion.

MR. C. S. DRUMMOND, manager of the London (Eng.) Transit Co., has been elected president of the Manhattan Transit Co., and left London for New York, August 2d.

MR. H. A. FISHER has resigned as general manager of the Columbus, London & Springfield Railway Co. and the Columbus, Grove City & Southwestern Railway Co., to become general manager of the Columbus, Delaware & Marion Electric Railroad Co., which has a line under construction between the cities named in the title with a branch from Prospect to Richwood.

MR. M. J. LOFTUS has resigned as superintendent of the Newark (O.) & Granville Street Railway Co. to become general manager of the Indianapolis & Martinsville Traction Co.

MR. ALONZO J. WALLER, superintendent of the Michigan Traction Co., of Kalamazoo, recently underwent an operation for appendicitis and was for a time critically ill, but is now rapidly recovering.

MR. B. S. BARNARD has resigned as manager of sales for the American Vitrified Conduit Co. and is now vice-president and secretary of the Standard Vitrified Conduit Co., with general offices at 39 Cortlandt St., New York.

MR. W. A. LARABEE, of Gloucester, Mass., formerly superintendent of the Gloucester, Essex & Beverly Street Ry., has been appointed superintendent of the Gloucester division of the Boston & Northern Street Railway Co.

MR. ANDREW WILKES has been appointed chief engineer of the Rothesay Tramways Co., Rothesay, Isle of Bute, Scotland; Mr. Wilkes was formerly with the Dudley, Stourbridge & District Electric Traction Co., at Staffordshire.

MR. W. PORTER BRAWLEY has been appointed traveling purchasing agent of the Cleveland, Cincinnati, Chicago & St. Louis Railway Co., with headquarters at Chattanooga, Tenn. Mr. Brawley succeeds Mr. W. A. Miller, transferred.

MR. C. W. GEARHART on recently retiring from the superintendency of the bridge division of the Brooklyn Rapid Transit Co., was presented by the men with resolutions of regret, framed in gold. Mr. Gearhart will be succeeded by Mr. E. F. Reeves.

MR. S. P. COWARDIN has been appointed chief engineer of construction in charge of all tracks of the Richmond (Va.) Passenger & Power Co. Mr. George H. Whitfield has been appointed superintendent of the company's shops, in charge of the maintenance of cars.

MR. E. T. SELIG, formerly superintendent of the Fort Scott (Kan.) Electric Railway & Light Co., has been elected secretary and manager of the Mount Vernon (O.) Electric Light & Railway Co., to succeed Mr. C. E. Johnson, who has resigned on account of ill health. Mr. Selig assumed his new duties at Mount Vernon, August 1st.

MR. J. W. PERRY, who was for 14 years with the Philadelphia office of the H. W. Johns Co., and recently the H. W. Johns-Manville Co., has just returned from a two months' trip in Europe. In the future Mr. Perry will be found at 100 William St., New York, as the manager of the railway department of the H. W. Johns-Manville Co.

MR. H. A. NICHOLL, heretofore assistant manager, was on July 28th elected general manager of the Ithaca Street Railway Co., the Brush-Swan Electric Light Co., and the Cayuga Lake Electric Railway Co., of Ithaca, N. Y., succeeding Mr. E. G. Wyckoff, who will hereafter serve as president of these companies, Mr. Wyckoff having formerly acted as general manager also.

MR. W. B. BROCKWAY, auditor of the New Orleans & Carrollton Railroad Co., resigned that position on the occasion of the reorganization of the company and will go to New York with Mr. J. K. Newman, lately president of the New Orleans & Carrollton company, who now represents Isidore Newman & Co. in New York. Mr. Brockway will be railroad accountant in the office of Newman & Co.

MR. WALTON H. HOLMES, formerly president of the Metropolitan Street Railway Co., of Kansas City, who is at present in Europe, has cabled his acceptance of the presidency of a new trust company in course of organization in Kansas City, which, according to reports, it is proposed to style the Monarch Trust Co. The organization committee of the new company includes C. F.

Holmes as chairman, who was formerly general manager of the Metropolitan Street Railway Co.

MR. F. F. BODLER, who was formerly master mechanic of the North Jersey Street Ry., Newark, N. J., has been appointed master mechanic of the United Railroads of San Francisco, and took charge of the rolling stock and shops early in August. Mr. Bodler has devoted a great deal of attention to developing the piece work system for street railway shops and has been very successful in this work. In our issue for April, 1902, page 228, we published a list of Mr. Bodler's piece work prices.

MR. J. P. POTTER, formerly superintendent of the western division of the Oakland (Cal.) Transit Co., has been appointed superintendent of the entire system at Oakland; Mr. A. H. Smith, formerly superintendent of construction, will be assistant superintendent of all the Oakland lines; Mr. E. E. Thornton, formerly inspector of the Alameda division, will be superintendent of the Haywards division, and Mr. C. O. Piper, formerly inspector of the Telegraph Ave. division of the system, will be superintendent of that division.

SENATOR HANNA, president, and G. G. MULHERN, general superintendent of the Cleveland City Railway Co., were both presented with gold headed canes by the employes of the company, August 4th, as an expression of the latter's appreciation of a recent advance in wages, and other benefits. The appearance of Messrs. Hanna and Mulhern in the employes' hall, where the presentation meeting was held, was greeted with resounding cheers and the informal ceremonies which followed were exceptionally demonstrative of good will. Both the recipients of the gifts replied with speeches.

THE NEW ORLEANS RAILWAYS CO. on July 17th assumed charge of the properties of the New Orleans & Carrollton Railroad, Light & Power Co., and announced the following general officers and department heads: President, H. H. Pearson, Jr.; vice-presidents, Charles H. Ledlie and Joseph H. DeGrange; general manager railway department, Capt. John G. Woods; general manager gas department, Bankson Taylor; chief engineer and electrical department, Alexander Black; superintendent power houses, E. B. McKinney; auditor City & Orleans railways, H. A. Ferrandou; master mechanic, E. J. Morris; purchasing agent, John R. McGivney; claim agent, W. H. Renaud.

MR. F. A. BOUTELLE has been appointed superintendent of the Hudson Valley Railway Co., Glens Falls, N. Y., assuming charge of the operating department August 1st. Mr. Boutelle has had extensive experience in connection with the operation of steam railways, having been for 20 years train dispatcher and chief train dispatcher for the Delaware & Hudson Co., at Albany, and for two years train master of the Boston, Hoosac Tunnel & Western R. R. In connection with Mr. Boutelle's assumption of the superintendency of the Hudson Valley Railway Co. the latter will create the office of trainmaster or chief dispatcher and the standard steam railway rules will be adopted without deviation.

CHICAGO OFFICE FOR MAYER & ENGLUND.

The Mayer & Englund Co., of Philadelphia, has decided to establish an office in Chicago from which it can more conveniently handle its electric railway supply business in western territory. Mr. J. M. Gallagher, formerly of Boston, will represent the company with headquarters at No. 1101 3 Merchants Loan & Trust Building.

The Union Traction Co. of Indiana proposes to transmit electric current from its power house to a point 60 miles distant at a voltage of 12,000.

The Railways Company General, of Philadelphia, which owns the electric line between Battle Creek and Kalamazoo, Mich., may effect a traffic agreement with the Hawks-Angus syndicate whereby through cars from Detroit will be run to Kalamazoo via the Detroit, Ypsilanti & Ann Arbor Ry. A report has been circulated to the effect that Messrs. Hawks and Angus have opened negotiations to acquire the Battle Creek Kalamazoo line from the Railways Company General.

OBITUARY.

MR. LUCIUS CLARK, who was formerly identified with Mr. Yerkes in building elevated and surface railways in Chicago, recently committed suicide at his home in Chicago. Mr. Clark was 46 years old, and a native of Marsailles, Ill. He had within the last few years lost the greater part of a considerable fortune through disastrous mining operations in the west.

MR. JOHN R. LATTIN, superintendent of construction of the Wabash River Traction Co., died in Logansport, Ind., August 7th, of heart failure. Mr. Lattin's home was in Stratford, Conn., and he represented the Blakesley syndicate of New Haven, in the construction of railways in New England and Indiana. The cause of the sudden attack from which he died is believed to have been a message containing bad news which reached him while he was at dinner.

MR. FREDERICK B. ROUNDS, formerly general superintendent of the Metropolitan Street Railway Co., of New York City, died recently at Hoboken from a pistol wound which, there seems reason to believe, was self-inflicted. Mr. Rounds was 38 years old, and his career in the street railway world had been one of unusual promise. His early life was spent at Watertown, N. Y., where he worked as a clerk for a local contractor. Fifteen years ago he removed to New York City to assume charge of the West Side branch of the Railroad Y. M. C. A. in which position he continued until 1890 when ill health caused his resignation. Subsequently he became secretary to the president of the Broadway & Seventh Ave. Railway Co., and, after Mr. Vreeland's accession to the presidency, and the consolidation of the New York roads, kept his position as president's secretary. He was for a time general manager of the Third Avenue R. R. In 1898 Mr. Rounds was appointed general superintendent of all the Metropolitan lines, a position which carried with it much responsibility. Since severing his connection with the Metropolitan in July, 1900, Mr. Rounds had been a salesman for the Sterling-Meaker Co. Mr. Rounds was a man of attractive personality and possessed many friends by whom the circumstances of his untimely death are deeply deplored.

NEW PUBLICATIONS.

THE ARMOUR INSTITUTE OF TECHNOLOGY has published its annual year book for the year 1902-1903, which gives a description of the various courses of this institution. The engineering courses are its prominent feature and are very complete. In addition to the theoretical and class-room instruction they include visits of inspection to a number of prominent engineering works in the vicinity of Chicago.

PROCEEDINGS of the Third Annual Convention of The American Railway Engineering and Maintenance-of-Way Association, at Chicago, March 18-20, 1902, has just been published. The volume contains nearly 500 pages of papers, reports and discussions, a number of which were abstracted in the columns of the "Review." Most of the committee reports contain data which are valuable to electric railway as well as steam railroad engineers.

MANUEL DU CHAFFEUR-MECANICIEN et du Propriétaire d'Appareils a Vapeur. By Henri Mathieu, Principal Controller of Mines, Steam Inspector of the Seine, Professor in the Federation generale des Mecaniciens-Chauffeurs-Electriciens, etc. Second edition. Published by Librairie Polytechnique, Charles Beranger, editor, 15 Rue des Saints-Peres, Paris. Octavo, 900 pages, profusely illustrated. Price, \$5.00 (25 francs).

PRODUCTION ET DISTRIBUTION DE L'ENERGIE POUR LA TRACTION ELECTRIQUE. By Henry Martin, Engineer of Arts and Manufactures. Published by Librairie Polytechnique, Charles Beranger, editor, 15 Rue des Saints-Peres, Paris. Octavo, 750 pages, with 870 illustrations in the text. Price, \$5.00 (25 francs).

Those who are familiar with French books on technical subjects cannot fail to have been impressed with the thoroughness with which the authors do their work and the painstaking care to include examples of the most recent designs and most modern practice.

As a consequence of this policy, the English reader can often find collected in the French books data on current practice that in his own language are only to be found after a more or less extended search in the technical periodicals. The two books here mentioned are striking examples of this class of works.

The *Manuel of the Chauffeur Mecanicien* (which we may translate "Fireman and Engineer") is a treatise on boilers and engines, to which are added chapters on the legislation apropos of these subjects, and an appendix in which are collated the laws and decrees relative to steam apparatus which are now in force in France and other European countries. Part I treats of boilers and comprises 540 pages, divided into 35 chapters. The subjects covered are general considerations as to heat, water and fuel, the different types of boilers (including stationary, marine, locomotive and automobile), reheaters, auxiliary apparatus, purifying apparatus, furnaces, chimneys, boiler tests, and a chapter on explosions. Part II comprises 20 chapters on steam engines, including steam turbines. The historical and other introductory chapters are brief, more attention being given to the design and operation of modern engines, and the necessary accessory apparatus.

The work of M. Martin on the "Production and Distribution of Energy for Electric Traction" is a sequel, so to speak, to the two-volume treatise on "Electric Traction" by Andre Blondel and E. Paul-Dubois, which was published in 1898 (Baudry et Cie, the predecessors of Beranger), and which we consider to be the most complete and modern manual on this subject that has yet been issued. M. Martin deals only with the electric railway power station and the transmission system, but covers all forms of electric traction. Part I is on the production of current and includes boilers, steam engines, gas engines, water power plants, direct and alternating current generators, storage batteries, sub-stations and their special apparatus, and costs of operating. Part II covers the design and construction of feeder lines. Part III deals with overhead trolley lines, going into details of line materials and illustrating the different types. Part IV similarly covers the third-rail and sub-surface conduit systems and surface contact systems. Part V is on the return of current to the power house. Part VI is a collection of state and municipal regulations affecting the distribution of electric energy for traction purposes. Naturally, in view of the high development of electric traction in America, there is much space given to American practice, and the work is in every respect up-to-date.

MESSRS. H. ALABASTER, GATEHOUSE & CO., of No. 4 Ludgate Hill, London, have issued their announcement of the 1923 edition of "The Universal Electrical Directory" and request that all companies and firms connected with the electrical industry send the necessary information, name, address and business, at the earliest date possible. All persons and firms are entitled to one entry in the alphabetical section and to one entry in the classified section free. Display announcements and advertising, or additional entries may be arranged for on an advertising basis.

A NEW PARK AT SPRINGFIELD, O.

The Springfield (O.) Railway Co. has recently acquired Spring Grove Park, a thickly wooded tract on its suburban lines just out of Springfield, and is effecting various improvements which it is expected will make this resort one of the most popular of its size in the country. A handsome and commodious theater has been completed, it being the intention of the company to provide first class theatrical attractions during the summer season. The building is 85x107 ft., with a stage 32x35 ft. The material used throughout is white maple finished in oil. Regular opera chairs are provided, with a total seating capacity of 1,200, and a full quota of stage scenery and properties sufficient for a fairly elaborate production. The theater is lighted by 250 incandescent and four arc lamps, and is carefully designed in regard to acoustics. Other attractions at the park are a bicycle track after a similar plan to that of Madison Square Garden, New York, and a huge and very elaborate merry-go-round, comprising new features, which have recently been erected. A running stream through the grounds and an abundant spring furnish fresh water the year round and supply the means for a number of artificial ponds which will be constructed next season. Rustic seats and promenades have been provided and the park is enclosed by a handsome iron fence.

TERMINAL COMPANY AT INDIANAPOLIS.

The Indianapolis Traction & Terminal Co. was organized early in August for the purpose of building a system of tracks and passenger and freight terminals or stations to be used by the cars of the following eight interurban companies whose lines are completed or shortly to be completed:

Union Traction Company of Indiana.
 Indianapolis Northern Traction Co.
 Indianapolis, Lebanon & Frankfort Railroad Co.
 Indianapolis & Martinsville Rapid Transit Co.
 Indianapolis & Plainfield Railroad Co.
 Indianapolis & Eastern Railway Co.
 Indianapolis, Greenwood & Franklin Railroad Co.
 Indianapolis, Shelbyville & Southeastern Traction Co.

The Indianapolis Traction & Terminal Co. is entirely separate and distinct from the Indianapolis Street Railway Co. and its officers are as follows: President, W. Kesley Schoepf, of Cincinnati; first vice-president, Hugh J. McGowan, Indianapolis; second vice-president, James M. Jones, Indianapolis; secretary, John D. Thompson, Indianapolis; treasurer, Clarence Winter, Indianapolis. The company is capitalized at \$500,000.

Each of the interurban companies mentioned has applied for a franchise from the city of Indianapolis, granting permission to use the tracks of the Indianapolis Street Railway Co., and also of the Indianapolis Traction & Terminal Co. in reaching the business heart of the city, and further granting the use of the terminals or stations to be provided by the Traction & Terminal company. Each interurban company has a private agreement with the Indianapolis Street Railway Co. and with the Indianapolis Traction & Terminal Company, relating to the terms on which use of tracks and other property belonging to those companies may be had.

The proposed belt line about the city, if built at all, will be built by the Indianapolis Traction & Terminal Co. The object of the belt line will be partly for the business it will create and partly to afford facilities for trolley parties and long rides to both visitors and residents.

When the Indianapolis Traction & Terminal Co. asked for a franchise to build certain tracks and stations, as already mentioned, the city authorities stated that cross-town lines are needed in the north and south parts of the city and insisted upon these being built as a condition of granting the franchise. The Traction & Terminal company has agreed to build these lines or extensions, and, with the permission of the Indianapolis Street Railway Co., to connect them with the existing tracks of the latter company so as to provide street car facilities for portions of the city that are now in a sense without such facilities.

It is quite apparent that the undertaking of the Traction & Terminal company is one of great magnitude. The passenger station to be provided for interurban patrons will alone, it is estimated, cost (building and ground) something over a million of dollars. The new tracks and special work to be put down by the company will require considerably more than another million, and the granting of all the franchises referred to means that within the next five years at least three millions of dollars will be expended in improvements to the street railway system of Indianapolis. When these improvements, or rather additions, have been completed, Indianapolis will have a most complete and comprehensive street railway system, and there will be scarcely a neighborhood in the entire territory covered by the city that will not be readily accessible to street cars.

Other interurban companies than those named are being talked of and will doubtless become realities, but it is believed that all those mentioned will be in operation within the next twelve months. The new ones will have to ask and obtain separate franchises, which will doubtless be of similar tenor to those just requested.

Mr. Konradin Zschokke, an eminent engineer of Aarau, Switzerland, is reported to be the principal promoter of much proposed street railway construction in that country. These roads will be built by the authorities of the townships through which the routes pass, and a committee appointed by such authorities will award contracts for the actual construction of the system and its equipment. Mr. Zschokke will, it is stated, acknowledge all communications addressed to him at Aarau.

NEW RAILWAY JACK.

The jack shown in the accompanying illustration is being placed on the market by the Railway & Electric Supply Co., No. 115 Broadway, New York, and is something entirely new in the jack line. The illustration shows a No. 6 jack with an attachment for lifting rails or axles which gives three different heights, and will lift 10 tons 25 inches. It has ball bearings, with double ratchet made of steel and malleable iron, and has both a pawl and a reversible ratchet



BALL BEARING RAILWAY JACK.

for adjustment, and a swinging lever instead of a lifting lever as on jacks of the more common designs.

The business of H. W. Shaw & Co., of New York, is now merged into that of the Railway & Electric Supply Co., which has offices at No. 115 Broadway, New York. The new company is a dealer and manufacturer of electric and steam railway material, and will continue all the former business of the Shaw Co., with the exception of the Shaw lightning arresters, which will be manufactured and sold by the Universal Electric Co. at the same address. The railway & Electric Supply Co. will also act as selling agents for the railway department of the Bray Manufacturing Co., manufacturer of ball bearing lifting jacks.

ACCIDENTS OF THE MONTH.

A rear-end collision on the Rochester & Irondequoit R. R. occurred at Rifle Range, five miles from Rochester, N. Y., at 10 p. m., July 27th, causing injuries to seven passengers. A party of intoxicated persons had placed obstructions on the track in order to make sure of stopping the car. The motorman of car No. 457 saw the obstructions in time to avoid running into them, and while the crew was engaged in clearing the track a car approaching from the rear crashed into the rear vestibule of No. 457.

Two electric motor trains on the Fifth Ave. elevated line of the Brooklyn Rapid Transit Co. collided at 10 a. m., July 28th, at Concord and Adams Sts. Three coaches were wrecked, the force of the head-on collision driving the car bodies partly off the trucks so that there appeared to be danger of their falling into the street below, but the few injuries to passengers that resulted were not of a serious nature. It is believed that the motorman of one of the trains disregarded the signals in rounding the curve at the point where the accident occurred.

An interurban car on the lines of the Union Traction Company of Indiana leaving Muncie at 1:15 p. m., July 30th, en route for Indianapolis, collided with a rapidly moving freight train at the crossing of the Big Four tracks near Yorktown. A brakeman on the freight train was killed, and the motorman of the electric car severely injured.

An electric car on the Terre Haute, Ind., lines was struck by the Vandalia limited No. 13 on the evening of August 2d, with the result that eight passengers of the former were injured, two of whom, it is stated, cannot recover. It is alleged that the electric car had waited at the crossing of the steam tracks for the limited to

pass, and had been signalled by the gateman in the tower to advance. The rear end of the electric car was struck by the passenger train with force sufficient to turn the car completely around.

A rear-end collision between a regular train and an extra on the third-rail system of the Albany & Hudson Railway & Power Co., occurred at 6 p. m., August 2d, eight miles north of Hudson, N. Y. Two persons were killed and 25 injured. The extra, which was carrying a picnic crowd and was behind schedule time, was going at a high rate of speed, when in rounding a curve the motorman saw the regular just ahead. He applied the brakes, but the extra crashed into the baggage compartment of the regular train.

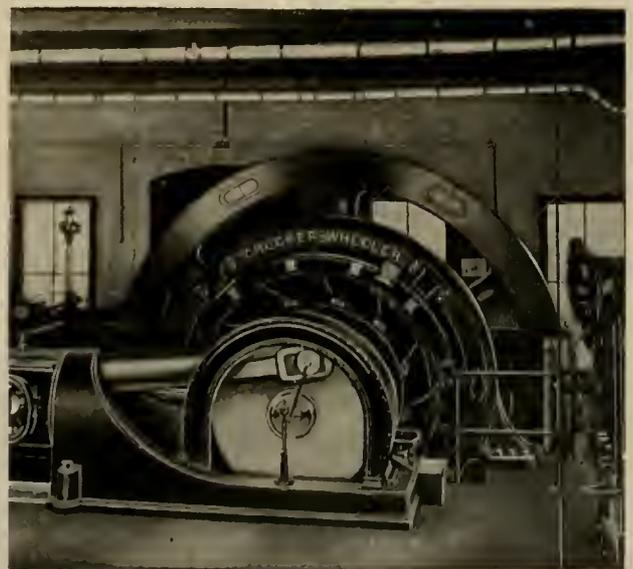
A suburban car on the Elgin, Aurora & Southern Traction Co.'s lines leaving Elgin at 4:45 p. m., August 3d, struck an open switch and collided with a string of empty cars on a siding, causing injuries to seven passengers. It is believed the switch had been purposely turned by some unknown person.

Eight persons were injured in a collision between an Indiana Ave. electric car and a Cottage Grove Ave. cable train at the intersection of Indiana Ave. and 22d St., Chicago, on the evening of August 9th. The rear trailer of the cable train was demolished.

POWER PLANT OF THE NEWTON (MASS.) STREET RY.

Among the recent installations for railway power service of the Crocker-Wheeler Co. is that of a 400-kw. generator for the Newton Street Railway Co., for operating cars between Newton and Waltham, Mass. The Newton company is affiliated with the Boston Suburban Electric companies, of Newtonville, Mass.

The generator is compound wound, giving 500 volts at no load and 550 volts at full load. The generator field frames are of the usual Crocker-Wheeler internally flanged channel section divided horizontally, and fastened by bolts on the interior of the frame which preserves the neat appearance to the outside. The two halves are held accurately in place by dowel pins let into both sections. The fields have the series coils separated from the shunt by means of wooden spacers, which opening assists in keeping the coils cool. The brush holders are so mounted as to permit of the brushes being adjusted at one time by means of a hand wheel fastened to the frame, and working through a worm connection on the rocker arm. The brushes themselves are of the Crocker-Wheeler parallel movement type. The current from each brush is transmitted by means of



CROCKER-WHEELER RAILWAY GENERATOR.

four sets of copper leaves set in such a way that any movement of the brushes is always radical to the commutator. The brush tension is regulated by a spring which plays no part in the carrying of current, and therefore is not submitted to any heat with consequent ruining of temper. The generator is guaranteed to run at continuous full load without any unusual heating in any of its parts, to

operate at all loads between no load and 25 per cent over load without sparking and to withstand overloads of 100 per cent without injury. The engines are of the cross compound corliss condensing type, built by Robert Witherhill Co., of Chester, Pa.

BELONGINGS LOST IN TRANSIT.

A list of the miscellaneous articles annually lost on street cars by the traveling public might afford a fund of amusement to the humorist and to the philosopher, grounds for speculation as to what per cent of these careless people are women; but the matter of collecting and returning to their owners these vagabond belongings assumes a far more serious aspect to the street railway manager. Through the courtesy of Mr. T. E. Mitten, general manager of the International Railway Co., of Buffalo, we have been furnished with a list of articles found on that company's cars from July 1, 1901, to May 31, 1902, an assortment which would have warranted the owner of the whole in starting a small department store. During the period mentioned, the umbrellas found on the International company's cars numbered 1,622, of which 794 were claimed, 736 returned to the finder and 92 remain to be disposed of; out of 768 "grips" found on the cars, 675 have been claimed, 88 returned to the finder, 2 are accounted for as "perished or destroyed," and 3 as being "on hand." Incredibly as it may seem, 1,085 garments are included in the list, of which number 609 have been claimed, 427 returned to the finder, 1 is in the perished or destroyed category, and 43 are on hand. The following table completes the report of the company's lost article department: gloves, 528 found, 130 claimed, 360 returned to finder, 38 on hand; jewelry, 110 articles found, 22 claimed, 84 returned to finder, and 4 on hand; watches, 10 found, 9 claimed, and 1 returned to finder; opera glasses, 4 found, and 4 claimed; purses, 530 found, 253 claimed, 254 returned to finder, and 23 on hand; cameras, 37 found, 34 claimed, 2 returned to finder, and 1 on hand; books, 364 found, 223 claimed, 132 returned to finder and 9 on hand; lunch boxes, 282 found, 91 claimed, 160 returned to finder, 76 perished or destroyed, and 9 on hand; miscellaneous, 2,633 found, 1,190 claimed, 1,222 returned to finder, 98 perished or destroyed, and 123 on hand. Total, 7,968 found (including umbrellas, grips and garments), 4,034 claimed, 3,412 returned to finder, 177 perished or destroyed, and 345 on hand. The purses turned in to the department during the 11 months ending May 31, 1902, contained \$1,334.46, of which amount \$1,153.18 was claimed by owner, \$168.94 returned to finder, and \$12.34 is still on hand. Receipts of owner or finder giving street number are taken and filed in numerical order in such manner that each article found on cars can be traced to final disposition.

BRILL CAR FOR PUNXSUTAWNEY.

The accompanying illustration shows the type of car adopted by the Punxsutawney (Pa.) Street Passenger Railway Co. It is the



SEMI-CONVERTIBLE CAR FOR PUNXSUTAWNEY.

Brill patented semi convertible car with extra large windows which slide into the roof, leaving the sides practically open for coolness in summer, but always ready to be drawn down in case of bad weather.

The car bodies are 25 ft. 4 in. long, and 34 ft. 9 in. over the vestibules. The width over the sills is 7 ft. 8½ in., and over the posts

at the belt, 8 ft. The inside finish is of natural cherry with ceilings of birch, handsomely decorated. Each car is fitted with specialties of Brill manufacture, angle iron bumpers, radial draw bars, "Ded-end" gongs, steps, brake handles, etc. The trucks are the Brill 27 G pattern.

AUTOMATIC CAR-TYPE CIRCUIT BREAKER.

The protection of railway motor equipments by the use of a fuse has until recently been the standard practice, but many of the largest street railway companies are now replacing fuse blocks by automatic car circuit breakers, with the idea of securing greater reliability and better protection against injury from carelessness of the



WESTINGHOUSE CAR CIRCUIT BREAKER.

motorman in improperly cutting out resistance. An important feature of the automatic circuit breaker for this use is the convenience in resetting, as the motorman can throw the handle to reset without leaving his position at the controller, and in most cases it is not necessary to stop the car.

The automatic car circuit breaker made by the Westinghouse Electric & Manufacturing Co. is designed to perform the function of the fuse block by opening an overload or short circuit and also replace the platform or canopy switch by providing a hand opening for the circuit. In construction the instrument is made thoroughly fire-proof of the best material and workmanship throughout; and all parts are interchangeable. Its design prevents any arcing at the current-carrying contacts, as the arc is broken on extra contacts especially provided for the purpose, and assisted by a powerful magnetic blow-out which will open the severest short circuit without damage. The breaker is calibrated, and can be set to open at any current within the limit of its range. The automatic opening device insures certainty in opening when the current reaches the predetermined value which feature it is claimed is not found in any latch device, particularly when exposed to such weather conditions as are found in the vestibule of a street car.

The Des Moines (Ia.) City Railway Co. has been granted extended privileges for carrying express and freight in that city. In connection with the prospective state fair at Des Moines the company has made arrangements to haul freight cars from the steam roads over the street railway tracks to the fair grounds, for which purpose an extra large electric engine will be put in use.

The Old Colony Street Railway Co., Brockton, Mass., recently completed its double track system between Neponset and Quincy.

A car house of the New York & Stamford Railway Co., Port Chester, N. Y., was robbed of \$900 by burglars on the morning of July 18th. The burglars were five in number. After binding and blindfolding two men on duty at the barns they blew open the safe with dynamite and secured the receipts of Sunday's operations. The capture of the burglars has not as yet been reported.

A SUCCESSFUL DEVICE FOR CONTROLLER REGULATION.

In the earlier days of electric railways the urgent demand for new devices and the desire of manufacturers to get their products on the market as soon as possible, resulted in the street railways doing a great deal of the experimental work at their own expense, but now the general practice has been changed and manufacturers are doing the experimenting, and new apparatus is offered to purchasers only after it has been perfected. Doubtless the majority of our readers will recall that for some time the Garton-Daniels Co., of Keokuk, Ia., has been developing a regulator for attachment to the controllers of electric cars, and they will welcome the announcement of the company that it now offers a perfected device. During the last three years the company has designed several models of the "Automotoneer," which is the invention of Mr. George W. Knox, formerly electrical engineer of the Chicago City Railway Co.; all of these would do the work, but were not all that could be desired from an operating standpoint. The present model, however, has been in use in different parts of the country for the past seven months, and the manufacturer advises us that there is yet to be received the first complaint from the companies using them.

The device consists of the wheel and regulator shown in Fig. 1. The wheel has a zig-zag groove in its periphery, with suitable ratchet teeth for engaging the dog of the regulator, which rides in the grooves. The regulator consists of the dog, or pawl, mounted on a pivoted lever, which is fastened to the back of the controller casting. The outer end of this lever engages a piston working in the cylinder of the dash-pot. This piston has a long bearing surface, and is provided with an adjusting valve to regulate its movement, as well as a release valve to permit easy operation.

When the controller is operated, the wheel, being attached to the

requires the motorman to stop the controller handle on each point for a predetermined time, and this may be adjusted so that the motorman cannot turn on full power in less than five seconds, seven seconds, or ten seconds, as desired. The predetermined time element is considered to be the important feature of the device, as without this a motorman would soon become an adept in manipulating the apparatus, and it would be valueless as a regulator.

Under ordinary conditions it has been found that ten seconds is about the time that should be allowed for the acceleration period to secure best results, and for the purpose of comparison the following table of data for 4-second and 10-second stops is given:

Time, when full power is turned on.....	4 sec.	10 sec.
Time, when full speed is attained.....	9.5 sec.	12 sec.
Distance car travels at time full power is on... ..	13.5 ft.	110 ft.
Distance car travels at time full attained.....	85 ft.	150 ft.
Maximum current consumption in making start,		
amperes	140	60
Volts drop in making start.....	80	20
Watt seconds consumed in making start....	307176.4	221676.0
Average H. P. used in starting.....	43.3	24.7

The need of a controller regulator has long been recognized and some years ago, in an article entitled "The Motorman as an Element in Street Railway Economy," read before the Engineers Club of Philadelphia, Mr. Charles Hewitt, electrical engineer of the Union Traction Co., of Philadelphia, gave the results of some tests made on the lines of his company, that show a possible saving of about 45 per cent, and Mr. Hewitt says: "The difference between the men is due almost entirely to the manner in which they handle the controller, and but very little to number of passengers or condition of rails." He also stated that he believed it possible to secure

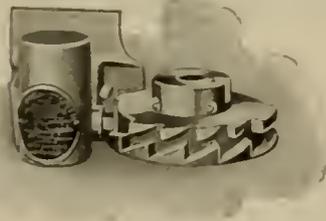


FIG. 1.



FIG. 2.

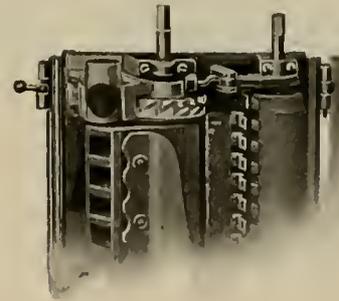


FIG. 3.

Left in place of the usual star wheel, rotates, and the inclined surface of the dash-pot raises the pawl and lever, which in turn raises the piston in the dash-pot. The pawl then strikes the ratchet stops, which are far enough back of the vertical portions to allow the pawl to drop when the pressure is relieved upon the controller handle, to the bottom of the groove, so that the upper edge of the pawl clears the bottom of the ratchet stops, when another notch may be taken.

The adjustment of the piston valve determines the speed of the pawl in its downward movement, and regulates the operation of the controller. The pawl has no strain on it, simply rising and falling in a vertical bearing.

The pawl is case-hardened and shows practically no wear after continued use. It is held in the groove by a coiled spring; and its back edge is filed so that when the wheel is reversed, in order to throw off the current, the pawl slides back against the tension of the coil spring, thus permitting a ready and sure return of the handle to the "off" position.

Fig. 2 shows a bottom view of the regulator. The thrust against the pawl is taken up by the regulator casting, and does not bind or bring any strain on the dash-pot piston, which rides perfectly free on the outer end of the lever. The dash-pot is to be lubricated with dry powdered graphite only, and each device is sufficiently lubricated when set out for at least one year's service. Oil must never be used in the cylinder.

A casing is provided that covers the regulator parts and prevents the motorman tampering with it, and the device is readily installed by any competent machinist working with complete instructions sent out with each shipment.

The automotoneer is designed to prevent the waste of energy and the damage to equipment incident to "fast feeding," and in action

a saving of about 20 per cent, or, assuming a cost of 1½ cents per kilowatt-hour, a saving of \$185 per car per year, for power alone.

The advantages of proper regulation of the controller are not limited to the saving in cost of power, but the smaller maximum currents are less severe on the equipment, and more cars can be operated with a given station equipment. Another point claimed for the device is that in case of an emergency stop, where the motormen are reversed, it prevents the operator losing his head, and throwing the controller "wide open," which almost invariably opens the circuit breaker, or blows a fuse, thereby cutting off control of the car by means of the current.

Fig. 3 shows a standard G. E. K-10 controller fitted with automotoneer, which is entirely concealed when the controller is closed. The same device may be used on types K-2, K-4, K-5, K-7, K-8, K-9, K-11 and K-12 controllers, and styles applicable to other types are in process of completion.

DETROIT UNITED RY. WEEKLY.

The Detroit United Ry. has commenced the publication of a small weekly folder. The paper contains valuable and interesting information pertaining to the operation of the cars, schedules, new routes, etc., and is intended to establish a closer relation between the public and the company. The columns are well written and are enlivened by anecdotes, humorous sketches, notices of the theaters and other current attractions in town. The folder has four pages, each page 4 x 6 in. The Weekly is distributed at the hotels and depots and copies are carried in a small box on all the cars.

NEW CAR HOUSE FOR CHICAGO CITY RAILWAY CO.

The accompanying illustration shows a front view of the new car house of the Chicago City Railway Co., located at Wentworth Ave. and 77th St., which was described in detail in the "Review" for April, 1902. Each end of the building is enclosed with Kinnear steel rolling doors, those on one end being provided of standard size attached to iron frames and on the other end each opening being enclosed with two doors with a hinged intermediate center post. The latter is so constructed that it can be quickly raised.



NEW CAR HOUSE FOR CHICAGO CITY RAILWAY CO.

leaving the opening entirely clear. Each door is equipped with Kinnear trolley wire connections, which provide an uninterrupted circuit with the door in any position. There are 54 of these doors now in service on the building, and the Chicago City Railway Co. has contracted for 55 similar doors for other buildings now being located at this site.

THE HARTMAN CIRCUIT BREAKER.

The Hartman automatic oil circuit breaker, shown in the accompanying illustration, is a new device made by F. O. Hartman, Mansfield, O., which has been designed for use in locations where it



HARTMAN CIRCUIT BREAKER.

would be unsafe to use the ordinary air break instrument. It is adapted especially for electric railway use and is claimed to be exceedingly reliable in breaking the circuit where the current exceeds the amount for which the instrument is set. The switch mechanism

operates in oil with which the lower part of the case containing it is filled, and the break in the circuit takes place in this oil, which will prevent a short circuit under the most severe conditions. The operating parts are enclosed in a metal case, which gives them ample protection against the weather and the rough usage to which these instruments are liable. This circuit breaker is arranged so that it cannot be closed as long as an overload or short circuit exists. Each side of the switch operates independently of the other, and both sides must be closed to complete the circuit. If the second switch is closed while a short circuit exists, the first switch will immediately open. This instrument is also designed to

act as an oil break switch as well as a circuit breaker, and where it is used on cars the hood switch may be dispensed with. It may be readily used on old equipments by removing the hood switch and inserting the circuit breaker in its place. It is also designed for use in connection with large motors and is well adapted for damp or other unfavorable locations as the working parts are entirely enclosed.

NATIONAL BUREAU OF STANDARDS.

A work that is being followed with much interest by all persons connected with engineering and manufacturing is that of the National Bureau of Standards, organized in March, 1901. It has been necessary to greatly increase the scientific and clerical force of the Bureau and to rent additional space for temporary quarters.

Contracts have recently been let for the mechanical laboratory, and those of the physical laboratory, which will be the principal building, are soon to be awarded.

The mechanical laboratory will be 135 ft. long, 50 ft. wide and three stories high, and will contain the power and lighting plant, storage batteries, special alternating current machines for experimental and testing purposes, refrigerating plant, heating and ventilating plant, machine and carpenter shops and laboratories for heavy electrical testing, photometry, gas and water testing. The boiler room will have two 125-h. p. boilers with space to double that capacity. The dynamo and engine room will have two 80-h. p. high-speed engines each direct connected to two 25-kw. direct-current generators, and additional space will be provided for double this equipment and for some special alternators.

For the heating and ventilating system the air will be supplied through ducts by electrically-driven fans, the temperature in each room to be independently controlled by thermostatic dampers and the air to be renewed every 15 minutes. In winter the air to be heated will pass over coils fed with exhaust steam, and in summer it will be cooled by coils through which brine is circulated. The refrigerating plant will cool the air and make ice.

An instrument shop will be equipped with motor-driven lathes,

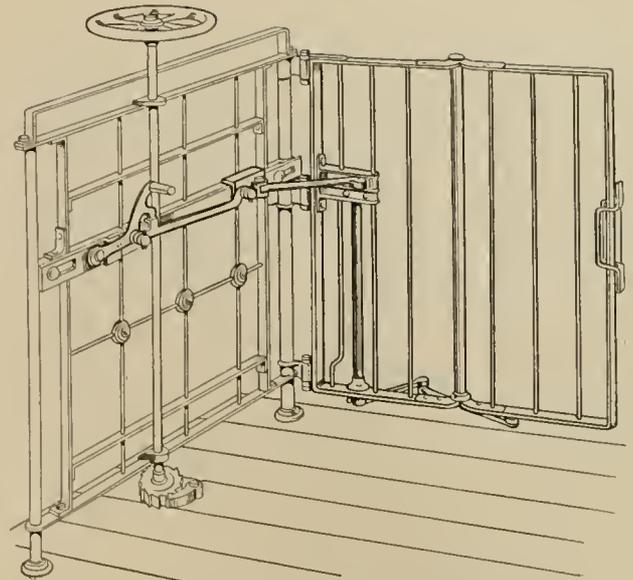
milling machines, shapers, drills, etc. A liquid air plant will also be installed for experimental use.

The main building will be 150 ft. long, 50 ft. wide, four stories high, and will contain 50 rooms. It will be equipped with apparatus for verification work and for special investigations and provided with gas, electric light, compressed air and a number of independent electric circuits. The basement of the main building, which is about level with the ground, will be used entirely for the more precise and accurate work, and there will be four special temperature rooms. The second floor will be used for administrative and clerical work, library and museum; the third floor will contain a well-equipped chemical laboratory, part of which will be a laboratory for photometric research, and this floor will also have a lecture room to seat about 150 people. Both buildings will be of brick with stone trimmings, and the two will cost \$325,000, an additional \$40,000 having been appropriated for equipment, making the total amount available \$365,000.

The site of the Bureau is at Chevy Chase, near Washington.

FOLDING GATE FOR CARS.

The illustrations herewith show a new folding gate for steam and electric cars, both elevated and surface, which has been placed on the market by the R. Bliss Manufacturing Co., of Pawtucket, R. I. The gate is designed to be durable, strong and safe, and combines the well-known features of this company's other folding gates, being hinged in the middle and operated by a right-angled rigid lever in connection with lazy tongs and a sleeve and slide, as shown in the illustrations. The gate folding from the center in half its reach will save the room of at least three people on the platform, and where cars are crowded as they must be in large cities, this feature of economy of space is a merit that deserves serious consideration. The new gate is stronger than the ordinary straight gate, being held rigidly in its extreme points and being assisted by a brace obtained from the lazy tongs, as well as from the interlocking hinges in the center post. This reduces to a minimum the danger of passengers being thrown from the car by a sudden lurch or oscillation. The



CLOSED POSITION OF FOLDING GATE.

all conditions. The workmanship and material are the best, while the well-known experience of the R. Bliss company in manufacturing will speak handsomely for the gate in general.

NEW INTERURBANS IN INDIANA.

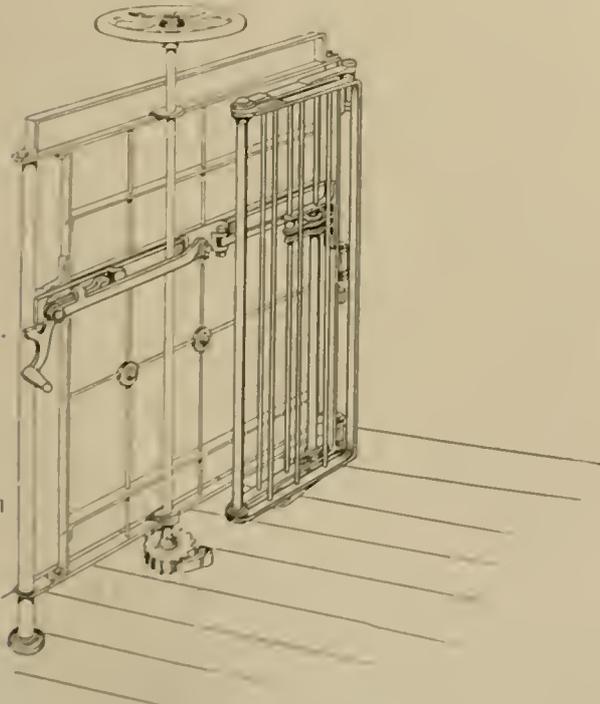
An extensive system is about to be built in Indiana in connection with the Indianapolis and Anderson lines by the same interests controlling the latter systems. The new lines will extend from Indianapolis north to Logansport paralleling the Pittsburg, Lake Erie & Western Ry. and passing through Noblesville, Tipton and Kokomo. At the latter place a branch will be built running to Peru, which will parallel the Lake Erie & Western Ry. Another branch will run between Tipton and Elwood and one between Alexandria and Muncie, both of which will connect with the Union Traction Co. of Indiana system to form a direct route between Tipton and Muncie.

There will be six sub-stations on the new lines located at Ripple, Noblesville, Tipton, Jewell, Logansport and Peru. The current for this system will be supplied from the Anderson power station of the Union Traction Co. and will be transmitted to the sub-stations at a pressure of 30,000 volts. The company will also have a portable sub-station similar to that of the Union Traction Co., which was described in the "Review" for April, 1901, page 212. This is used in cases of emergency or of accident to a regular system, and being mounted upon a car body may be readily moved to any part of the system. The new sub-station car will be provided with an easily removable roof in order that the apparatus in the car may be handled from overhead by a traveling crane.

CONCORD-MANCHESTER INTERURBAN OPENED.

The first car over the lines of the Manchester Traction, Light & Power Co. was put into service in the latter part of July between Concord and Manchester. On board the car making the initial trip were several officers of the company and invited guests and the trip to the Boston & Maine railroad bridge near Concord, and return to Manchester, was made everything working successfully. Since this trip cars are operating upon the line under a regular schedule.

A singular accident happened at Troy, N. Y., on the lines of the United Traction Co., August 7th, resulting in the death of two persons. A car left the track in the middle of a switch 200 ft. in length, plunged down an elevation of the roadway and the forward truck jumping the four inch curb of the sidewalk, smashed into a frame house.



OPEN POSITION OF FOLDING GATE.

handle a straight lever hinged at the bottom in connection with the operating sleeve and slide, locks positively in either direction, whether the gate be open or closed, and gives the operator a powerful leverage thus enabling the gate to be operated with ease under

ADVERTISING LITERATURE.

THE ARNOLD ELECTRIC POWER STATION CO., of Chicago, is mailing to its customers and friends an advertising card calling attention to the central plant it has built for the Chicago & Alton Ry. at Springfield, Ill. The heat, light, power, water and electric light of this plant are all secured from a single source.

THE OSBORN MANUFACTURING CO., of Cleveland, Ohio, has issued its catalog No. 100. The company manufactures brushes, brooms, foundry supplies and hardware specialties adapted to use in the power house, machine shop and factory. The catalog contains 50 pages of illustrated descriptions of all its manufactures, together with price list.

THE PROTECTED RAIL BOND CO., Philadelphia, has issued two handsome colored folders containing illuminated designs and a brief statement of its claims for the Protected rail bond. This bond, being short and made of pure copper, offers slight resistance to the passage of the current, and is therefore highly economical. The Mayer & Englund Co., of Philadelphia, is sales agent for the Protected rail bond.

THE MULTIPLE SPEED & TRACTION CO., of New York, has published in pamphlet form the oral presentation by Mr. Julien T. Davies of the proposition to equip the Brooklyn Bridge with moving sidewalks, and also the arguments by Messrs. George S. Morrison and Walter D. Edmonds on the feasibility of relieving the present conditions.

THE J. G. BRILL CO., under the title of "A Brilliant Idea" has issued a pamphlet describing the illuminated signs which it manufactures. These signs are plainly visible, both by day and by night, and may be made of the turn-over variety with two, three, or four sides containing lettering of patented enamel on transparent celluloid sheets. The sign needs no special lighting arrangement, as it is sufficiently lighted by being placed in front of the transoms or side vents. It is built so as to be practically unbreakable.

THE NEW JERSEY & HUDSON RIVER RAILWAY & FERRY CO. is mailing a handsomely decorated card describing the pleasant trips which may be taken on the company's ferry and electric lines in the vicinity of New York City. The company has recently put in commission the new double-decked propeller "Edgewater" from West 130th St. to Edgewater, N. J. This is one of the nattiest and most commodious ferry boats on the river and is a highly creditable acquisition to the company's line of modern steamers.

THE ELECTRICAL STORAGE BATTERY CO. has issued its bulletin, No. 74, upon "The Application of Storage Batteries to Isolated Plants," which describes the plant of Hastings' Sons Publishing Co., of Lynn, Mass., in which a battery of "Chloride" accumulators has recently been installed. The load on this plant includes elevators, incandescent lights and printing presses and the variation in pressure made it impossible to supply the lights from the same machine that supplied the power, without a storage battery to act as a regulator.

ELECTRICAL AND STEAM MACHINERY is the title of a pamphlet published by Rossiter, McGovern & Co., 141 Broadway, New York. This company now maintains warehouses in New York, Jersey City, Boston, and St. Louis, and carries a large stock of electrical machinery, engines, boilers, railway motors, etc., all of the stock being ready for immediate shipment. All of its machinery is guaranteed to be in first-class condition, and the company also maintains a well appointed repairing department, in which it makes a specialty of electrical repairs.

THE J. G. BRILL CO., of Philadelphia, Pa., is distributing a handsomely illustrated catalog and a folder describing the Brill No. 27 truck, built for both electric railway and steam railroad cars. These trucks are extremely strong and their principal features include three sets of springs working in series and link spring suspended equalizer bars. The side frames are made of solid forgings, lending strength and simplicity to the design. The typo-

graphical appearance of this catalog is fully in keeping with the high standard of this company's advertising literature.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., has published a highly artistic catalog containing descriptions and illustrations of its numerous graphite products. This company is the largest miner and manufacturer of graphite in the world, and is also the oldest in this line of business, having commenced the manufacture of graphite crucibles in 1827. All of this company's graphite is mined or worked by the company itself, and its products are all guaranteed. In addition to this general catalog the company also publishes a number of interesting pamphlets on the special use of graphite.

MOTOR DRIVEN TOOLS is the title of Bulletin No. 24, published by the Crocker-Wheeler Co., of Ampere, N. J. The contents consist largely of engravings of machine tools direct driven by electric motors, in which field this company is the pioneer. The descriptions are generally very brief, as the illustrations suffice to show the method of applying motors to tools of all kinds. The increasing attention which is being given to the driving of mills and shops by electric power makes this bulletin of special interest, and the Crocker-Wheeler Co.'s experience in this line enables it to suggest the equipment which will give the best returns to the purchaser.

ADAM COOK'S SONS, 313 West St., New York City, who are the only makers of "Albany" grease, have issued a booklet which gives considerable information regarding this widely known lubricant in a brief and attractive way. The pamphlet is in two colors, the cover bearing the familiar "Albany" grease trade-mark, reproduced in yellow. The manufacturers state that Albany grease is now used to lubricate everything from an automobile to the U. S. Battleship Oregon and has been adopted by the U. S. Government. Illustrations are presented in colors showing what genuine Albany grease looks like when put in 10-pound pails and purchasers are cautioned to look for the distinctive yellow label. Copies of the booklet will be sent free by Adam Cook's Sons, upon application.

THE GREEN FUEL ECONOMIZER CO., of Matteawan, N. Y., has published a large catalog on the Green improved fuel economizer for steam boilers. This apparatus, which is to be found in a large number of the most prominent steam plants, consists principally of a stack of tubes arranged vertically in the flue leading from the boiler to the chimney. These tubes are designed to utilize the waste heat from the gases passing off from the furnace. The advantages of this economizer are the saving of a large percentage in fuel, heating the feed water economically to a high temperature, a large volume of water always in reserve at the point of evaporation, utilizing the heat in the escaping gases which otherwise goes to waste, prolonging the life of the boiler by preventing expansion and contraction due to cold feed water, and increasing the boiler efficiency. The catalog contains a number of views of these economizers with descriptive matter and results of tests, as well as a large number of testimonials from those who have used the apparatus.

The Exeter (N. H.), Hampton & Amesbury Street Railway Co. is operating a special car equipped with a rotary transformer to supply additional power at any point on the system where such assistance may be necessary. The car might be described as a portable power house, and on days when traffic is unusually heavy it is very serviceable. It is known as the power car and was made at the Laconia shops.

WABASH A. S. R. A. SPECIAL.

The Wabash Railroad has made a rate of \$0 for the round trip from Chicago to Detroit for the A. S. R. A. convention on the certificate plan. A special train will leave Polk St. Station, Chicago, Tuesday afternoon, October 7, for the accommodation of delegates and in addition to the special there are regular trains leaving Chicago for Detroit at 11 a. m., 3:03 and 11 p. m. The special will leave at an hour to suit the convenience of the Chicago and western delegates and will be personally conducted by Mr. M. C. Keeran, who has had charge of the A. S. R. A. specials for the past five years.

NEWS OF THE MONTH.

A strike of some 200 employes of the Camden Interstate Railway Co., which lasted for practically two days beginning on the morning of August 3d, caused suspension of traffic on the lines in Ironton and Hanging Rock, O., Guyandotte and Huntington, W. Va., and Ashland, Ky. The cause of the strike was the company's dismissal of a number of employes who had been instrumental in organizing a local union, and its refusal to recognize the union. On Sunday morning, August 3d, the conductors and motormen who had refused to strike were driven from the cars in Ironton by a mob, and on substitutes being obtained, the cars were stoned and the tracks greased. Similar experiences were repeated at Huntington and at Ashland. In the latter city five shots were fired by an unknown person at a car bound for Clyffeside Park, none of them, however, taking effect. A compromise was reached on August 4th, and the men returned to work.

Four hundred employes of the Fair Haven & Westville Railroad Co., of New Haven, Conn., went out on strike at 5 a. m., August 6th, causing a complete tie-up of the 90 miles of railways operated by the company, which lasted until the night of August 9th, with the exception of a very irregular mail car service and a few trips of passenger cars through the down-town district. The cause of the strike was the refusal of the company to recognize the union and its alleged discrimination against union men in the recent discharge of 10 of its employes. The strike was exceptionally free from mob violence, the only disorderly conduct of the strikers reported being their attempt in one instance to pull the conductor of a mail car from the rear platform, an attempt which was promptly checked by the police. The strike, which resulted in considerable financial loss to the merchants of the city, was settled at 6 p. m., August 9th, the company having convinced the leaders that membership in a union had not been and would not be considered a cause of disqualification for service in the company's employ.

The employes of the Yonkers, N. Y., lines of the Union Railway Co., including motormen, conductors, repairers, firemen, engineers and electricians, struck August 9th for the reinstatement of a superintendent whom the company had dismissed, and for an advance in wages, demanding 20 cents per hour for 10 hours' work instead of 18 cents for 11 hours. The first demand, for the reinstatement of the superintendent, has been conceded, but at latest reports the question of wages had not been decided.

The local transportation committee of the Chicago city council returned August 4th from a tour of investigation of street railway systems of eastern cities, and the committee's report, it is inferred, will influence the final action on the proposed subway for Chicago, and the extension of surface lines. The itinerary included New York, Brooklyn and Boston, which cities furnished such a complete exposition of transportation facilities in the opinion of the aldermen that it was considered unnecessary to visit Washington, as had at first been intended. An examination of the New York and Boston subways resulted in a conclusion favorable to subway construction in Chicago, where, the members of the committee affirm, the subway problem is much easier of solution than in New York, since in the former city it would not be necessary to tunnel for miles through the solid rock. The report of the committee will also include such matters as down-town terminals, single car service and grooved rails.

Announcements were recently made that the Metropolitan Elevated, of Chicago, will declare a semi-annual dividend of 1 or 2 per cent. The company paid 3 per cent last year and 3½ per cent the year previous, in both cases the first payment being 2 per cent. There is much discussion of extending the express service on Chicago elevated lines, and as has been announced, the South Side Elevated Railroad Co. contemplates an initial experiment with such a service, but its plans have not yet developed. It is said that the South Side company has under consideration the construction of an extension to the stock yards, which will afford a through route from the stock yards to the lake. The feasibility of a double deck elevated structure has been discussed, the proposition being that the South Side company use the upper track and the Union Stock Yards & Transit Co. the lower tracks.

The Lake Street Elevated R. R. is soon to inaugurate an express service on the West Side, the only stops being at Oakley and 48th Ave. Express trains will run at 10 minute intervals between 6:40 and 8:35 a. m., and 4:36 and 6:20 p. m.

All the interurbans running into Columbus, O., are doing an exceptionally heavy passenger business. The Columbus, Buckeye Lake & Newark Traction Co. expects to inaugurate a street railway mail service, a recommendation having been made to the postal authorities at Washington through the local office to this effect. According to present plans there will be two mails per day for Reynoldsburg, Wagram, Etna and Kirkerville, and one in and out of Hebron. People along the route are generally anxious to see the mail service established.

The Cincinnati & Columbus Electric Railway Co., which is being promoted by Richard Swing, projects a line between the cities named in the title, passing through Norwood, Oakley, Madisonville, Milford, Fayetteville, Hillsboro and Washington, C. H. It is stated that this company is completing arrangements to build without further delay, and that an agreement has been effected whereby its cars will enter the business district of Cincinnati over the tracks of the Cincinnati Traction Co. When this road is completed, two roads from Columbus to Cincinnati will be afforded; one over the route described, the other via the Columbus, London & Springfield Ry., thence through Xenia, Lebanon and Carthage.

The Cincinnati Traction Co. on August 7th gave a free picnic to the inmates of the orphan asylums and children's homes of Cincinnati, entertaining some 1,200 children at the Zoological Gardens. Refreshments and special amusements were provided, and the outing proved a great success.

The Toledo Railway & Light Co. has secured a site of 30 acres in that city on which car shops and storage buildings will be erected, it being projected to rebuild and repair cars at this plant for local and interurban traffic. The Toledo, Bowling Green & Southern Traction Co. is rapidly completing its new power house at Cygnet, and machinery is being installed. A 300-h. p. Corliss engine is included in the installation. Work on the building was delayed to some extent by reason of the difficulty in securing stone suitable for a foundation on which to mount the engine. The Toledo, Fostoria & Findlay Electric Railway Co. has literally struck oil on its right of way. A well on this route, five miles west of Findlay, which had been pumping salt water for six months, began flowing oil on July 25th and since then the product has been 100 barrels of oil per day. The well is owned by a Findlay citizen, who has leased three miles of the company's right of way, and proposes to line it with wells. Apparatus has been installed along the electric line, and there is barely sufficient room for the car to pass without grazing the edge of the derricks.

The Cleveland & Eastern Electric Railroad Co. proposes to straighten its track, eliminating all abrupt curves and reducing the heavy grade, a work which will take a year to complete and which will cost approximately \$100,000. When it is finished the time required to make the round trip over the line will be reduced by half an hour.

The Cleveland City Railway Co. recently submitted its tax returns for 1902, reporting the value of its property at \$900,300. The report includes 28 miles of double track valued at \$16,000 per mile, and 7 miles of single track at \$7,000 per mile. First class cars are returned at \$1,500 each and second class cars at \$700. The Cleveland Electric Railway Co. returned the total value of its property at \$2,603,700. Personal property, including tracks, cars, etc., is valued at \$1,603,900, and real estate, including power houses, machinery, etc., at \$900,800. Superintendent Mulhern of the former company is quoted as stating that the company's valuation of its property this year exceeds that of last year by reason of the number of improvements that have been effected in the system, including the purchase of more than 80 large cars, the erection of additional power houses and the construction of new and heavier track. The majority of the properties included in the return are reported to have been appraised at about 60 per cent of their original value.

The Lake Shore Electric Railway Co., of Cleveland, is rapidly pushing its road to completion. The Sandusky division has been tied up owing to a delay in the construction of a bridge over the Huron River, a fact which will make it impossible to complete this branch until late in the fall, but satisfactory progress has been made on the work to be done on the Detroit & Toledo Shore Line, and it is expected that through trips will soon be made from Toledo to Detroit. As to the remainder of the system, over the greater part of which cars are in operation, the work that remains to be done is chiefly in the nature of rock ballasting until which is completed no considerable speed can be attained. An incident of considerable

interest occurred on the Sandusky division of the Lake Shore Sunday, August 3d. The authorities of Milan, a small village en route, had ordered that no cars from Norwalk should pass through Milan, there having been reported several cases of small pox at Norwalk. The superintendent of the division, according to press reports, attempted to run cars through from Norwalk to Sandusky without stopping at Milan, but the authorities of the latter village, anticipating such an attempt, placed another car on the track, compelling the Norwalk car to stop, and then arrested everybody on board, including the superintendent. The constables of Milan had not, however, entirely the best of it. In thus stopping the electric car the authorities had held up the United States mail and they were threatened with serious trouble on this account until the matter was adjusted.

The Indianapolis & Eastern Traction Co. recently experienced a similar difficulty in running cars, as a result of a quarantine against Knightstown, Ind. Owing to the small-pox cases in that city the company had temporarily suspended operations on the line running from Knightstown to Charlottesville, five miles west, but on August 3d attempted to resume its regular service. The second car through Charlottesville was stopped by a mob, the motorman and conductor were arrested, and the car was side-tracked. Obstructions were placed on the track to prevent other cars passing through the town, and in one instance a wreck was narrowly averted from this cause. Traffic was resumed the following morning, but later the sheriff of the county with a posse of 75 armed deputies was ordered to enforce the quarantine, and cars were not run until it was lifted. For a short time mob violence threatened destruction to the company's property, and as a result a number of arrests were made, when it was found that the mob leaders had purchased a quantity of dynamite and had threatened to blow up a bridge on the company's route.

There are persistent rumors that a consolidation of the Detroit, Ypsilanti, Ann Arbor & Jackson and the Grand Rapids, Grand Haven & Muskegon roads will be carried through, the new company to be capitalized at \$20,000,000 and later acquire other Michigan interurban lines.

August 4th it was announced that Mayor Johnson had won his fight for 3-cent fares in Cleveland, the Circuit Court having dissolved the temporary injunction restraining the city council from granting service franchises. The Supreme Court however granted a stay on the order of the lower court and as we go to press the injunction is still in force.

Considerable meanness has been manifested among the employes of the Chicago streets railways and the radical element among the men has kept the local press well supplied with strike talk. The employes of both the large companies however are under an agreement to arbitrate any differences that may arise between them and the companies, and the situation is not regarded as at all serious.

The Kenosha (Wis.) Electric Railway Co. has again opened negotiations with the Kenosha Gas & Electric Co. to secure power for the operation of the street railway in that city. The work of erecting a bridge on the route through the city has been begun, and it is expected to open the line in October.

The Winnebago Traction Co., Oshkosh, Wis., is building an addition to its power house at a cost of \$30,000.

The bid of the Belmont-McDonald syndicate for the construction of the tunnel extension of the rapid transit system to Brooklyn was unanimously accepted by the rapid transit commissioners, July 24th. The bid was for the completion of the Brooklyn tunnel extension alone at a cost of \$2,000,000. The former bid of the same company to build the Brooklyn extension and the proposed tunnel between Union Square and 42d St. for \$3,100,000 was not accepted for the reason that the Broadway route from 42d St. to Union Square was not included in the specifications. In both bids the additional cost of terminals was estimated at \$1,000,000. The only other bid considered by the board was that of the Brooklyn Rapid Transit Co., which proposed to construct the Brooklyn extension for \$7,000,000 and terminals for \$1,000,000 additional. The Brooklyn Rapid Transit Co. estimated that its bid was \$1,000,000 less than it would actually cost to complete the Brooklyn extension alone, but it also estimated that the loss in the initial cost would soon be more than compensated for by the increased traffic over Brooklyn lines resulting from the tunnel extension. The importance of this prospective increase in traffic was also a basis of calculation of the Belmont-McDonald company in submitting its bid which was estimated to be millions of dollars below cost. The latter claimed that if its bid for

the Brooklyn extension and the 42d St.-Union Square tunnel were accepted, the city would be required to pay only about 25 per cent of the actual cost of the construction work. It should be remembered that the Belmont interests in being already provided with the necessary equipment had an advantage not shared by the Brooklyn Rapid Transit Co. when it submitted its bid of \$7,000,000.

The New York Central & Hudson River R. R. is reported to have authorized the statement that electricity will be substituted for steam on all its lines out of New York if the city will approve the changes it projects at the Grand Central depot in the metropolis. The contract for the erection of power houses will be signed, it is said, so soon as the city shall approve the railroad's terminal plans. The third vice president of the railroad is quoted as stating that two or more power stations with an aggregate capacity of 100,000 h. p. will be built and the third-rail system installed exclusively except in a few of the yards where the overhead trolley system will be used. Even switching in the yards will be done by electric power. At Croton Landing on the main line and White Plains on the Harlem R. R. the change to steam locomotives will be made with a delay not exceeding a minute. The conversion of the system from steam to electric traction within a radius of 30 miles is estimated to cost approximately \$15,000,000 inclusive of the necessary changes in the yards along Park Ave. from 49th to 56th Sts. Above the Harlem River a three-deck passenger station may be erected for the accommodation of suburban traffic.

The points at issue in the franchise of the Pennsylvania R. R. for an entrance into New York may be summarized as the perpetuity of franchises, the ultimate compensation to the city and the right of the city to stipulate the wages to be paid the railroad's employes and the number of hours comprising a working day. The Pennsylvania is said to have assented to a proposition to the effect that the franchise be granted not to the company proper, but to a new corporation working under the jurisdiction of the laws of the state. This provision, in the view of those opposed to the granting of perpetual rights, will give the city the right to acquire the tunnel at any time under condemnation proceedings if due regard is paid to the vested rights of the corporation. It is reported that an agreement was reached whereby the railroad company will be obliged to apply to the president of the borough for street openings, and the latter is quoted as stating that no permit will be granted unless the eight-hours' labor law were made part of it. Various amendments to the proposed franchise have been agreed to, such as the stipulation that the city authorities and the railroad shall adopt a basis of compensation at each period when terms are to be re-adjusted; that the board of health shall have jurisdiction over the tunnel, and that the city shall have the use of the tunnel for police and telegraph wires. The rapid transit commission will pass upon the work of the committees, September 4th.

Press reports state that the Omaha Street Railway Co.'s stock aggregating \$6,000,000 has been sold to a New York syndicate of which J. & W. Seligman & Co. is at the head, the price being 92 on the total capitalization of the company. It is stated that the purchase included the property of the Omaha & Council Bluffs Railway & Bridge Co. Preparations are being made for the construction of extensions of the Omaha lines and various other improvements of the system, aggregating an expenditure of \$1,000,000. New equipment will be purchased and a large and modern power house erected. New machinery has recently been installed in the Council Bluffs power house, which will suffice until plans are completed for furnishing all the lines owned by the company with power from the same plant.

The Seattle-Tacoma Interurban Railway Co. has decided upon a 60 cent fare between Seattle and Tacoma, or \$1.00 for the round trip. Cars will leave either city at intervals of an hour and a half, three of the trains being limited and making but two stops outside the corporate limits of the two terminal cities. The last car will leave Tacoma at 11:30 p. m. and Seattle at midnight. Freight cars will be run only between midnight and 6 a. m. The company has closed a contract with the Snoqualmie Falls Power Co. for furnishing 1,000 h. p. to operate cars between Seattle and Tacoma. The power is to be delivered at Kent, and for this purpose the Snoqualmie Falls company will erect a sub-station at that place.

The Seattle Electric Co. has petitioned for franchises for extensions of its system to suburban districts, contemplating the construction of a number of miles of new lines this year.

The Puget Sound Electric Co. is preparing to install a large

transformer station at Georgetown, Wash., for the new interurban which is under construction between that city and neighboring towns. Power will be transmitted from Seattle.

From present indications portions of the new street railway at Reno, Nev., will be constructed this season. Eventually the road will be extended to the Southern Pacific shops, thence to Wedekind City and back to Reno.

Surveys are being made for the proposed electric line between Ventura and Bakersfield, Cal. The road will be constructed north of the route originally proposed, and it is believed that an extension will be built through the Sunset oil fields.

An electric railway from Torresdale, a suburb of Philadelphia, via Bristol, Pa., to Trenton, N. J., a distance of 22 miles, is projected and when completed will form an important link in the proposed electric railway system between New York and Philadelphia. The promoters have organized as the Philadelphia, Bristol & Trenton Electric Railway Co., and the Union Trust Co., of Baltimore, has closed the underwriting which covers an issue of \$600,000 first mortgage 5 per cent bonds. The money was largely over-subscribed by Philadelphia, Baltimore and New York capitalists. The company has an authorized capital stock of \$1,000,000 and an authorized bond issue to a similar amount.

NEW CONDUIT COMPANY.

Mr. Bleecker S. Barnard has been elected vice-president and secretary of the Standard Vitrified Conduit Co., having resigned as sales manager of the American Vitrified Conduit Co., to take the new position. The Standard company, which was recently organized by Mr. Robert W. Lyle, who is its president, will manufacture in vitrified clay every known conduit. It has extensive clay



B. S. BARNARD.

beds and factories at South River, N. J., which will enable it to do business on a very large scale, not only in this country, but abroad as well. It controls several new patented features that are applied to its multiple duct conduit, guaranteeing superior construction. The general offices are at Nos. 39-41 Cortlandt St., New York. Mr. Barnard is one of the most popular men in the trade, as well as one of the best equipped, while in military and social circles he has held a prominent position for years. He has earned his laurels and honestly deserves to be congratulated upon his success.

On August 4th, for the third time within two weeks, the wires of the Mineola, Hempstead & Freeport Traction Co., that cross the tracks of the Long Island R. R. at West Hempstead, L. I., were purposely torn down, it is alleged, by persons in the employ of the Long Island R. R. Shortly before daylight an engine with a gang of laborers aboard reached the crossing, when by means of ropes thrown across the trolley wires from the moving engine, the wires were torn down and left in the roadway. Some of the company's poles were broken off at about three feet above the ground. The traction company, it is stated, will make a determined effort to secure a permanent injunction against the railroad from damaging its property.

STREET RAILWAY PATENTS.

This list is furnished by T. Reed Clift, Patent Attorney, Washington, D. C., from whom copies of patents and information thereon can be secured.

- No. 703,536. July 1, 1902. Edwin F. Cannon, Chicago. Street car fender.
- No. 703,561. July 1, 1902. Horace H. Dolly et al, Camden, N. J. Automatic switch.
- No. 703,589. July 1, 1902. Charles J. Johnson et al, St. Louis. Trolley for electric cars.
- No. 703,614. July 1, 1902. Frederick W. Rock, Detroit, Mich. Car brake.
- No. 703,786. July 1, 1902. George W. Hammond, Philadelphia. Apparatus for preventing trolley wheels from leaving the wire.
- No. 703,818. July 1, 1902. Jos. Plattenburg, McKeesport, Pa. Car brake.
- No. 704,092. July 8, 1902. Theo. B. Patch, North Cambridge, Mass. Contact system for electric railways.
- No. 704,093. Same.
- No. 704,141. July 8, 1902. Charles T. Stoelting, St. Louis. Street car fender.
- No. 704,143. July 8, 1902. Max Straus, Denver, Col. Hand strap for street railway cars.
- No. 704,166. July 8, 1902. Casper Zimmerman, Chicago. Street car fender.
- No. 704,228. July 8, 1902. Hubert Witte, St. Louis. Guard gate for railway cars.
- No. 704,432. July 8, 1902. William S. Bradley, Philadelphia, Pa. Guard rail for street cars.
- No. 704,452. July 8, 1902. Charles B. Fairchild, New York, N. Y. Vehicle brake.
- No. 704,461. July 8, 1902. John T. Hodgins, St. Louis. Car fender.
- No. 704,474. July 8, 1902. Enoch C. Deskin, Moberly, Mo. Car heating device.
- No. 704,506. July 15, 1902. Frank O. Brown et al, Dallas, Tex. Car brake.
- No. 704,523. July 15, 1902. Ashford T. Dowden, Prairie City, Kan. Portable chair swing.
- No. 704,695. July 15, 1902. John L. Crevelling, New York. Combined electric and gas lighting system.
- No. 704,776. July 15, 1902. Eli A. Booser, Altoona, Pa. Car fender.
- No. 704,870. July 15, 1902. Chas. D. Fox, Appleton, Wis. Car mover.
- No. 705,020. July 22, 1902. Gaston Bellange, Arcachon, France. Safety contact interrupter for electric wires.
- No. 705,028. July 22, 1902. Amel Broheska, Detroit, Mich. Car brake.
- No. 705,075. July 22, 1902. Henry S. Hale, Philadelphia. Car seat.
- No. 705,083. July 22, 1902. F. W. Hild, Schenectady, N. Y. Electric railway.
- No. 705,150. July 22, 1902. Henry J. Schuldt, St. Paul, Minn. Street car fender.
- No. 705,235. July 22, 1902. Wm. H. Harris et al, Eldorado, Col., Street car and railway indicator.
- No. 705,434. July 22, 1902. James M. Osgood, Boston. Passenger car.
- No. 705,466. July 22, 1902. Otto Siplen, Spitzer, Austria. Street car fender.
- No. 705,662. July 29, 1902. Joseph W. Frost, Washington, D. C. Electric signal for railway cars.
- No. 705,668. July 29, 1902. William S. Hadaway, Jr. Electric heater.
- No. 705,705. July 29, 1902. Susie E. Pressler, Toledo, Ohio. Safety attachment for trolley car vestibules.
- No. 705,783. July 29, 1902. Ole Olsen, St. Louis. Street car fender.
- No. 705,798. July 29, 1902. William L. von Hardenberg, Brooklyn, N. Y. Trolley.
- No. 705,814. July 29, 1902. John Bauer, New York, N. Y. Fender.
- 705,825. July 29, 1902. Walter A. E. Davis, Toledo, O. Trolley head and wheel.

No. 705,848. July 29, 1902. Charles J. Kuntner, New York, N. Y. Electric railway.

No. 705,882. July 29, 1902. Thomas W. Sutton, Pittsburg, Pa. Trolley.

No. 705,886. July 29, 1902. John W. Wehmeyer, St. Louis. Car fender.

No. 705,918. July 29, 1902. Charles Giblin, Cleveland, O. Car fender.

ENGLISH NOTES.

The Corporation of Douglas, Isle of Man, has under consideration whether it will issue fortnightly tickets on the cable trams at reduced rates.

The highways committee of the London County Council has decided to investigate the shallow underground systems of tramways in foreign cities and proposes that the officials who recently visited the United States should go to Paris, Budapest and Munich and report to the council on the matter.

The Stalybridge & Joint Electric Tramway board is going to carry out a tramway scheme costing about \$2,000,000 and has appointed Mr. Schofield, who was connected with the Manchester Tramway Co. as clerk to the board.

The Dewsbury & District Electric Tramway will, it is expected, be completed in from 12 to 18 months. The length of line to be laid is about 15 miles; the contract is in the hands of Dick, Kerr & Co.

A plebiscite is being held in Ayr, Scotland, as to whether the running of Sunday cars should be continued or discontinued; should the latter be the result it will materially affect the earnings of the tramways, as the earnings per car mile on Sunday are nearly twice as much as on week days.

Mr. W. Spaven, traffic manager of the Leeds Corporation Tramways, has been appointed manager of the Portsmouth electric tramways. Forty-four candidates applied for the position. Mr. Spaven, who has risen from the position of a tram conductor under the old company, was appointed traffic manager by the Leeds Corporation in 1899.

The Hastings Town Council has decided against introducing tram ways in the town; but only by the majority of one vote.

The York County Traction Co. has completed the erection of a power station at Red Lion.

A car house of the New York & Stamford Railway Co., Port Chester, N. Y., was robbed of \$900 by burglars on the morning of July 18th. The burglars were five in number. After binding and blindfolding two men on duty at the barns they blew open the safe with dynamite and secured the receipts of Sunday's operations. The capture of the burglars has not as yet been reported.

The Des Moines (Ia.) City Railway Co. has been granted extended privileges for carrying express and freight in that city. In connection with the prospective state fair at Des Moines the company has made arrangements to haul freight cars from the steam roads over the street railway tracks to the fair grounds, for which purpose an extra large electric engine will be put in use.

TRADE NOTES.

THE ALLIS CHALMERS CO., Chicago, has declared its fifth consecutive quarterly dividend of 13 1/4 per cent, payable August 1st, out of net earnings.

THE SPRINGFIELD (MASS.) STREET RY. has placed a third order for a Green economizer to keep the service of this apparatus co-extensive with the growth of the plant.

THE EDISON ELECTRIC ILLUMINATING CO., Boston, has contracted with the Green Fuel Economizer Co. for an installation of the economizer in its Atlantic Ave. power station.

THE IRONSIDES CO., Columbus, O., reports a substantial increase of business during its late fiscal year recently ended, with encouraging prospects for continued growth in the current year. Its manufactures comprise special lubricants for ropes, gears and machinery, and specially adapted to motor gears of street cars.

THE LUDLOW SUPPLY CO., 301 and 302 Electric Building, Cleveland, advises that it is having a good sale of the Gore track drill, mounted on carriage. In addition to several sold in this country last month, the company received an order for two drills to go to Australia and has recently received inquiries from England and Canada.

IN ORDER TO KEEP before those interested the average physical properties of the solid and hollow steel forgings made by the Bethlehem Steel Co., that company has sent to its friends and customers blotting pads on which are tables showing the tensile strength, elastic limit, elongation and reduction of area of test pieces for the different sizes of the principal grades of steel forgings.

THE SPRAGUE ELECTRIC CO. is meeting with great success in securing important contracts for its motors and generators. Both its Watessing factory and New York conduit factory are rushed to their utmost capacity. In addition to its foreign sales and a large number of orders for small size apparatus, the company reports about forty contracts for large size machines which are for use in almost every variety of business.

THE ALLIS-CHALMERS CO. reports the following among its recent sales of Reynolds corliss engines: Kioto Traction Co., Kioto, Japan, 16 and 32 by 36 in., 1800 frame cross-compound direct connected. Twin City Rapid Transit Co., 46 and 94 by 60 in. vertical cross-compound direct coupled (third order). London United Tramways, London, England, 26 and 54 by 48-in. vertical cross-compound direct connected (second order).

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York, has just issued a new catalog containing 103 pages. It is generously illustrated and is of a very handy size for reference. Complete lines of overhead materials, electric car heaters, "Noark" tuses, "Vulcaheston" and molded mica, manufactured by this company, are thoroughly illustrated and described. The company will be pleased to send one of these catalogs upon request.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. reports the sales of Westinghouse integrating wattmeters for the month of June to have been the largest in the history of the company. Also that the sales of Westinghouse transformers have more than doubled in the past six months, and the transformer building capacity of the Westinghouse company has been largely increased to meet the demand for O. D. and Type "N" transformers.

TIES FOR SALE

50,000 Mixed Oak 6x8x8 Ties;
10,000 Chestnut 6x8x8 Ties;
10,000 Mixed Oak and Chestnut 5x7x7 Ties;
Prepared to make prompt shipment.

MARTINDALE & EDMUNDS
LUCASVILLE, OHIO

STREET RAILWAY REVIEW

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No. 9

The Street Railways of Detroit

A History of Their Development Including a Review of the Agitation for Low Fares and a Table Showing the Relations of the Different Companies Forming the Detroit United Railway.

To one interested in the purely economic questions arising in street railway operation, the history of street railway organization and development in the city of Detroit is of more than passing interest. In no city on the globe have the conditions given rise to so many important discussions, experiments and litigations involving economic theories and questions so vital to the industry at large. Among the topics brought prominently to the front by the situation in Detroit may be mentioned, in passing, the following: An at-

According to good authority Detroit was the fourth city in the United States to have a regularly established street railway line; that is, a line on which cars were drawn at more or less regular intervals over tracks permanently laid in the city streets. The records show that the first horse railway for urban street traffic in America, was laid on Madison Avenue, New York City, in 1852. This was quickly followed by other lines in New York, and by similar railways in other American cities, viz.: in Boston in 1853; in

Majestic Building.



City Hall.

VIEW LOOKING NORTH ON WOODWARD AVENUE, DETROIT.

Opera House. Campus Martius.

tempt to determine the relations between street transportation companies and the public, as represented in municipal bodies and corporations; rates of fares and tariffs; taxation and percentage payment; franchise values; perpetual and limited term franchises; municipal ownership of public utilities; the fair and just burdens and duties devolving upon private franchise holding corporations, and the extent and scope of powers of municipalities with reference to the granting of franchises for the transportation of passengers through city streets.

Baltimore in 1860; in Detroit in 1862; in Albany in 1863, and in Indianapolis in 1864, after which date the movement became general, and horse railways were established in all the larger cities. Prior to the opening of the first horse-car line in Detroit, in 1862, several unsuccessful attempts had been made to establish lines to various parts of the city, but for one reason or another, none of these lines were financially successful, and all were short-lived. Also, efforts were made with varied success to establish communication by stage lines with the towns and cities around Detroit,

many of these, it is interesting to note, following the routes now traversed by the high speed interurban electric roads radiating from Detroit.

All the street railway companies now included in the Detroit United Railway system were chartered under one or the other of two statutes of Michigan, known respectively as the Tram-Railway Act, passed in 1855, and the Street Railway Act, passed in 1867. The Tram Railway Act provided originally for the construction of "tram railways," but in 1861 was amended to include the building of street railways "in and through the streets of any town or city in the state," and provided that "no such company or corporation shall be authorized to construct a railway under this act through the streets of any town or city without the consent of the municipal authorities of such town or city, and under such regulations and upon such terms and conditions as said authorities may from time to time prescribe." In 1867 this act was further amended by adding an additional proviso, as follows: "Provided further, that after such consent shall have been given and accepted by the company or corporation to which the same is granted, such authorities shall make no regulations or conditions whereby the rights or franchises granted shall be destroyed or unreasonably impaired, or such company or corporation be deprived of the right of constructing, maintaining and operating such railway in the streets in such consent and grant named pursuant to the terms thereof."

The Street Railway Act of 1867 authorized any street railway company organized under the provisions of the act, with the consent of the corporate authorities of any city or village given in and by ordinance, to construct street railways in and upon such streets as the city or village authorities should designate. The road was to be operated under such rules, regulations and conditions, including rates of fare, as the ordinance passed by the authorities should prescribe but it was provided that after the consent and grant had been accepted by the company, the authorities could not revoke such consent or deprive the company of the rights and privileges conferred.

These provisions are quoted here at length inasmuch as they formed the basis for a very important decision by the Supreme Court of the United States, when the city of Detroit in 1899, under its police power attempted by ordinance to reduce the rates of fares on some of the older street railway lines organized under these acts.

By both of these statutes the life of any corporation organized thereunder was limited to a period of 30 years, and the common council of Detroit has followed this wording in granting street railway franchises, all franchises having been limited to 30 years.

The first franchise for a street railway in the city was granted by the common council Nov. 24, 1862, to Eben N. Wilcox, C. S. Bushnell, and others, for a street railway through Jefferson, Michigan, and Woodward avenues, and other streets, which are now the principal down-town streets and avenues. Inasmuch as this was the fundamental franchise upon which (with several amending and supplementing franchises) a large portion of the present Detroit United Railway system was established, it will be apropos to examine its essential features. As originally granted in 1862 this franchise gave to Wilcox and his associates, who were afterwards organized into the Detroit City Railway Co., exclusive and blanket franchises on all the streets named, and the first option to build street railways on all other streets of the city, in consideration of which the grantees were "to keep the surface of the streets, inside the rails and for 2 ft. 4 in. outside thereof in good order and repair, and all snow, ice, and dirt cleared and removed from the same, at the expense of the grantees; provided, however, that upon the paved portions of said streets the materials for repaving shall be supplied at the expense of the city." The rate of fare was "not to exceed 5 cents in any one car or on any one route named in the ordinance, except where cars or carriages shall be chartered for specific purposes; provided cars so chartered shall not be considered regular cars." The only taxation clause in the franchise provided that "the said grantees shall pay to the city of Detroit, annually, \$15.00 for each car excepting only those cars used for cleaning the track." The franchise was granted for a term of 30 years, which would place the expiration date at Nov. 24, 1892.

On Nov. 14, 1879, an ordinance was passed supplementary to the one passed on Nov. 24, 1862, extending the life of the franchises 30 years from 1897 (or until 1909) in consideration of certain

concessions on the part of the company, notably that the company was thereafter to pay the city a tax of 1 per cent on its gross receipts and pave and maintain in all streets occupied by its tracks the space constituting its roadway or track and between the tracks. This special tax and undertaking as to paving was expressly stated by the ordinance to be in lieu of license and other taxes and charges for paving under the previous ordinance. By this same ordinance of 1879 the company was given permission to build extensions in several additional streets not mentioned in the earlier ordinance of 1862.

Under the ordinance of 1862, the original grantees interested several capitalists from Syracuse, N. Y., and in 1863 a single track railway operated by animal power was constructed on Jefferson Ave., extending from the Detroit, Grand Haven & Milwaukee R. R. tracks to the Michigan Central depot, at the foot of Third St. It was about one and one-half miles long, and was used almost exclusively for transferring railroad passengers between the two depots. The volume of travel was far from satisfactory, and the company soon found itself in financial straits. However, new capital was induced to join the enterprise, and additional lines were built on Woodward Ave. for a distance of a mile from the city hall. The operation of the road was turned over to Mr. George Hendrie, who held a contract for the trucking and transfer business between the two depots, and he was therefore chosen as the man who was best fitted to make a success of the new enterprise. Four years of experiment showed that the Detroit City Ry. was not a financial success, unless a larger patronage could be obtained. The city contained about 50,000 people, but the lines did not advantageously connect the residence districts with the business sections, and so were not in position to receive any great amount of passenger traffic. In 1867 the capital stock was again increased, new stockholders were taken into the company, and preparations were made for building new lines that would afford more convenient means of travel between the business and residential sections. Up to 1865 the right of the company to the exclusive use of the streets had not been questioned, but, at about that date, the company having forfeited certain of its franchises, through failure to lay tracks within the specified time, the common council granted franchises on several streets to a new company known as the Fort Street & Elmwood Avenue Ry.

From this time until 1890 there were few developments in the street railway situation worthy of special record. Several additional franchises were granted to Hendrie, to the Detroit City Railway Co., and to other companies which were incorporated at various times. Several of the lines built under these franchises were ultimately absorbed by the Detroit City Railway Co., and the several steps in the history of each one of them may be traced through the accompanying table. It will be seen that during this period the Detroit City company, afterward absorbed by the Detroit Citizens' Street Railway Co., was always the chief factor in the situation.

Sometime after the ordinance of 1879 was passed, a number of differences having arisen between the Detroit City Railway Co., and the city, in respect to the payment of certain taxes on real estate and several suits having been instituted for collecting certain back taxes, claimed to be due to the city, a new ordinance was passed Jan. 4, 1887, over the mayor's veto, providing conditions for adjusting these disputes. The new ordinance provided that for the time from July 1, 1882, to Dec. 31, 1896, the company was to pay an annual tax of 1½ per cent of the gross receipts, and from Jan. 1, 1897, to the end of its franchises (under the ordinance of Nov. 14, 1879) the company was to pay an annual tax of 2 per cent of its gross receipts. In consideration of this increase in the tax on receipts, the city agreed to discharge all claims for back real estate taxes, but the company agreed to pay such taxes on its real estate property as the city should levy on all other city property in the collection of the usual city taxes on lands. It was distinctly specified, however, that this tax on gross receipts and these legitimate taxes on real estate should be the only taxes, license fees and charges of any kind to be levied or assessed by the city against the property, capital stock or franchises of the company during the life of the franchises.

On Jan. 3, 1889, the company asked for franchises on certain important streets heretofore unoccupied by its tracks. These franchises were granted to continue until the expiration of previous franchises, that is until Nov. 14, 1909, but in passing the ordinance

the city council took occasion to impose certain new conditions on the company: i. e., the granting of free transfers at certain points; limiting the speed of cars in the city to 10 miles an hour, and requiring an average speed of at least 6 miles per hour; and the sale of eight tickets for 25 cents, known as workmen's tickets, good on all lines between the hours of 5:30 a. m. and 7:00 a. m., and 5:15 p. m. and 6:15 p. m., said low rate tickets to bear the same transfer and other privileges as the regular 5-cent fare. By an additional ordinance approved Feb. 4, 1893, and amended Feb. 26, 1895, the company was required to place these low rate tickets on sale on its cars as well as at its general offices.

In 1891 the Detroit City Railway Co. sold all its property to the Detroit Citizens' Street Railway Co., and it was in this year that arrangements were made for equipping all the lines of the company for electric traction. True to its promises the new company introduced electricity upon all its trunk lines, and made other costly improvements.

Shortly after the year 1891, the city instituted suit to have the franchises of the Detroit Citizens' Street Railway Co. declared invalid after the year 1892, on the grounds that the common council in passing the ordinance of 1879 extending the franchises of the company for 30 years, had exceeded its legal powers. The first decision in this case was rendered on Jan. 31, 1894, by Judge Taft of the United States Circuit Court, who sustained the claim of the city as to the expiration of the franchise held by the Citizens' company. The case was then appealed by the company to the United States Court of Appeals. The case was argued before this court, and on Oct. 2, 1894, the court reversed Judge Taft's decision, and held that the ordinances of 1879, by which the rights of the street railway company were extended to 1909, was valid, on the grounds that the city could grant privileges in the streets unlimited in duration. The case was reviewed by the Supreme Court of the United States, which fully sustained the decision of the Court of Appeals.

While these cases were still pending, the owners of the property for several reasons decided to withdraw from street railway investments, and accordingly in September, 1894, the property was sold to R. T. Wilson & Co., of Boston and New York, and Mr. Tom L. Johnson became general manager. Three months afterward, in

December, 1894, the famous 3-cent fare franchise was granted to a rival company, and the Detroit street railway war was on.

The history of street railway matters from the year 1860 until 1900 is one long record of agitation, discussion, charges and countercharges, personal and otherwise, and legal controversies involving decisions by the city courts, the circuit and district courts and the supreme court of the United States. The history would also include much of the political history of Detroit and the state of Michigan for that period. It is not necessary to here give a full record of these events. Sufficient it is in this connection to state a few of the main facts as they occurred.

The idea of a 3-cent fare found its chief champion in the person of the Hon. Hazen S. Pingree, who had been elected mayor of Detroit in 1890, and it is undoubtedly true that most of the subsequent agitation on this subject in Detroit was the result of his announced intention to secure cheap fares for the city.

For sometime after Mr. Johnson and his associates had purchased the Detroit Citizens' property, they strenuously opposed any

reduction of fares on the part of the city, and after the common council passed an ordinance reducing the rates of fares on the various street railways, the company took the case to the Circuit Court, and finally into the Supreme Court of the United States. The final decision in this case will be remembered as one of the most important affecting street railways ever rendered. The Supreme Court decided that the franchise granted to the company in 1862, and amended and supplemented in 1897, was in effect a contract between the city and the company, and the city had no power to alter the rates of fare therein stipulated.

As already stated, Mayor Pingree, in 1894, finding he could not secure his cherished 3-cent fare from the Citizens' company, induced outside capitalists to accept new franchises for street railways on most of the streets in Detroit not then occupied by the Citizens' company, these franchises to be granted with the expressed provision that the fare was to be eight tickets for 25 cents, or virtually a 3-cent fare during the day, and six-for-a-quarter tickets during the night.

This 3-cent fare franchise was passed Dec. 4, 1894, and was granted to Henry A. Everett, Greene Pack, Albert Pack, and their associates, who immediately formed themselves into a corporation under the name of The Detroit Railway.

Aside from the low fare, the sensational feature of this franchise was a clause stipulating that the company would not have to pay for nor keep in repair any paving either outside or between its tracks, this expense to be borne entirely by the City of Detroit. It is in this regard that the advocates of 3-cent fares showed considerable inconsistency. They claimed to be saving the people of Detroit several hundred thousand dollars a year in street car fares, without drawing attention to the fact that the taxpayers would be called upon to bear the expense of paving and maintaining the streets in good repair. The new company immediately let contracts for the construction of the road and opened about 40 miles of new lines in the spring of 1895.

The situation therefore shows at this period, the two companies operating very largely on parallel streets, the Detroit Citizens' company, with a straight 5-cent fare, and six tickets for 25 cents, and the Detroit Railway selling eight tickets for 25 cents. The struggle for traffic was very keen, and both companies were brought to the

verge of bankruptcy before the situation was satisfactorily adjusted. The old company had the advantage of location, and the new company had the lower fares.

This condition continued until 1896, when the companies in self-defence arranged a merger of interests, this taking the form of a temporary lease of the Detroit Railway to the Detroit Citizens' Street Railway interests.

In 1899, Mr. Pingree, not satisfied with his achievements, publicly announced that the city ought to purchase all the street railway properties of the city, and operate them as public property. By his efforts, an act was approved March 24, 1899, authorizing the city of Detroit to purchase the street railways and directing the common council to appoint three persons to constitute a board of commissioners known as the Detroit Street Railway Commission, which had power to acquire any street railway property in Detroit. The commission was given full power to operate the properties so acquired, regulate fares, and possessed such other powers as are possessed by boards of directors of corporations.



H. H. Hutchins

President Detroit United Ry.

April 24, 1899, a bill for injunction was filed in the Circuit Court for Wayne County to restrain the street railway commission from acquiring the railways for the city, and at the same time quo warranto proceedings were commenced in the Supreme Court of Michigan to test the constitutionality of the act under which, and the council proceedings by which, the commissioners were appointed. The proceedings were ultimately taken into the United States Courts where decision was finally given that the law was unconstitutional, and the Detroit Street Railway Commission had no legal standing.

Before the final decision was rendered, however, the commission had completed negotiations with the street railway companies for the purchase of their properties, and had made its report to the common council. Although the law under which the commission was created was finally declared unconstitutional, the results of the investigation made by the board were exceedingly interesting, and attracted wide attention. In the steps taken by the members of the commission, looking to the acquirement of the street railways of Detroit for the purposes of municipal operation, two elements entered into the question of determining the value of these properties. First, the value of the physical property including real estate, power houses, cars, tracks, equipment, etc., and second, the valuation of the franchise rights and privileges, or in short the earning power of the franchises themselves computed according to the term each had to run. The commission secured the services of

several experts who fixed the aggregate value of the physical property of all the street railways in Detroit, after making allowance for depreciation, at \$7,808,737.42. The railway companies insisted that this amount was too low by a million dollars, but the commission finally decided upon \$8,000,000 as the basis of its report. The commission decided the aggregate value of the franchises owned by the companies to be \$8,478,563.86. The valuation was arrived at by taking the net earnings for the preceding year, namely, \$750,000, deducting 4 per cent annual increase of traffic and earnings during the lives of the franchises, which at that time varied from 11 to 26 years. This franchise value of \$8,478,563.86 added to the value of the physical plant, namely \$8,000,000, gave the total value of the street railway properties and franchises as \$16,478,563.86, this being the price to be paid by the city in acquiring the various properties. After these figures had been submitted, the street railway companies made a counter proposition, fixing their price for all the railway properties and franchises at \$17,500,000, the proposition being that a new security franchise covering all the lines be granted to a new company, which new company would execute bonds secured by mortgage on all the properties of the companies, and the security franchise for \$17,500,000, and then the city would acquire such property subject to the payment of such mortgage indebtedness. At this time the foregoing decision was rendered and negotiations stopped.

On December 31, 1900, the Detroit United Ry. was formed with

SYSTEM OF THE DETROIT UNITED RAILWAY.

Detroit United Railway, organized Dec. 31, 1900, effecting a consolidation by purchase of the several companies named below:

The following is a complete statement of all the properties it now controls:

- I. DETROIT CITIZENS' STREET RAILWAY CO.—Organized Aug. 24, 1871. On Dec. 31, 1900, this company sold all its property to the Detroit United Ry., this property comprising all the properties, rights and franchises of the following companies:
 1. DETROIT CITY RAILWAY CO.—This company was organized in 1863 and received the first street railway franchise granted by the city of Detroit. In 1891 this company sold all its property to the Detroit Citizens' Street Railway Co., this property comprising all the properties, rights and franchises of the following companies:
 - a. CONGRESS & BAKER STREET RAILWAY CO.—This company was organized in 1873 and soon after purchased the property of the Detroit & Grand Trunk Junction Street Railway Co. (franchises to which were granted April 11, 1873, and June 13, 1873). The property of the Congress & Baker Street Railway Co. was transferred to the Detroit City Railway Co. on June 22, 1882.
 - b. CASS AVENUE RAILWAY CO.—This company purchased the property of the Central Market, Cass Avenue & Third Street Railway Co. (franchises to which were granted June 16, 1875). The property of the Cass Avenue Railway Co. was transferred to the Detroit City Railway Co. June 22, 1882.
 - c. HAMTRAMCK STREET RAILWAY CO.—This company was granted franchises dated Aug. 29, 1888, and Aug. 12, 1873. The property was transferred to the Detroit City Railway Co. in 1881.
 2. GRAND RIVER RAILWAY CO.—This company was organized in 1890 and in December, 1890, purchased the property of the Grand River Street Railway Co. (franchises to which were granted May 1, 1868). The property of the Grand River Railway Co. was transferred to the Detroit Citizens Street Railway Co. Oct. 1, 1891.
- II. DETROIT SUBURBAN RAILWAY CO.—Organized on Nov. 1, 1892, and effected a consolidation of several street railway companies (named below) operating in the suburbs of Detroit. On Dec. 31, 1900, this company transferred all its property to the Detroit United Ry. This property, in addition to certain franchises granted during 1890, 1891 and 1893 to the company itself, included the properties, rights and franchises of the following companies:
 1. DETROIT ELECTRIC RAILWAY CO.—This company purchased the property of the Dix Avenue Ry. (franchises to which had been granted April 11, 1886, and May 10, 1886). The property of the Detroit Electric Railway Co. was transferred to the Detroit Suburban Railway Co. Nov. 1, 1892.
 2. HIGHLAND PARK RAILWAY CO.—This company was organized in 1886 and received various franchises from the city of Detroit and outlying townships during the period from 1886 to 1891. The property of this company was transferred to the Detroit Suburban Railway Co. on Feb. 1, 1893.
 3. JEFFERSON AVENUE RAILWAY CO.—This company was organized in 1891 and purchased certain franchises granted in 1891 by outlying townships to Hendrie, et al. The property of the company was transferred to the Detroit Suburban Railway Co. in 1892-3.
 4. EAST DETROIT & GROSSE POINT RAILWAY CO.—This company was organized in 1887 and purchased certain franchises granted in 1887 by outlying townships to Brandon, et al. The property of the company was transferred to the Detroit Suburban Railway Co. in 1892-3.
- III. DETROIT, FORT WAYNE & BELLE ISLE RAILWAY.—Organized Feb. 28, 1898, Dec. 31, 1900, all the property of this company was transferred to the Detroit United Ry., this property comprising all the properties, rights and franchises of the following company:
 1. FORT WAYNE & BELLE ISLE RAILWAY CO.—This company was organized May 23, 1892. Early in 1898 the property of this company was transferred to the Detroit, Fort Wayne & Belle Isle Railway Co., this property comprising all the rights, property and franchises of:

- a. FORT WAYNE & ELMWOOD RAILWAY CO.—This company was chartered originally in 1865 as the Fort Street & Elmwood Avenue Ry., but by special act of Legislature, in 1871, the title was changed to Fort Wayne & Elmwood Railway Co. On July 1, 1892, the property of this company was transferred to the Fort Wayne & Belle Isle Railway Co. This property, in addition to numerous properties, rights and franchises granted to individuals and to the company itself by the city of Detroit and outlying townships at various dates from 1865 to 1891, included certain rights and franchises granted in 1889 to the Detroit, Springwells & Dearborn Railway Co., afterward transferred, on March 23, 1893, to a company known as the Detroit, Rouge River & Dearborn Street Railway Co., by which company they were assigned to the Fort Wayne & Elmwood Railway Co.

IV. THE DETROIT ELECTRIC RY.—Organized July 9, 1896, Dec. 31, 1900, all the property of this company was transferred to the Detroit United Ry., this property comprising all the property, rights and franchises of:

1. THE DETROIT RY.—This company was organized in November, 1891, to receive certain low-fare franchises granted in 1891 and 1896 by the city of Detroit and outlying townships. On July 11, 1896, all the property rights and franchises of this company were transferred to the Detroit Electric Ry.

V. DETROIT, PORT HURON & SHORE LINE RAILWAY.—This company comprises what is known as the Rapid Railway System. The capital stock of this company was purchased in 1902 and is held in trust for the Detroit United Ry. (For history of the Rapid Railway System, see separate diagram.)

VI. WYANDOTTE & DETROIT RIVER RAILWAY.—This company was organized about 1898 and transferred all its property to the Detroit United Ry. Feb. 20, 1901.

VII. DETROIT & NORTHWESTERN RAILWAY.—This company was organized in 1899, and May 1, 1901, transferred all its property to the Detroit United Ry., this property comprising all the properties, rights and franchises of the following companies:

1. GRAND RIVER ELECTRIC RAILROAD CO.
2. PONTIAC & SYLVAN LAKE RAILWAY CO.
3. DETROIT & HOWELL PLANK ROAD CO.

VIII. DETROIT & PONTIAC RAILWAY CO.—This company was organized in 1897, and on June 1, 1901, transferred all its property to the Detroit United Ry. The company had previously purchased the property rights and franchises of the

1. OAKLAND RAILWAY CO.

IX. DETROIT & FLINT RAILWAY.—This company was organized Aug. 9, 1901, and in August, 1901, transferred all its property to the Detroit United Ry. The company had previously purchased the property of:

1. DETROIT, ROCHESTER, ROMEO & LAKE ORION RAILWAY.—This company was organized March 22, 1899, as the "Detroit & Lake Orion Ry.," but name was changed shortly after organization. The company owned the property, rights and franchises of the following companies:

- a. DETROIT, LAKE ORION & FLINT RY.—Organized March 6, 1901.
- b. NORTH DETROIT ELECTRIC RY.—Organized July 21, 1899.
- c. DETROIT, UTICA & ROMEO RY.—Organized Aug. 10, 1898.

X. ROCHESTER LIGHT & POWER CO.—This company was organized Nov. 13, 1899, and owned the electric lighting franchises and plant in the city of Rochester, Mich. The capital stock was purchased in 1902 and is held in trust for the Detroit United Ry.

XI. SANWICH, WINDSOR & AMHERSTBURG RAILWAY CO.—This company was organized in 1873. It is a Canadian corporation and the stock is held in trust for the Detroit United Ry. by purchase in 1901. The company owns the capital stock of:

1. SOUTH ESSEN ELECTRIC RAILWAY CO.—This company is a Canadian corporation. It was organized in 1902, and the same year transferred its property rights and franchises to the Sandwich, Windsor & Amherstburg Railway Co.

XII. CITY RAILWAY CO., OF WINDSOR, ONT.—This is a Canadian corporation. Its stock is held in trust for the Detroit United Ry. by purchase in 1901.

XIII. ELECTRIC DEPOT CO.—This company was organized in 1901 for the purpose of providing terminal facilities for the freight and express business on the interurban lines running out of Detroit. The capital stock is held in trust for the Detroit United Ry.

*EXPLANATION.—In 1896 the Detroit Citizens' Street Railway Co. took over control and virtually leased the Detroit Suburban Railway Co., the Detroit, Fort Wayne & Belle Isle Railway Co., and the Detroit Electric Ry., but these leases have now been superseded by the transfer of all these properties to the Detroit United Ry.

the Everett-Moore interests in control, and ultimately took over all the street railway properties in Detroit and the suburbs (with the exception of the interurban road to Jackson) as outlined in the accompanying table. On the original low fare lines tickets are still sold at the rate of eight tickets for 25 cents, but on the other lines

	1901.	1900.
Car Mileage	16,080,041	15,233,410
Earnings per car mile.....	18.15	16.90
Expenses per care mile.....	9.93	9.45
Net earnings per care mile.....	8.22	7.45



HARRY BULLEN,
Assistant General Superintendent.



A. E. PETERS,
Assistant Secretary and Purchasing Agent.



A. E. ROSSO,
Chief Dispatcher.

a straight 5-cent fare is charged with lower fare tickets at certain hours of the day, as described by Mr. Stanley on another page.

This in brief is the history of the low-fare agitation in Detroit. Reviewing the entire matter, it is difficult to see how anyone has profited by this agitation. Both the city and the companies have been put to great expense in fighting the various suits, and there is considerable useless mileage being operated, as the result of the competing lines built by the Detroit Ry. It is true the public has the advantage of practically a 3-cent fare on about 40 miles of track, but on the other hand the city has to maintain the paving on those lines. As far as can be determined by an outside observer, neither the citizens of Detroit, nor the companies have been benefited by the agitation which would seem to merit the criticism of having been uncalled for and entirely useless.

FINANCIAL.

The following is a summary of the business of the Detroit United Ry. (not including the Rapid Ry.) for the year ending Dec. 31, 1901, as compared with 1900:

	1901.	1900.
Gross earnings	\$2,919,171.36	\$2,575,276.54
Operating expenses including taxes.....	1,596,765.60	1,439,957.78
Net earnings from operation.....	1,322,495.76	1,136,418.76
Income from other sources.....	23,066.99	14,558.88
Gross income from all sources.....	\$1,345,472.75	\$1,150,777.64
Deductions:		
Interest on funded debt....	\$975,343.73	\$638,316.91
Dividend March 1st.....	125,000.00	
Dividend June 1st.....	125,000.00	
Dividend September 1st.....	125,000.00	
Dividend December 1st.....	125,000.00	
Surplus income	170,129.00	512,460.73

The comparison includes all lines operated for the same period both years.

Passenger Statistics

Revenue passengers carried in 1901	62,822,749
Transfer passengers	17,470,227
Employee passengers	826,135
Total passengers	81,119,111
Average receipt per passenger.....	.0354
Average receipt per revenue passenger .....	.0457

The following is a summary of the business of the six months ending June 30, 1902, compared with the six months ending June 30, 1901:

	1901.	1902.	Increase	Cts.	Cts.
Number car miles.....	\$8,079,363	\$8,725,822		or	
Receipts.....	Amount.	Amount.	Decrease.	Mile.	Mile.
Passengers	\$1,338,789.05	\$1,551,180.19	\$212,391.14	.....	.....
Chartered cars....	5,277.74	4,592.48	685.26	.....	.....
Express	22,595.60	33,805.48	11,209.88	.....	.....
U. S. Mail.....	373.38	1,708.83	1,335.51	.....	.....
Car receiptal, sub.	4,911.54	.....	4,911.54	.....	.....
Total earnings					
from operation ...	\$1,371,947.25	\$1,591,286.98	\$219,339.73	76.98	18.24
Less op. ex....	775,346.88	907,043.65	131,696.77	9.60	10.40
Net earn. from op.	596,600.37	684,243.33	87,642.96	7.38	7.84
Income from other sources.					
Advertising	4,762.00	4,954.43	192.43	.....	.....
Rent of lands and buildings	3,855.25	23,602.35	252.90	.....	.....
Interest	3,489.32	.....	3,489.32	.....	.....
Mis. sources	427.00	831.51	704.56	.....	.....
Gross income from all sources ...	\$608,833.44	\$831,56	\$704,56	.....	.....
Deductions.					
Ac. Int. funded dbt	345,118.72	380,041.53	44,822.81	.....	.....
Int. floating dbt. ....	.....	4,190.24	4,190.24	.....	.....
Dis. on bonds.....	.....	1,607.16	1,607.16	.....	.....
Total	\$345,118.72	\$395,738.03	\$50,620.21	4.27	4.53
Net income from all sources	263,715.22	207,892.74	34,177.52	3.26	3.42

OFFICERS.

The corporate officers and directors of the Detroit United Ry. are as follows: Chairman of the board, H. A. Everett; president and general manager, J. C. Hutchins; vice-president, Arthur Pack; treasurer, Geo. H. Russel; secretary, Edwin Henderson; assistant secretary, A. E. Peters; directors, J. C. Hutchins, E. W. Moore, R. B. Van Cortlandt, H. R. Newcomb, Arthur Pack, R. A. Harman, H. A. Everett, J. G. Schmidlapp, Geo. H. Russel.

Review of the Detroit United Railway System from an Operating Standpoint.

BY A. H. STANLEY, GENERAL SUPERINTENDENT.

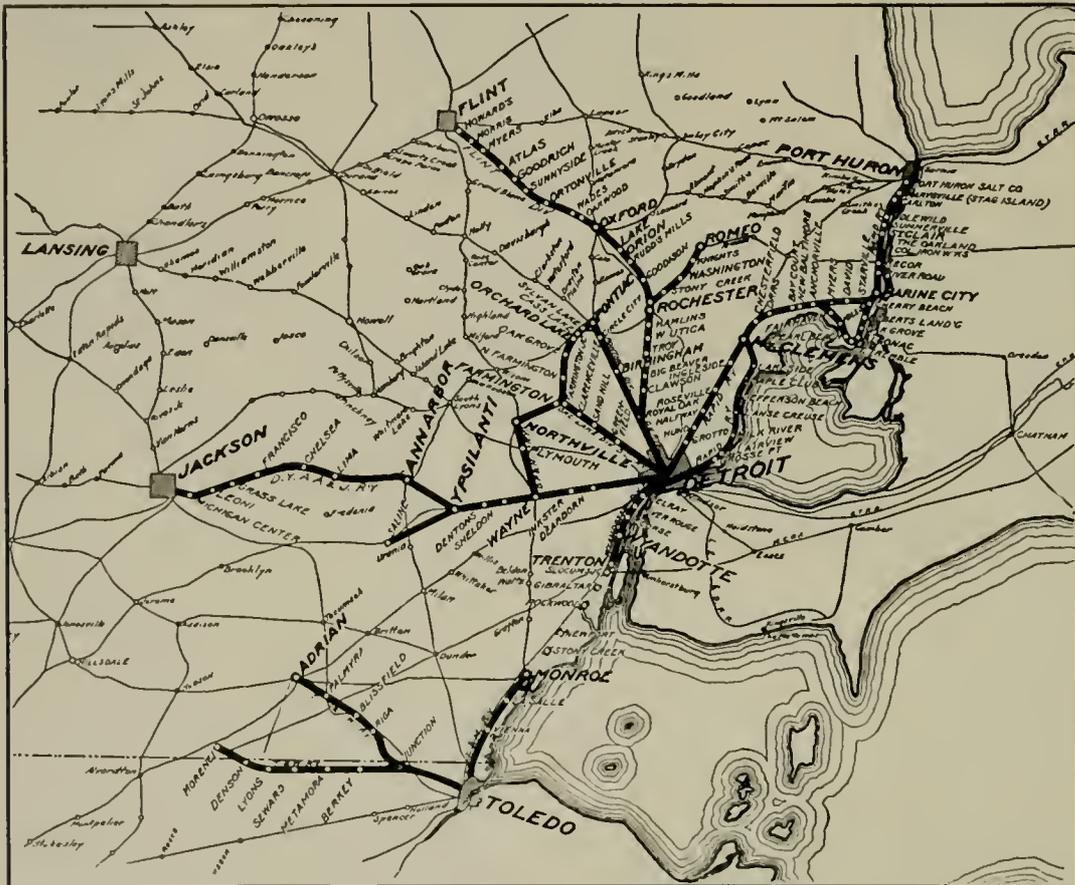
To a street railway man visiting Detroit for the first time, a number of features about the Detroit United Railway System will appear prominently as being distinctly characteristic. A full description of the company's property and methods in all departments will be found in the following pages of this issue. It is the purpose of this article to speak briefly, from purely an operating standpoint of some of these distinguishing characteristics.

In the first place the general lay-out of the lines and particularly the number and length of interurban lines present a situation believed to be unparalleled in the United States. There are seven distinct interurban lines coming into the city, varying in length from

directly to the heart of the business district, where a temporary waiting room is established on lower Woodward Avenue.

The management has made a very close study of the transfer conditions and in many instances has combined short lines in order to do away with transfer points in the center of the city; thus leaving in existence only the short lines necessary to take care of the boat and depot travel.

There are lines operated under a 5-cent fare with eight-for-a-quarter tickets good in the morning between the hours of 5:30 and 7:00, and in the evening between the hours of 5:15 and 6:15, called workingmen's tickets. There are also a certain number of miles



MAP OF INTERURBAN ELECTRIC RAILWAYS ABOUT DETROIT.

All lines controlled by Detroit United Railway except the Detroit, Ypsilanti, Ann Arbor & Jackson; the Detroit, Plymouth & Northern, a short spur connecting Wayne and Northville, and the lines out of Toledo.

20 to 79 miles, and, with one exception, all under the control of the Detroit United Railway. The topography of the city admits of better than the average speed in cities the size of Detroit; the schedule speed for the city lines being 10.67 miles per hour. The closest headway on the heavy lines is 30 seconds at 6 o'clock at night, and on the crosstown and main north and south lines this headway is maintained during the rush hours. To insure this schedule timers are placed at different points in the city and the cars on all lines are timed. Under normal conditions all lines are required to have an average of at least 85 per cent of cars on time. These lists from each line are checked with the schedules on the following day, and their percentage shown and sent to the division superintendent in charge of each line for the purpose of inspection and noting what men were not on time.

All of the cars on the interurban lines enter the city, running

operated with eight-for-a-quarter tickets good from 5:45 a. m. to 8:00 p. m., after which time a six-for-a-quarter ticket or 5-cent fare is collected. Transfers are issued to all lines on payment of a 5-cent fare, but the transfer on eight-for-a-quarter lines is restricted to those particular lines on payment of an eight-for-a-quarter fare. Transfers are not issued from a 5-cent to an eight-for-a-quarter line on payment of a fare with a workingman's ticket (eight-for-a-quarter) but are issued from one 5-cent to another 5-cent line on these tickets during the hours these tickets are good. Owing to our rates of fares being so very much lower at certain hours in the morning and evening, there results an enormous congestion of traffic at that time, as all the factories and institutions employing labor adapt the working hours to suit the time when these tickets are good. As a result this company is required to increase its service mornings and evenings

134 per cent above the average schedule maintained during the day, this service running during the entire time that the workmen's tickets are in effect. On the interurban lines round trip and one-way tickets are on sale. Traffic arrangements are in effect between the steamboat companies and the Detroit United Railway whereby passengers on the interurban lines can buy a ticket from any of the stations to and from Detroit and to almost any point on the lakes; also to any Eastern point on most of the steam railroad lines.

The organization of the Detroit United Railway is shown by one of the accompanying diagrams.

The Detroit United Railway operates 187 miles of city tracks and nearly 300 miles of interurban road. Practically all of the track

to do with the rolling stock while in the car houses other than to see it is kept clean; the motor inspectors are under the motive power department. The standard closed car is 22-ft., single truck; the standard open car is 12-bench, 33 ft. long. Our experience indicates the desirability of having a larger closed car but not a large open car. With too large an open car the people are slower to get on and off and the conductor cannot collect all the fares. We run both city and interurban cars the same end on at all times, all of the cars being equipped with controllers at one end only. We believe this is the most satisfactory way to operate. We have about 1,300 conductors and motormen in service, including the city and interurban lines. The rate of wages paid on all lines except the

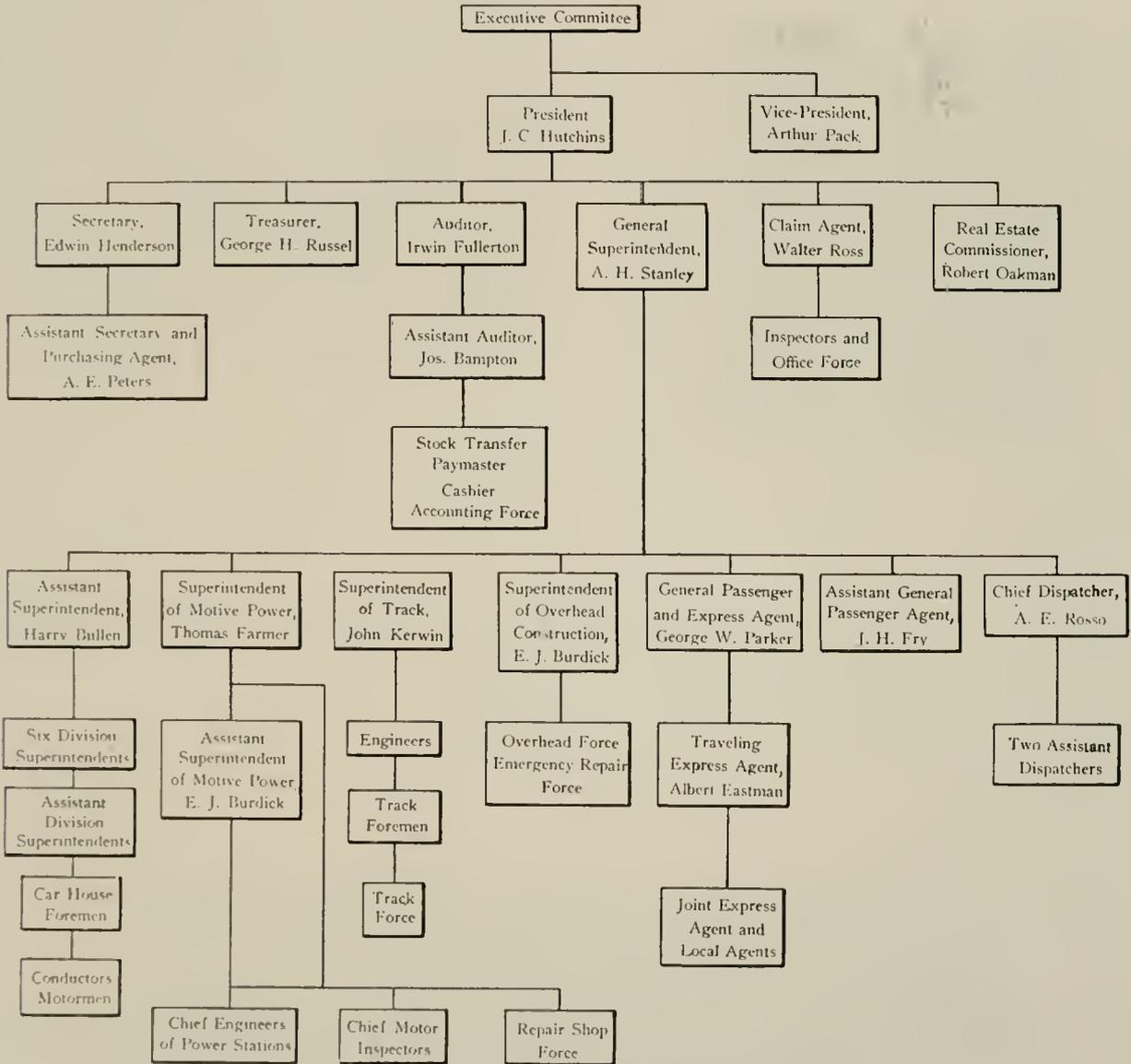


DIAGRAM OF ORGANIZATION OF THE DETROIT UNITED RAILWAY.

construction in the city of Detroit is 9-in. girder groove rail with concrete foundation. Our experience in Detroit has shown that 6 in. of concrete is not a sufficient foundation for heavy rails. We are satisfied with concrete construction, only it should be deeper and heavier. The interurban lines are of 60-lb. T rail construction, located in most cases on the highway; some of it is on private rights of way.

We have seven division superintendents, each one of whom has two or more lines under him, depending on the length of the lines and traffic conditions. Each of these division superintendents has at least one assistant known as an assistant division superintendent, and at each of the car houses, are day and night car house foremen. Neither division superintendents nor their assistants have anything

Rapid Railway System is 23½ cents per hour; on the Rapid it is 22 cents per hour, irrespective of the length of service and the amount of work done. The men work nine hours in twelve with one-half trip lee-way; Sundays eight hours, excepting in the summer months, when they work as the service requires. The conductors and motormen are disciplined under what is known as the Brown system, which was put in effect on Jan. 1, 1902.

There were 81,119,111 passengers carried on the entire system in 1901. To handle this traffic 16,080,041 car-miles were run. The regular schedule provides for 186 city cars and about 36 interurban cars, including the Rapid Railway.

On the 5 cent lines the company is required to maintain the pavement between the rails and it is stipulated that the paving

material shall be the same as the remainder of the street excepting where asphalt pavement is laid, when the company may substitute brick. On the 3 cent lines we are not required to maintain and keep in repair either the pavement or the foundation; nor are we required to lay the original foundation and pavement excepting where a car line is laid on a street already paved, where we are required to do the work. On unpaved streets we simply make the grade, trenching 6 in. beneath the base of the rail, lay rail, lift up track to grade, and the city does the paving and concreting, and is required to keep it in repair afterwards. Should the foundation become disturbed, we merely lift the rail to grade, and the city is required to put the foundation in proper shape. Since all of the



A. H. STANLEY,
General Superintendent Detroit United Ry.

interurban lines have come under one management, an express and passenger department has been inaugurated. The express department, which was described in the "Review" for January, 1902, is in charge of experienced steam railroad men, and the general policy of steam railroads in reference to express has been put into effect over the entire system. An electric express depot has been erected in Detroit and express service given to all points at least twice daily on all the interurban lines.

Inasmuch as Detroit is so well supplied with pleasure resorts of all kinds the street railway company does not maintain parks or places of amusements of its own, but it is always ready to aid such enterprises and encourage them by giving good service.

A general passenger agent has charge of all advertising, special

applies directly to our patrons, and with which they come in direct contact in their daily life, for example: Information as to the transfer system, instructions as to how to get on and off cars properly, etc.

A somewhat unique service has been arranged by the management of the Detroit United Railway for the special benefit of visitors in Detroit who desire to obtain a comprehensive idea of the city in a short time. This service includes the use of a special parlor car known as the "Yolande," which leaves Cadillac Square near the Soldiers' Monument in the heart of the city every two hours. This special car takes passengers through the principal wholesale and manufacturing districts, as well as the finest residence portions of the city, and affords a magnificent view of Detroit and its surroundings, including the public buildings, the art museum, the churches, educational institutions (public and private), large hospitals, the House of Correction, the County Buildings, the large apartment houses and fine residences which are located in every part of the city; also the famous Water Works Park, Belle Isle Park and the Detroit River. A competent attendant accompanies the car and explains the points of interest along the route.

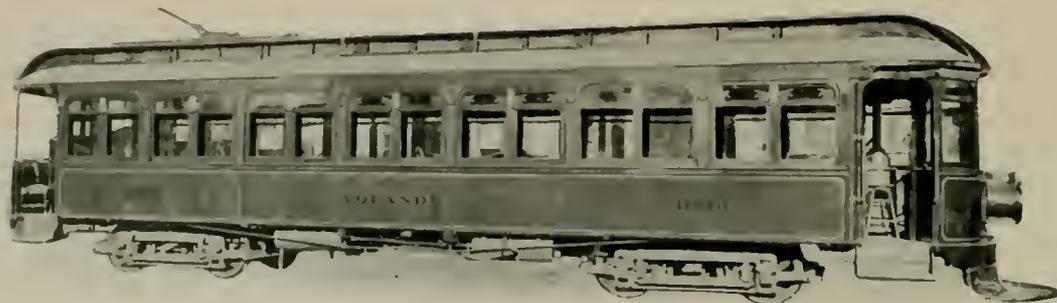
The fare for the round trip is but 25 cents, and the car stops at any street crossing on the route to receive passengers and to deliver them after the trip. This car has been in service for two years and has reached a point where it is almost necessary to put on an additional car to care for the people who are anxious to take this ride.

We have operated for some years a single truck funeral car, but the demands for interment at outlying cemeteries and points on the interurban lines is so great that we have found it necessary to build a double-truck funeral car, which is now in process of construction at our shops. It is similar to an interurban passenger car with a front compartment having doors on each side, which drop down and permit the casket being rolled in from the side. The front end is draped in black and the car is draped in black with silver trimmings; the inside is furnished with dark plush. The car is being constructed in our Jefferson Avenue shop.

We charter special cars on application. The price for the ordinary city cars run as specials is \$3.00 per hour from the time of leaving car house until return thereto. There is a regular schedule of rates in effect for cars running to the different interurban points, based on a service of 10 hours for a round trip. For over 10 hours an additional charge of \$1.00 per hour is made, and a charge of \$5.00 per hour is added in case the suburban power houses are required to keep open over-time to take care of the service.

MERIT SYSTEM.

The idea of placing the merit system in effect on the Detroit United Railway originated with our president, Mr. Hutchins. The system, which was described in the "Review" for February, 1902,



SPECIAL CAR YOLANDE DETROIT UNITED RY.

tickets, etc. Folders are issued for distribution giving schedules of all interurban lines in Michigan, Ohio and Indiana, connections with steamboats and steam railways and showing the different points of interest adjacent to Detroit which can be reached by interurban cars. In the city cars, what is known as the Detroit United Weekly is carried in a box placed in the front end of the car. The object of this Weekly is to place before the public in an attractive form the different attractions along our lines and to bring the public into closer touch with the inner workings of the system, particular attention being paid to that part of the railroad system which

is what is known as the Brown system of disciplining conductors and motormen and on Jan. 1, 1902, was put in effect for all the properties of the Detroit United Railway, affecting some 1,200 conductors and motormen; and embracing both the city and interurban lines operating on the regular schedule, 186 city cars and 24 suburban cars; on the maximum schedule 400 city cars and 50 interurban cars.

A circular was issued, addressed to conductors and motormen, on Dec. 23, 1901, notifying them that "commencing Jan. 1, 1902, all punishment of conductors and motormen by suspension from duty

with loss of time would be abandoned, and thereafter punishment for neglect of duty, violation of rules, and bad conduct, would be by reprimand, demerit marks, or dismissal from the service. The circular describes the system as follows:

"On Jan. 1, 1902, every conductor and motorman starts with a clear record, except that when subsequent records show that past offenses are being repeated, the persons concerned will be either



INTERIOR OF "YOLANDE."

dismissed from the service or double the demerit marks entered against them.

"It will be understood that disloyalty, intemperance, insubordination, willful negligence, immorality, making false reports or statements, or concealing facts surrounding matters under investigation, will be considered as cause for discharge.

"A complete record of all conductors and motormen will be kept,

will be deducted from any that may have been previously entered against an employe's record. When 60 marks are entered against the record of any employe, his services will be dispensed with.

"On January 1st of each succeeding year, the name of each conductor or motorman who has gone through the previous year with a perfect record will be posted at each of the car houses.

"In the promotion of employes, their previous record will be fully considered.

"Record Bulletins will be issued at least weekly and posted at all of the car houses on a special bulletin board. These bulletins will be educational, and will give a brief account of each case that has resulted in discipline, giving the number of demerit marks that have been inflicted, but will omit all reference that would identify the person at fault. A copy of the same will be sent to the person at fault.

"Each employe will be afforded an opportunity for appealing against any decision regarding the number of demerit marks imposed, but such appeal must be made to his division superintendent within 10 days of receipt of notice.

"The objects to be obtained under this new system are

"1. To avoid loss of wages by persons employed and consequent suffering to those who are dependent upon their earnings.

"2. To stimulate and encourage all persons engaged in the company's service in the faithful and intelligent performance of their respective duties.

"This system is introduced with the belief that it will be directly beneficial and that it will meet with the approval and cordial co-operation of all concerned."

Our records for the first six months of service under the merit system show as follows:

237 conductors and 341 motormen have perfect records.

89 conductors and 124 motormen have between 10 and 20 merit marks.

33 conductors and 16 motormen have 20 merit marks.

267 conductors and 180 motormen have under 30 demerit marks.

13 conductors and 22 motormen have over 30 demerit marks and under 60 demerit marks.

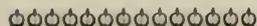
21 conductors and 16 motormen have been discharged.

The number of merit and demerit marks given has been changed

The Only Way to See DETROIT In Two Hours

THE CAR will stop at any street crossing on the route to receive passengers, and return them to the same point, for Twenty-five Cents.

take the NEW PARLOR CAR

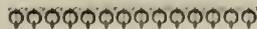


View of Exterior of Car.

"YOLANDE"

View of Interior of Car.

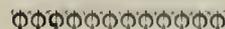
As viewed from the windows of the Parlor Car



A competent attendant will be in charge to explain points of interest along the route.

which leaves CADILLAC SQUARE, near the Soldier's Monument, every two hours

INTERIOR VIEW OF "YOLANDE"



Each Trip takes you through the principal wholesale and retail, as well as the finest resident portions of the City, and affording you a magnificent view of the Detroit River, Belle Isle Park and Water Works Park.

CAR LEAVES: 3:00 A.M., 11:00 A.M., 8:00 P.M., 3:00 P.M. and 5:00 P.M.

25c. A Most Delightful Ride Of Two Hours for 25c.

AN ADVERTISING CARD ORIGINAL 11 X 21 IN.

and all discipline imposed will be shown thereon, and credit given for excellent conduct, deeds of heroism, loyalty, etc., and these records will be given full consideration in connection with the charges entered against any conductor or motorman. This record will be a private one, and no employe will be shown any record therein except his own.

"For every 12 consecutive months of service free from demerit marks, or free from necessity for imposing a reprimand, 10 marks

several times, and is the decision arrived at by all of the division superintendents of the company in executive session. They meet weekly and review all of the cases, which are pending and have a personal hearing with the employes at fault. It has been found necessary to make several changes in the number of marks given for certain offenses, particularly in the matter of missing. The marks now given are the result of some six months' experiment. Today we are satisfied that the marks as given for the different

Power Stations of the Detroit United Railway.

BY THOMAS FARMER, SUPERINTENDENT OF MOTIVE POWER.

The power generating plants of the Detroit United Ry. consist of six stations and three storage battery houses, as follows:

Two city power houses, known as "A" and "B," located near the business heart of Detroit. These two stations are operated from one switchboard, located in Station "A."

Four suburban stations, known and located as follows: Station



THOMAS FARMER.

"D," at Farmington Junction, 19 miles from Detroit City Hall; "E," at Birmingham, 18 miles from City Hall; "F," at Pontiac, 26 miles from City Hall, and used only in emergencies; "G," at Rochester, 28 miles from City Hall.

Three storage battery houses, known as stations "C," "H" and "I," respectively.

Atwater St., near the river front. There is no switchboard in "B," the board controlling both "A" and "B" being located in "A."

Station "A" contains an engine room 243 x 65 ft., and boiler room 253 x 58 ft. The equipment is as follows:

Four Reynolds-Corliss compound condensing tandem engines, 28 and 32 by 48 in., direct connected to 1,000-kw. Siemens & Halske direct current outside armature generators.

Twelve Babcock & Wilcox boilers, 250 h. p. each, set in batteries of two. Boilers are fitted with Murphy stokers and Hoppes live steam purifiers.

Thirteen pumps, as follows: Four Worthington duplex jet condensers, 14 x 22 x 15 in.; two Worthington duplex compound, 10 x 16 x 8 1/2 x 10 in., for boiler feed; one Worthington duplex, 10 x 5 x 10 in., for fire protection, washing boilers, etc.; two Worthington duplex 3 x 2 x 3 in., and one Davidson, 3 x 2 1/4 x 4 in., for oil distribution; one Davidson, 6 x 4 x 7 in., for bleeder; one Gordon, 6 x 4 x 6 in., pit pump; one Westinghouse air pump for cleaning generators.

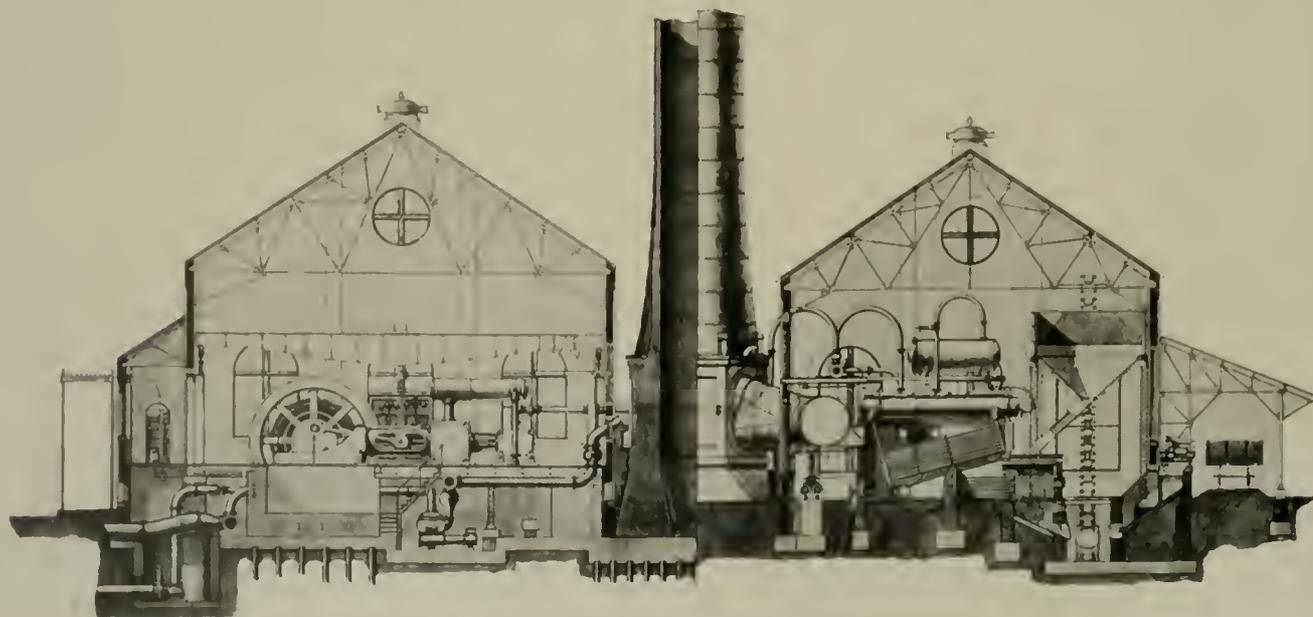
Hunt conveyor for handling coal and ashes, driven by double engines, 4 x 6 in.

The engine room is served by a 25-ton Brown hand crane.

Between the boiler room and engine room is a self-supporting steel stack, 180 ft. high, by 11 ft. 6 in. inside diameter.

The engines are fitted with gravity oiling system, fed from a tank of 200 gallons' capacity. In this connection the oil piping to and from bearings, tanks, filters and cooler is somewhat novel. The pipes are painted different colors, supply being light yellow, return dark yellow, by-pass to sewer, dark red.

As there is quite a multiplicity of pipes and valves in the system, the different colors make their manipulation very simple. For example, should a bearing become hot, so that it is necessary to use water on it, the valve on the return pipe from this bearing, i. e., the dark yellow pipe, would be closed and the valve in the by-pass to the sewer (dark red) would be opened. This would run the oil used on the bearing to waste, but it would save getting the entire system full of water, as all other bearings would remain in normal



CROSS SECTION OF STATION A - DETROIT UNITED RY.

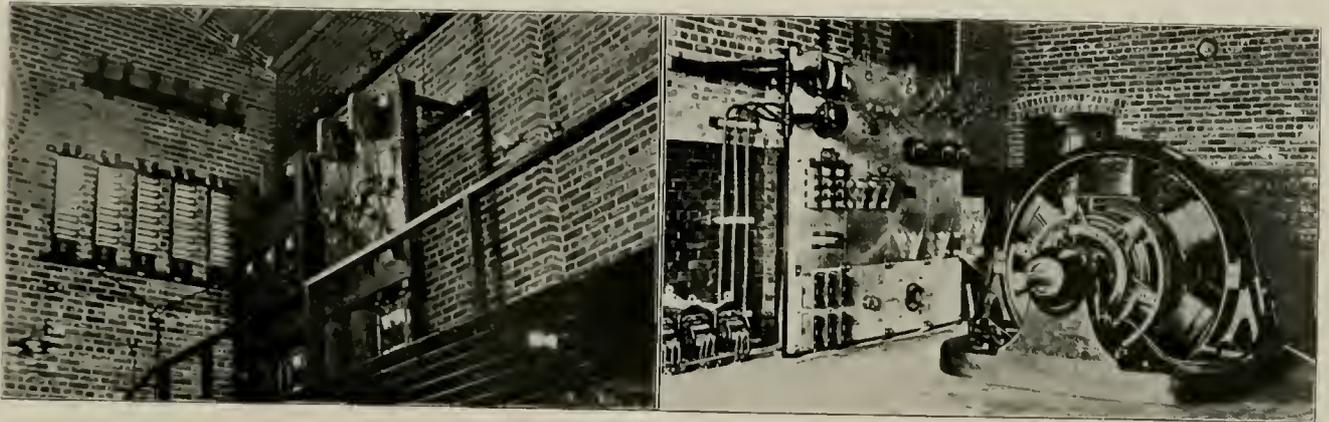
Station "A" is the one built originally for the Detroit Citizens' Street Ry. Station "B" was built by The Detroit Ry., and both properties were afterwards acquired by the Detroit United Ry. These two houses are situated diagonally opposite each other on

condition as regards the return of oil to the filter. As a matter of record, however, water has not been used on a single bearing in over six years. The oil filters are also original and have a capacity of 500 gallons per hour. The method of low pressure cylinder

lubrication is also original. The cylinder is drilled on both sides on its center line right through the walls, and is connected by piping to a special double sight feed lubricator. The piston in passing by the openings acts as a wiper and insures the most perfect lubrication. This has been used for over seven years, and has not only

One booster set, made up of one Westinghouse 525-volt direct current motor, direct connected to two 500-volt T. H. generators of 150 kw. capacity each.

The boilers comprise eight Sterling of 300 h. p. each, and eight Sterling of 250 h. p. each, set in batteries of two, and equipped with



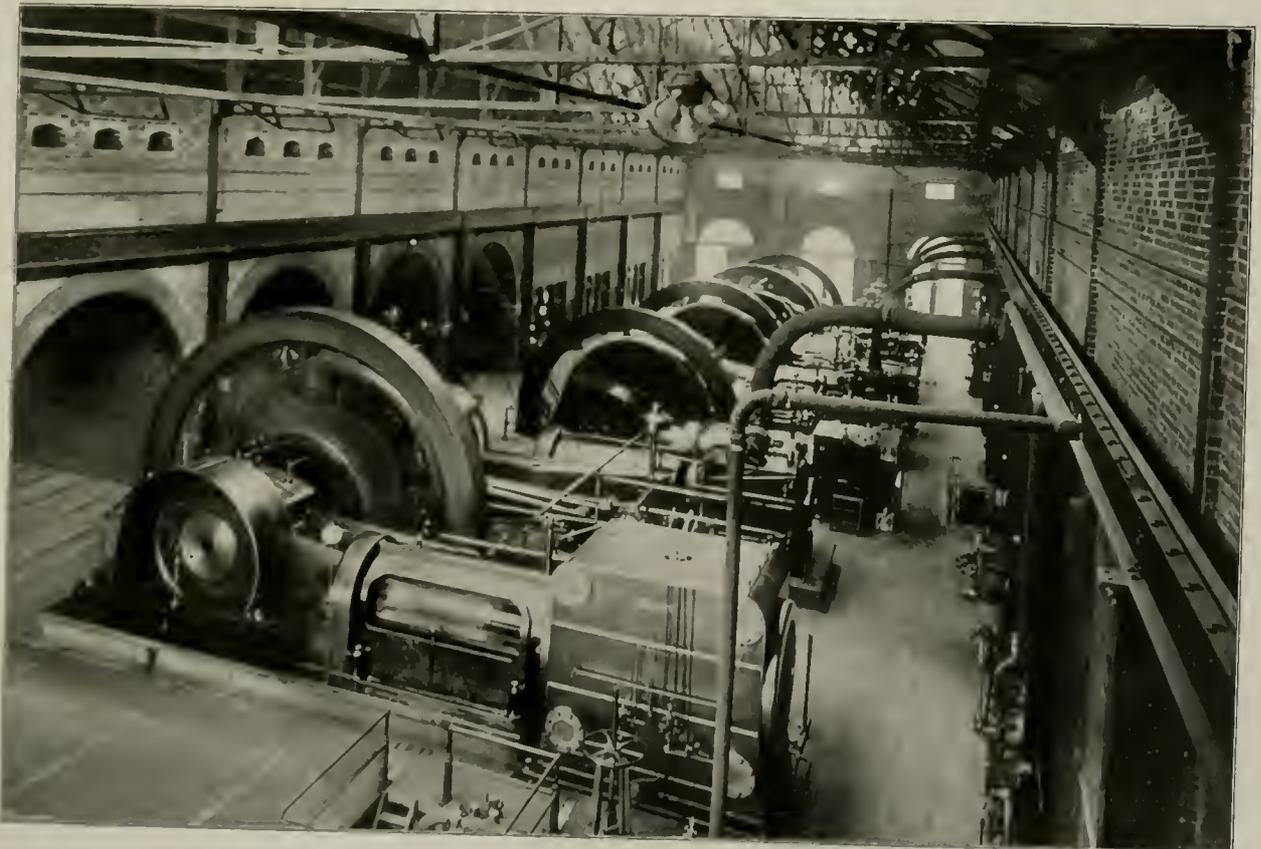
HIGH TENSION SWITCHES AND STANLEY APPARATUS IN OXFORD SUB-STATION.

effected a great saving in oil, but has been so effective that but two cylinders have required re boring, a somewhat unusual result on tandem engines.

The equipment in Station "B" is as follows: Two Reynolds-corriss cross compound condensing engines, 20 and 40 by 48 in., direct connected to 400-kw. direct current 525-volt Walker generators.

Murphy stokers and Green fuel economizers and connected to a brick stack 185 ft. high by 10 ft. flue.

Fourteen pumps, as follows: One Blake vertical duplex jet condenser, 15 and 24 x 38 x 21 in.; two Davidson jet condensers, 12 x 18 x 20 in.; two Davidson jet condensers, 12 x 20 x 24 in.; four Davidson, 12 x 8 x 12 in., boiler feed; two Davidson, 4 x 2 x 4 in.,



INTERIOR OF STATION B DETROIT UNITED RY.—FILER & STOWELL AND ALLIS ENGINES.

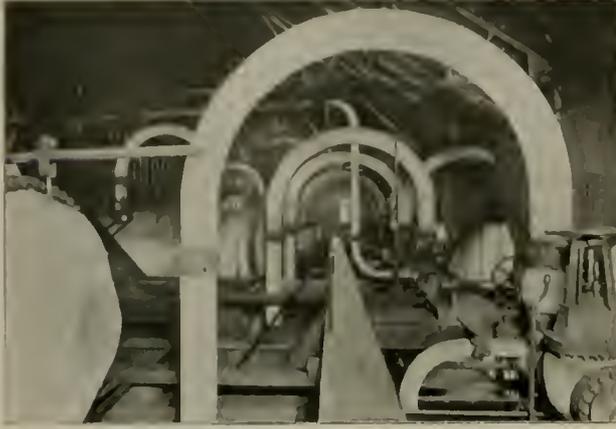
Two Reynolds corriss cross compound condensing engines 24 and 48 by 48 in., direct connected to 800 kw. direct current 525-volt Walker generators.

One Filer & Stowell cross compound condensing engine, 32 and 64 by 60 in., direct connected to a 1,500-kw. direct current 625 volt Westinghouse generator

oil distribution; one Marsh, 4 x 2 x 4 in., bleeder; two Davidson automatic pumps and receiver.

As before noted, the switchboard in Station "A" controls Station "B" as well as "A." It is made up of nine machine panels, 36 feeder panels, two booster panels, two main instrument panels, and four blank machine panels, and is 96 ft. long. The bus bar arrange-

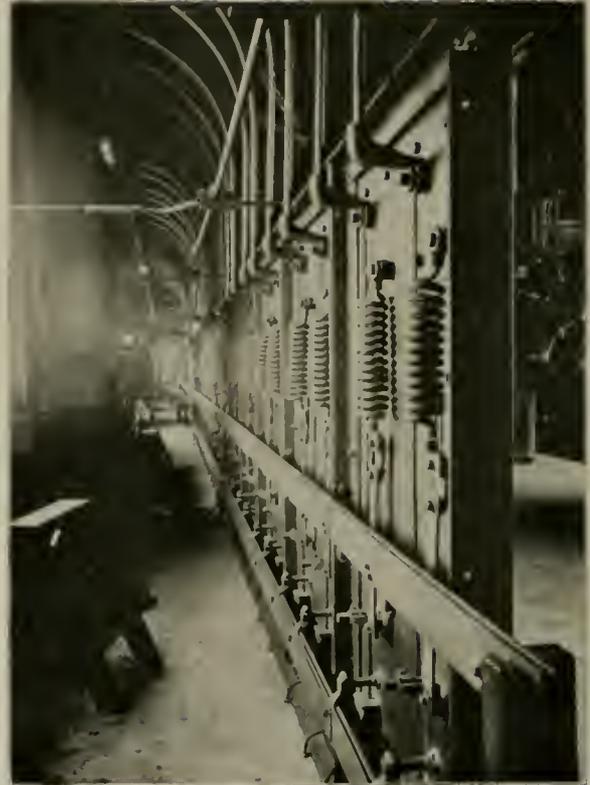
ment is as follows. There are three positive bars on the board, the negative bar being in the cellar below the board. All machines are tied in, and equalized on, the ground side. Of the three positive bars the upper one is Station "A" bar, the lower one is Station "B" bar, and the center bar is also fed from Station "B." The center and lower bars are connected through a switch which can be opened



STEAM PIPING, STATION A.

and each bar operated independently, that is, a voltage of 585 can be maintained on middle bar, using the four 525-volt units at Station "B," and the 625-volt unit cut in on lower bar, thus raising the voltage for outlying lines. The upper and lower bars can be connected so that the night load can be carried by either station; also by means of double throw switches to upper and lower bars load on each house can be equalized.

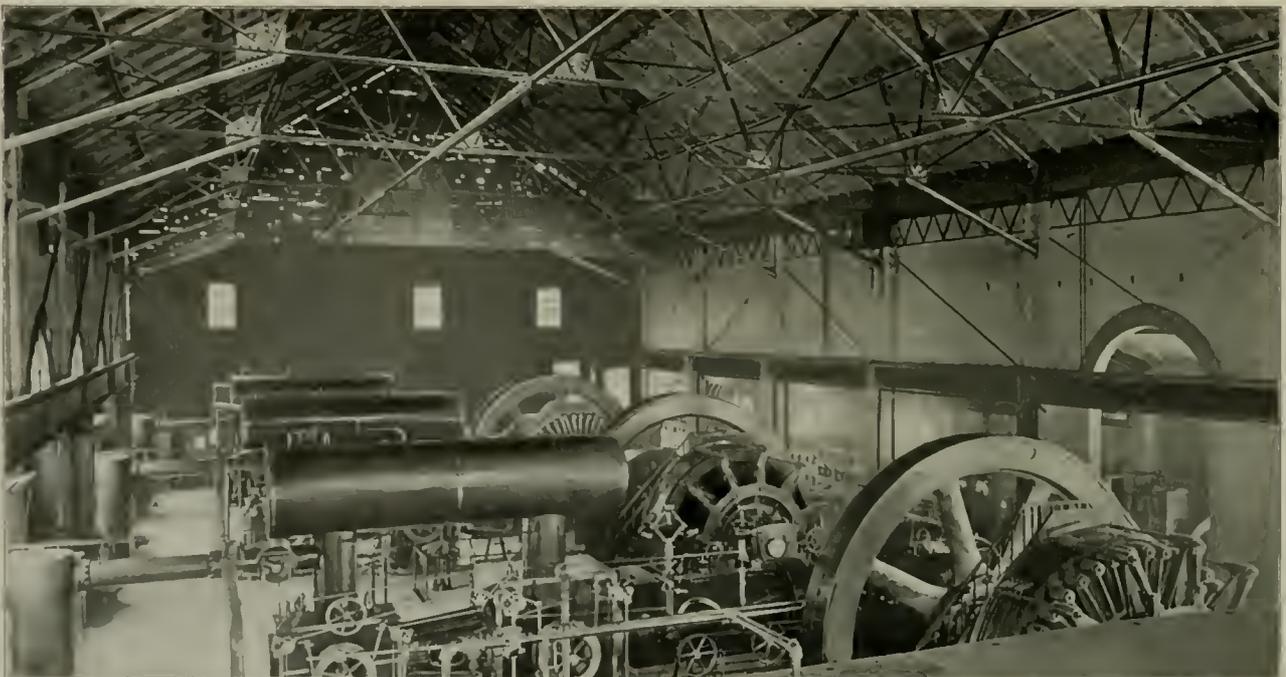
About $3\frac{1}{2}$ miles from the power house, and running directly across the center of the city, is an equalizing feeder of about 1,300,000 c. m. capacity and about $1\frac{1}{2}$ miles long. All feeders that radiate from the power house and cross through this district are tied into this equalizer wire through circuit breakers. Tied to the equalizer is also a 2,000-ampere-hour storage battery, which serves to carry the evening and morning peaks. The general feeder distributing scheme, including the use of this equalizing wire, is shown in the accompanying feeder diagram. The load situation on this



REAR OF SWITCHBOARD IN STATION A.

The third positive bus commences at the knife switch at the center of the board. The feeder connections are the curved rods.

wire will be understood from the curves, Fig. 6, which will also explain the advantages of the third bar at the switchboard. Under normal conditions the low voltage machines at the power houses are sufficient to carry the load on the equalizing wire. As the load increases the 625-volt machine is connected in through the medium of the third bus and the available pressure at the center and at the ends of the equalizing wire correspondingly increased. When the heavy peaks begin to come on, the battery located near the center



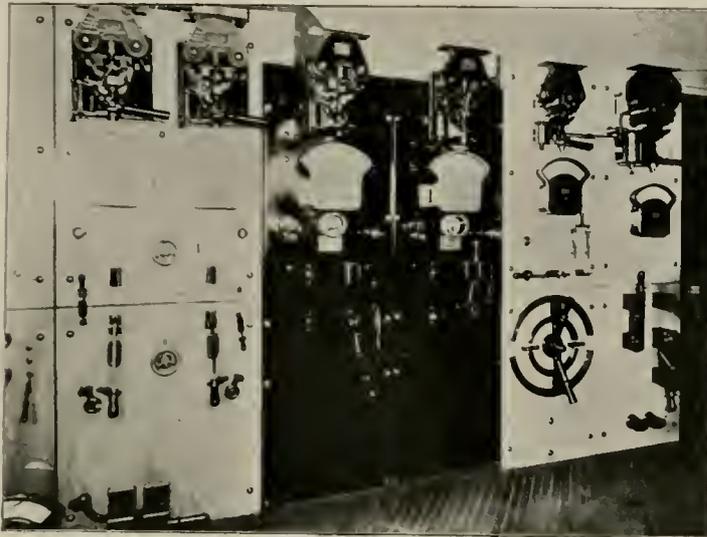
INTERIOR OF STATION A—REYNOLDS-CORLISS ENGINES—SIEMENS & HALSKE GENERATORS.

of the equalizer will take the added load, not only maintaining the voltage, but also protecting the engines against violent fluctuations in load.

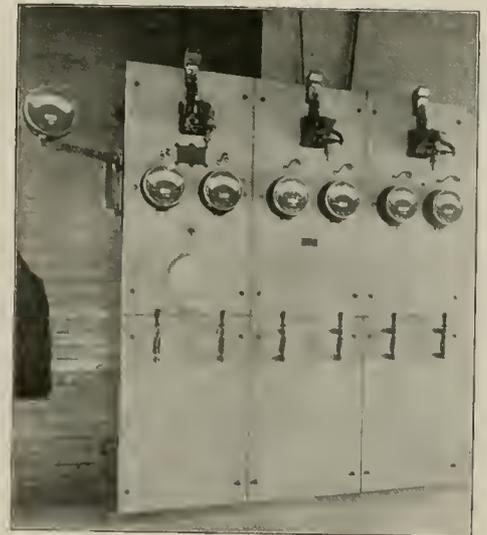
Both stations "A" and "B" were erected in 1895, the only additions since that time being the 1,500-kw. Westinghouse generator and the Filer & Stowell engine. A duplicate of this latter unit is now be-

can be had to piston without removing head. Total weight of engine, 640,000 lb.; speed, 75 r. p. m.

Station "D" is situated at Farmington Junction, on the Orchard Lake Division, 19 miles from the City Hall. The engine room is 120 x 52 ft. and boiler room 120 x 52 ft., built of brick, with brick stack. The equipment is as follows:



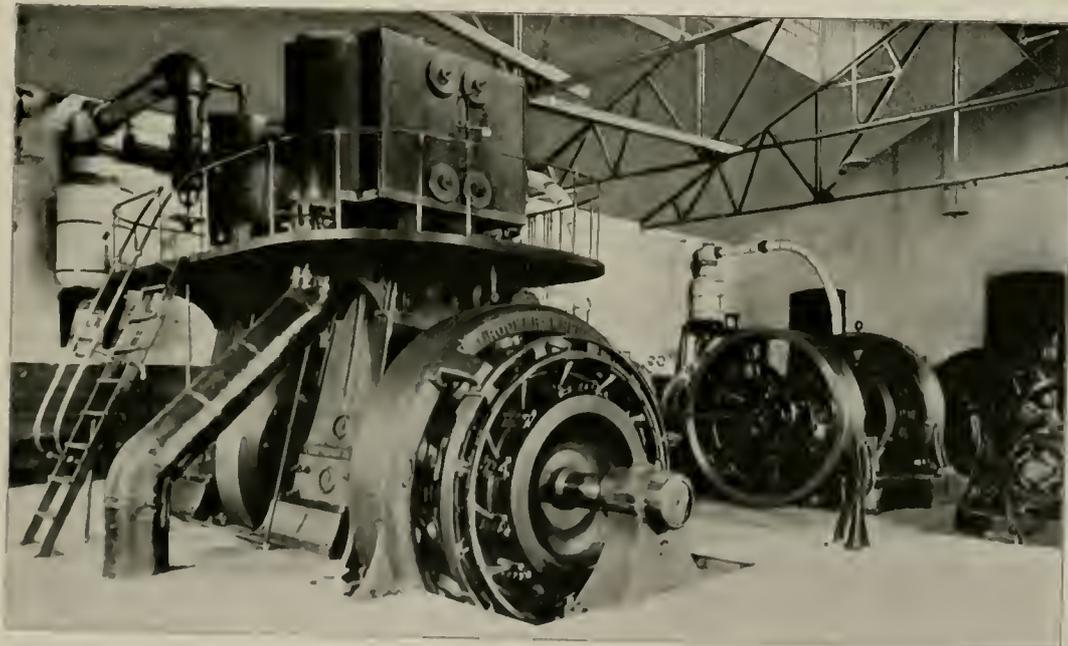
SWITCHBOARD FOR BATTERY STATION "C."



SWITCHBOARD FOR BATTERY NO. 3, STATION "L."

ing erected. The Filer & Stowell engine differs somewhat from previous standards of that company. The shaft is Bethlehem hollow forged steel, 29-in. in diameter at wheel fit, with bearings 26 x 48 in., and 26 ft. long; axial hole, 10 in. square; weight of shaft alone 41,574 lb.; weight of shaft with crank disks, pins and hub, 102,200 lb.; fly-wheel, 23 ft. in diameter; weight of fly-wheel, 160,000 lb. Cross heads are fitted with an extension, so that slippers are fastened by means of studs to cross head proper, insuring that slippers

Three Reynolds-corriss engines, 26 x 48 in., direct coupled to 400-kw. Siemens & Halske outside field generators. Eight Aultman & Taylor boilers, 250 h. p. each, set in batteries of two, and fitted with Murphy stokers. All pumps are Davidson make. Two General electric 100-kw. boosters, one for Detroit end of line and one for Orchard Lake end. These boosters are only run on increased loads, the regular schedule not receiving their use. One air compressor for Magann storage air brakes used on cars.



STATION G, ROCHESTER, MICH. BALL & WOOD ENGINE CROCKER-WHEELER GENERATOR.

will be retained in case the adjusting screw breaks. Valve gear is connected straight through, no wrist plates being used on either admission or exhaust. Both high and low pressure piston junk rings are babbitted. Connecting rod is babbitted at both ends. Low pressure cylinder head is fitted with manhole, so that access

Station "E" is situated at Birmingham, on the Pontiac Division, 18 miles from City Hall. The equipment is: Two Westinghouse compound condensing engines, 16 and 30 by 18 in., belted to 250-kw. Westinghouse D. C. 650-volt generators.

One Babcock & Wilcox 250-h. p. boiler, fitted with Roney stoker,

and three fire-tube boilers of 125 h. p. each, which are fired by hand. The pumps are all Worthington. One air compressor, 8 x 7 x 4 x 12 in., for supplying Magam storage air brakes used on cars.

The Weingo system of water purification and softening is used with success at this plant.

Station "F" is situated at Pontiac, the terminus of the Pontiac Division, and is used only in emergency cases, when all help required for operation is sent from the shops of the company. The equip-



1,500-KW. CHLORIDE BATTERY, STATION C.

ment is: One Dick & Church engine, 16 x 15 in., and one Ball engine, 15 x 16 in., each belted to 100-kw. Westinghouse generators. Two Phoenix Iron Works 100-h. p. boilers. One Worthington boiler feed pump, 6 x 4 x 6 in.

Station "G" is at Rochester, on the Flint Division, 28 miles from the City Hall. The machinery is contained in a building 72 x 104 ft., and is as follows:

Two 325-h. p. Ball & Wood horizontal tandem compound condensing engines, 15 and 30 x 16 in., direct connected to Crocker-Wheeler 200-kw. generators. The engines are of the single valve type, having the high pressure valve under control of the inertia shaft governor, and are operated at 200 r. p. m.

One 600-h. p. Ball & Wood vertical cross compound condensing engine, 21½ and 45 by 20 in., direct connected to Crocker-Wheeler

One 60-kw. direct current booster for feeding the Detroit end of line.

One 250-kw. S. K. C. inverted rotary built by the Stanley Electric Manufacturing Co., of Pittsfield, Mass. The method of utilizing this machine is explained later in this article.

One 90-kw. alternating current single-phase lighting generator direct driven by a 600-volt direct current motor, taking current from the station bus.

The boiler equipment consists of four 450-h. p. Aultman & Taylor boilers.

The pumps were all furnished by Dean, of Holyoke, and comprise: One 14 x 20 x 24-in. jet condenser; two 8 x 14 x 18-in. jet condensers, and two 7½ x 5 x 10-in., for boiler feed.

There is an air compressor for supplying air to Magam storage air brakes used on cars.

This station furnishes commercial lighting for the city of Rochester, Mich.

The use of the inverted rotary is somewhat unusual. Part of the direct current generated is fed directly to the line and a part is put through the S. K. C. inverted rotary, converted therein to three-phase, 300-volt, alternating current, and then stepped up by Stanley type T transformers to 15,000 volts and transmitted to rotary sub-stations at Oxford and Atlas, distant 13 miles and 30 miles respectively, from Rochester power house.

Each of these sub-stations is equipped with three 100-kw. type T Stanley 15,000-300-volt transformers; one 250-kw. S. K. C. rotary converter, and complete high and low tension alternating and direct current switchboards, switches, breakers, etc. An extra 250-kw. rotary is also located at Atlas sub-station for use as a reserve.

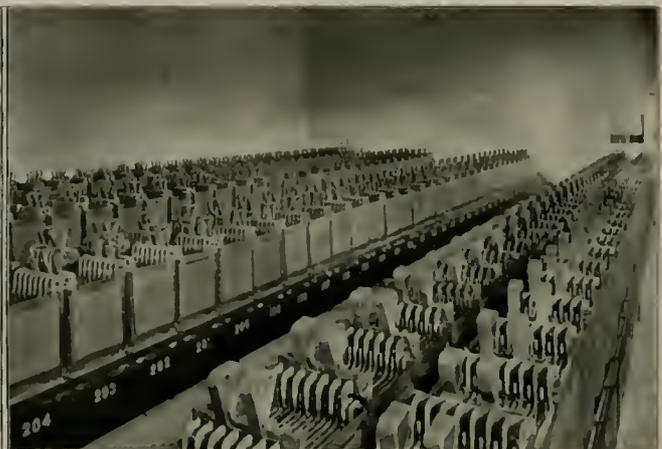
At Station "G" there will be installed, about September of this year, one 750-h. p. Ball & Wood vertical cross compound engine, 22 and 45 by 24 in., to which will be direct connected one 500-kw. Bullock 300-volt, three-phase revolving field alternator. The building will be extended for this equipment, and there will also be provided additional boilers, pumps, condensers, etc., of the same capacity as this unit.

When this alternating current unit has been installed it is proposed at all times of heavy load to operate from this unit the two sub-stations at Oxford and Atlas on the Flint Division, and from the direct current generators located in the same power house to operate the sections between Royal Oak and Rochester, Rochester and Orion and Rochester and Romeo.

If, however, it is noted that either the direct or the alternating current machinery is not loaded up to its economical capacity, the



1,000-KW. CHLORIDE BATTERY—STATION H.



150-KW. CHLORIDE BATTERY—STATION I.

400-kw. generators. This engine is of the corliss valve type. All admission valves are under control of inertia shaft governor and exhaust valves driven by separate fixed eccentric so that each may be adjusted independently of the other or of the admission. The frames are entirely enclosed with large manholes and hand holes, covered by closely fitting metal casings, so that no oil or spray can escape to governor or generators. The shaft, bearings and all working parts are of ample proportions. The engine runs at 180 r. p. m. at 150-lb. initial steam pressure.

S. K. C. rotary now used as an inverted rotary, will then be used to convert some of the output of the lightly loaded portion of the station to the other kind of current, so that at all times all units in operation will be operated economically. On very light loads the sections between Royal Oak, Romeo and Flint, it is expected, will be operated from either the 500-kw. alternator or the 400-kw. direct current generator, by utilizing in combination with either of these units the S. K. C. rotary, using it as an inverted rotary, if the greater portion of the current required is direct, and consequently

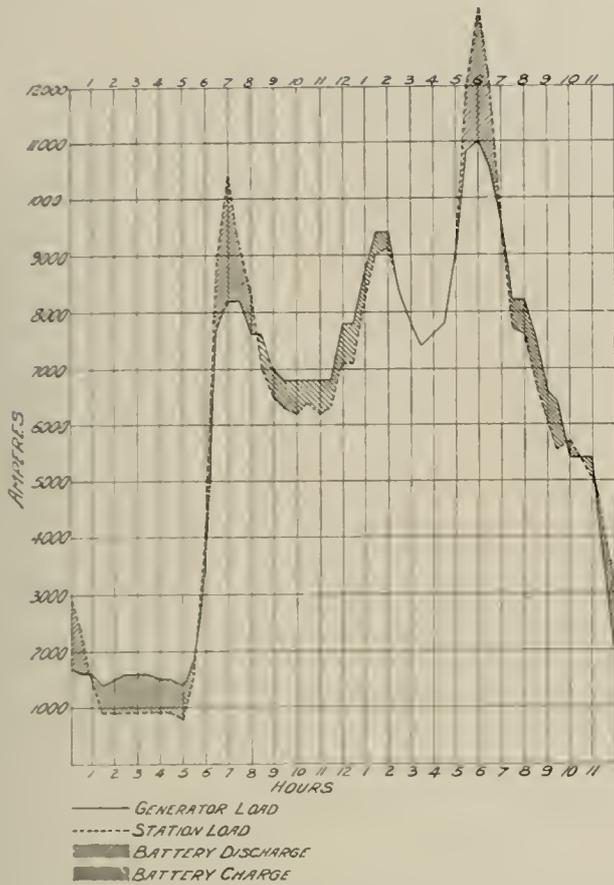


FIG. 1 BATTERY LOAD OCT. 10, 1901—BATTERY NO. 1—STATION C.

the direct current engine unit is operated; or, if the major portion of the current required is alternating, and the alternator unit is operated, then using the rotary in the ordinary direct manner to convert from alternating to direct current.

It is also proposed at times when momentarily first the alternating current and then the direct current units are likely to be overloaded, to keep this rotary in operation as a floating medium of conversion between the alternating current and the direct current sides of the station, so that neither may be overloaded unless the entire station is similarly affected. This regulating action will be accomplished automatically by the rotary.

Storage Battery Installations.

As stated, there are three storage batteries in use, all being "chloride" accumulators, furnished by the Electric Storage Battery Co., of Philadelphia, through the Michigan Electric Co., of Detroit. A description of each battery follows:

Battery No. 1, known as Battery Station "C."



FIG. 2 DIAGRAM FOR ONE MINUTE—BATTERY OUT OF SERVICE.

This battery, which was installed during August, 1900, is of 1,500-kw. capacity, and consists of 276 cells of "Chloride" accumulators, each cell being a lead-lined tank containing 67 type G plates, each of which is 15 5-16-in. square. A 250-kw. Western Electric



FIG. 3 DIAGRAM FOR ONE MINUTE—BATTERY IN SERVICE.

motor-driven booster was also furnished with this battery, and by this means the charging and discharging can be regulated either by hand or automatically.

The discharge capacity of the battery installation is 2,500 amperes at 575 volts for one hour, 1,250 amperes for three hours, or 625 amperes for eight hours.

This battery was installed to help carry peak loads, which on this railway system are excessive, owing to the fact that the number of cars operated during certain hours of the morning and evening is nearly double the number operated at any other time. The load curve, Fig. 1, illustrates the main power house load of this com

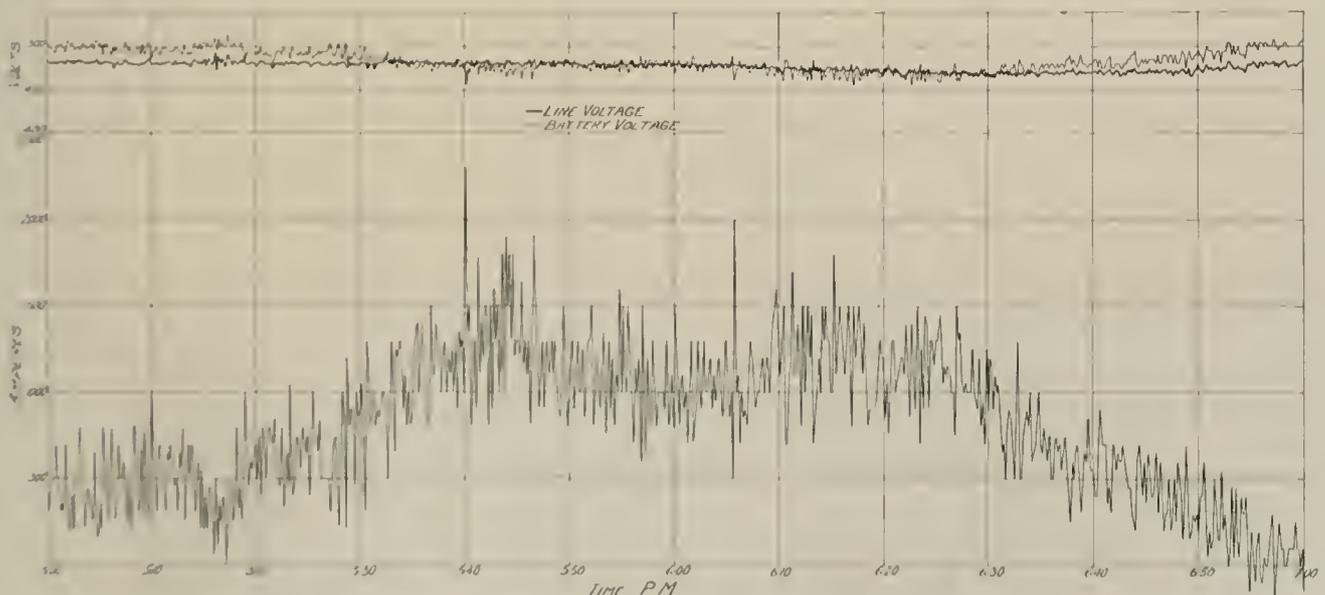


FIG. 4 LOAD ON BATTERY NO. 2, STATION B, MAR. 26, 1902.



FIG. 5 LOAD ON BATTERY NO. 3, STATION 1, JULY 22, 1902.

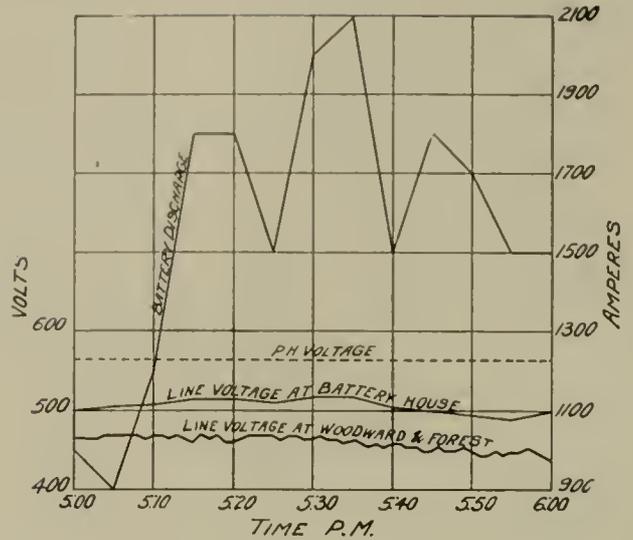


FIG. 6 SITUATION AT EQUALIZER WIRE.

pany, and the portion which is carried by the battery, as well as the period for charging.

This battery also serves another purpose, that of reducing the fluctuations on the main station. The reduction of the fluctuations on the generators and engines is very neatly shown by the indicator diagrams shown in Figs. 2 and 3; Fig. 2 shows an indicator card taken with the battery off the system, the pencil of the indicator

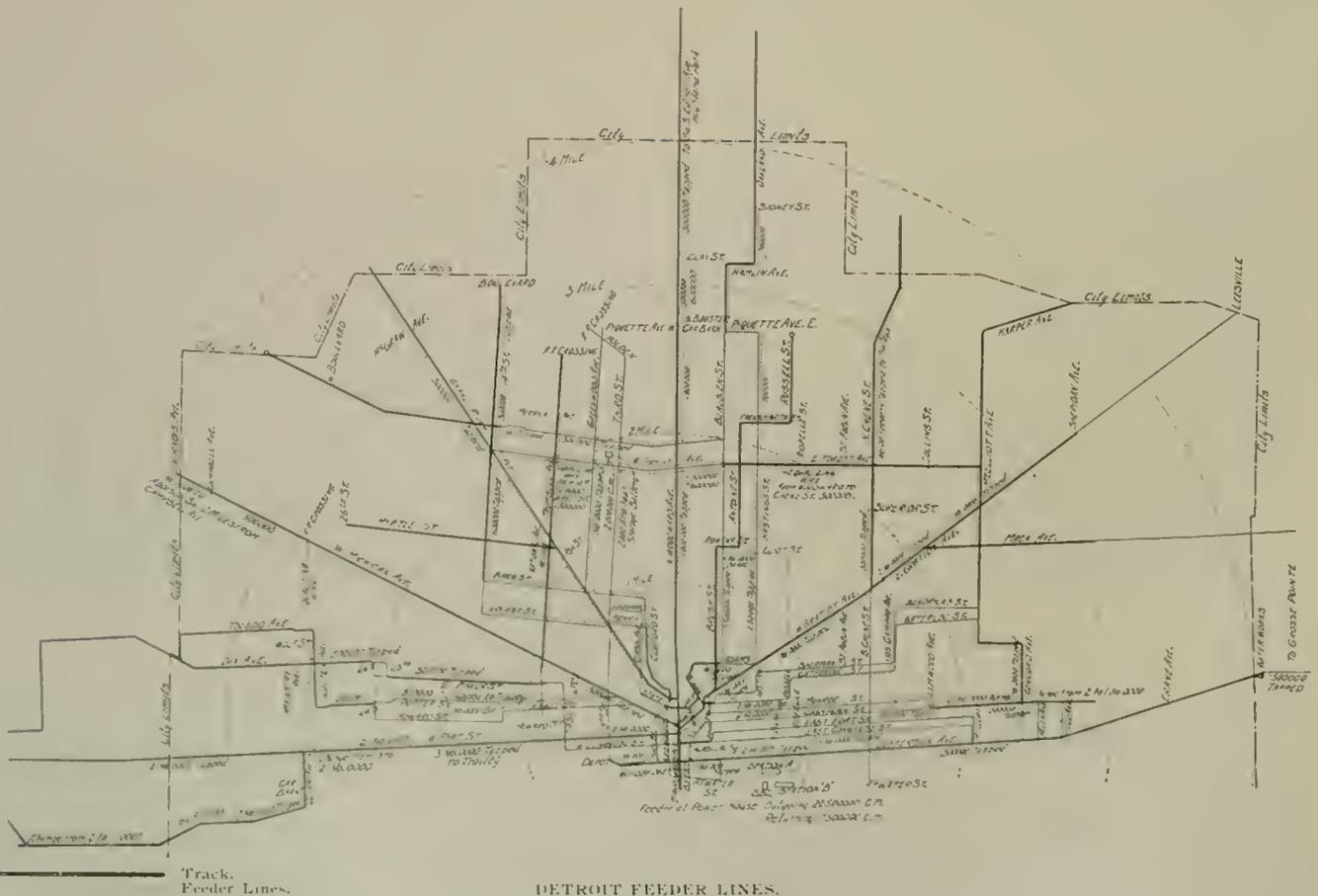
being left on the card for one full minute. The card shown in Fig. 3 was obtained in a similar manner with the battery on the system.

The battery has been in constant service of the most severe character ever since it was first installed, and has probably had, in doing so, as exacting a service as any railway battery in the country.

This battery is located across the street from Station "A;" the booster and switchboard being located in said power house and connected with the battery by means of cables which pass through a tunnel under the street.

Battery No. 2, known as Battery Station "H."

This battery is of 1,000-kw. capacity and consists of 250 "chloride" accumulators, each cell consisting of 52 type G plates in a G-76 lead-lined tank. There was also furnished with this battery a 150-kw. Western Electric motor-driven booster for regulating the charge and discharge. The discharge capacity is 2,000 amperes at



DETROIT FEEDER LINES.

500 volts for one hour, 1,000 amperes for three hours, or 500 amperes for eight hours.

This battery is located about three miles from the power house, and about two miles beyond the center of the railway company's city lines; it is used to help carry the morning and evening peaks, relieving in so doing the power house from a portion of the load, and also maintaining a better voltage throughout the portion of the city where it is located than could be maintained from the power house, without materially increasing the power house voltage. It feeds into the equalizing wire previously mentioned.

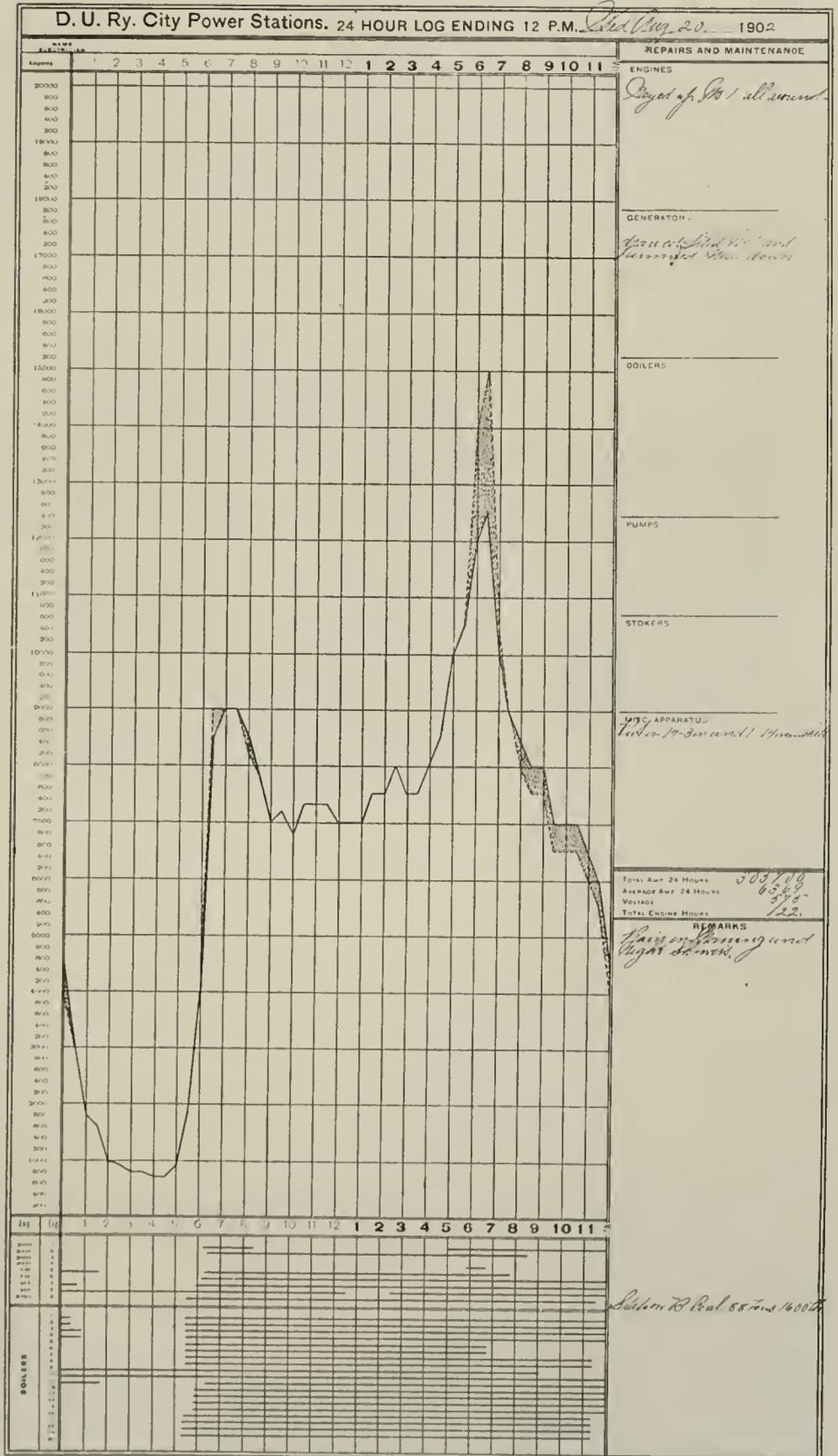
This battery was installed in January, 1901, since when it has been in daily use. Fig. 4 illustrates a typical day's load on this battery.

Battery No. 3, known as Battery Station "L."

This battery is of 150-kw. capacity, and is located at Ecorse, on the Wyandotte Division, the battery building being about 10½ miles from the power house. The battery installation consists of 276 "chloride" accumulators, type F-15; the plates being 11 by 10½ in., contained in glass jars mounted upon suitable stringers, which are in turn supported on brick piers. This battery is used for regulating purposes; the average voltage being 575, and the battery having 300-ampere capacity for regulating fluctuations. It can be used for operating the line without the aid of current from the power house to the extent of 280 amperes for one hour.

Previous to the installation of Battery No. 3 on this division a 30-minute service was operated, and the trip from the city limits to Trenton and return (a distance of 20¾ miles) required 90 minutes. Current was obtained for that service from the power house through a booster located therein. The voltage at the city limits end of the line under these conditions varied from 425 minimum to 800 maximum, and the amperage from 160 minimum to 600 maximum, the result being that electrical repairs on the cars used for this service were naturally excessive and the service not at all satisfactory as was desired. The lighting in cars was also exceedingly poor.

Since Battery No. 3 has been installed on this division the service has been increased to a 20-minute headway, and the run from the city limits and return, cut down from 90 minutes to 80 minutes, yet not with tarding the increase of car service and improved running time the voltage at the battery station, located about the center of the division, only varies from 520 minimum to 610 maximum, and the amperage required from the city power house from 160 minimum to 270 maximum, car repairs having also been re-



TYPICAL DAILY LOAD CURVE SHOWING COMBINED LOAD ON CITY POWER HOUSES IN CONNECTION WITH BATTERY CHARGE AND DISCHARGE.

duced to normal, and lighting and general car service being now of the most satisfactory character. A typical load curve of this battery is given in Fig. 5.

The Rapid Railway System.

BY F. W. BROOKS, GENERAL MANAGER, ASSISTED BY W. O. WOOD, GENERAL SUPERINTENDENT, AND A. C. MARSHALL, CHIEF ENGINEER.

The Detroit & Port Huron Shore Line Railway, generally known as the "Rapid Railway System," extends from the northerly city limits of Detroit to Keewahdin Beach, on the shores of Lake Huron, passing along the shore of Lake St. Clair and the St. Clair River and through the following towns and villages: Roseville, Grosse Pointe, Mt. Clemens, Chesterfield, New Baltimore, Anchorville, Fair Haven, Pearl Beach, Algonac, Roberts' Landing, Cherry

overhead line work and track bonding; general freight and passenger agent, reporting to the general manager; general claim agent, reporting to the general manager; auditor, reporting to the general manager; attorney, reporting to the general manager.

The Rapid Railway System is in a strict sense an interurban rather than a suburban road. The first step toward the construction of this line was the completion of the Rapid Railway from



W. O. WOOD.



F. W. BROOKS.



A. C. MARSHALL.

Beach, Marine City, St. Clair, Maryville and Port Huron. The various steps in the formation of the system, with the names of all the constituent companies, are shown graphically in one of the accompanying tables. The system comprises a total of 113 miles in operation and 10 miles under construction. A close relationship exists between the Rapid Railway System and the Detroit United Ry., and the two properties are operated in entire harmony.

The operating organization is as follows: General manager, who reports direct to the president; general superintendent, who reports to the general manager; two division superintendents, one roadmaster, one chief and two assistant train dispatchers, reporting to the general superintendent; one chief engineer, reporting to the general manager, he having charge of the power plants, car shops,

Detroit to Mt. Clemens. After this line had been operated for several years, an extension from Mt. Clemens to Port Huron was completed and operation commenced in the summer of 1900. The City Electric Railway Co., embracing all of the city lines in Port Huron, was taken into the System July 1, 1901.

The line is practically level, there being no grades of any consequence. The standards of construction which have been followed are those which are most approved by the steam railroads. The organization of the force in the road department is based upon steam railway practice, dividing the line into sections, each under the charge of a section foreman, these foremen reporting to the roadmaster, who is in charge of the road department of the entire line.



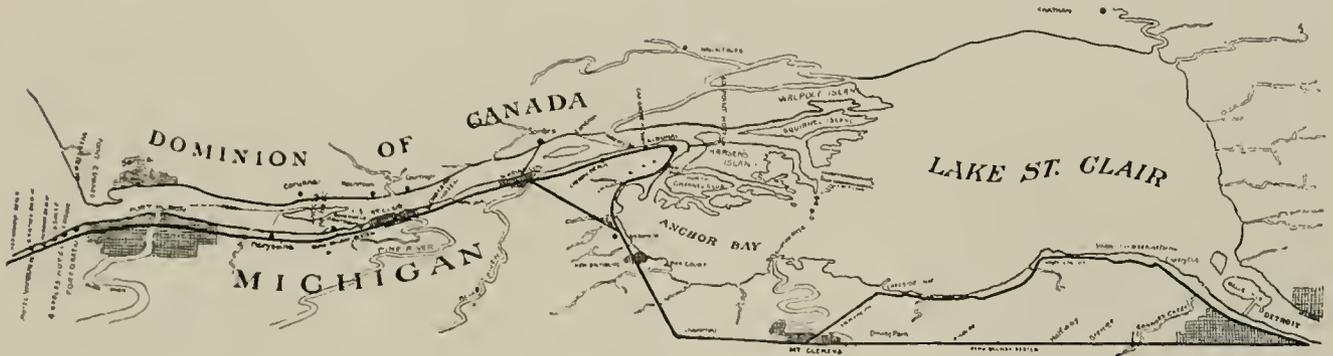
TYPICAL SCENE ON THE BEACHES SERVED BY THE RAPID RAILWAY.

The track outside the cities is laid with rails of A. S. C. E. standard 70 and 60-lb. section, according to the requirements of the traffic. The ties are 6 x 8 in. x 8 ft. cedar for the tangents, and the curves are laid on white oak ties of the same size. Switches are standard railway split switches, with spring rail frogs of standard construction. Gravel from deposits found along the line is used for ballasting.

The few places where bridging is required are provided with pile trestle, none of them consisting of more than one bent, excepting in the case of a viaduct over the Michigan Central R. R. at St. Clair, where a trestle supporting the elevated track provides against the possibility of crossing accidents. This is the only place where the line crosses another railroad at grade.

Its route follows the shores of the St. Clair Flats, one of Detroit's famous fishing, hunting and outing regions.

The movement of cars is under a system which is a modification of the standard code of train rules of the American Railway Association. South bound regular trains are given right of track, which continues until a train is three minutes late. The movement of extra trains and of regular trains which for any reason are not running on time, is looked after through a regular dispatching system. The dispatching is done by telephone from the dispatcher's office at Mt. Clemens. The orders are received at telephones in booths provided at each switch and at other places where it is convenient to receive orders. The orders are given by the dispatcher to the motorman, are repeated by the motorman to the



BIRDSEYE VIEW OF RAPID RAILWAY SYSTEM.

In the cities the standard of construction is a 7-in. T rail of the Lorain Steel Co., section No. 264, placed upon a 10-in. stringer of concrete and fastened with bar iron ties.

Car barns are provided at terminals of runs, namely, Port Huron, Marine City, and Mt. Clemens, and are well equipped for purposes of the machinery department.

Transportation Department.

The Rapid Railway serves the travel between Detroit, Mt. Clemens, New Baltimore, Pearl Beach, Algonac, Marine City and Port Huron, and provides a city service in Mt. Clemens and in Port Huron. An hourly service between 6 a. m. and midnight is main-

dispatcher, and likewise repeated by the conductor. A train sheet kept by the dispatcher and also a complete copy of each order retained in the dispatcher's order book provide against any question as to what movement is ordered. Motormen and conductors receive their orders relative to the movement of trains from the dispatcher, but report to their respective division superintendents, who are in authority over all train men.

In the employment of men an application in detail, giving the previous history of the applicant and certificates from persons to whom he refers and certificates of his physical qualifications are required.

The company requires from both conductors and motormen re-



CAR HOUSE IN PORT HURON RAPID RAILWAY.

tained over the length of the interurban line between Detroit and Port Huron, and a half hourly service over that portion of the line between Detroit and Mt. Clemens, the cars reaching the Detroit City Hall over the direct Gratiot Ave. line of the Detroit United Ry. In addition to this line hourly service is maintained over the Shore Line Division from Detroit, via Grosse Pointe farms and the Lake Shore to Mt. Clemens, carrying passengers to the Country Club and various club houses and resorts along the shore. In addition to its regular all year round traffic, the system enjoys an exceptionally heavy summer business, its territory between cities and towns being practically one great summer resort.

ports of every mishap or unusual occurrence. The questions which they are required to answer are such as will give as intelligent and comprehensive an idea of the circumstances as can be given in concise form. This report is followed by an investigation and a detailed signed statement from the employe, giving every particular, setting forth the circumstances in minute detail. These reports are filed for reference in the claim department, after they have served the purpose of the operating department. All claims resulting from personal injury or damage to property are looked after by the general claim agent.

All material and supplies are obtained upon requisition bearing

the signature of the head of the department and the approval of the general manager, through the purchasing department. Bills for material are approved by the head of the department for which the purchase is made and are vouchered and put through the accounting department in the usual course.

The City of Port Huron is well laid out for street railway purpose. To the extreme north are the beaches on Lake Huron, with heavy summer travel to the hotels, cottages and parks. The extensive repair shops of the Grand Trunk Railway System are in the northern end of the city, while at the extreme southern end are a number of factories. In the extreme western end of the city is the Union Depot, which is reached only by the street car service.

In Mt. Clemens the city cars connect with all interurban cars,

The building is a handsome brick structure, 110 ft. long by 80-ft. wide, taken up entirely by the engine room and boiler room, with a commodious basement under the engine room. The building rests on 40 ft. pile, capped by an extremely heavy stratum of concrete, so that under the entire building is practically a huge monolith.

The boiler room, 100 ft. by 38 ft., contains four Babcock & Wilcox 350-h. p. boilers, with Roney mechanical stokers; two Worthington boiler feed pumps; Green economizer; the circulating pump and dry air pump for the condenser and two 10-ft. direct connected fans for draft. These fans are depended upon for the draft, as the stack extends but 7 ft. above the roof.

A side track for coal is just outside the boiler room wall and about 8 ft. from the boilers. Coal cars are placed here every night

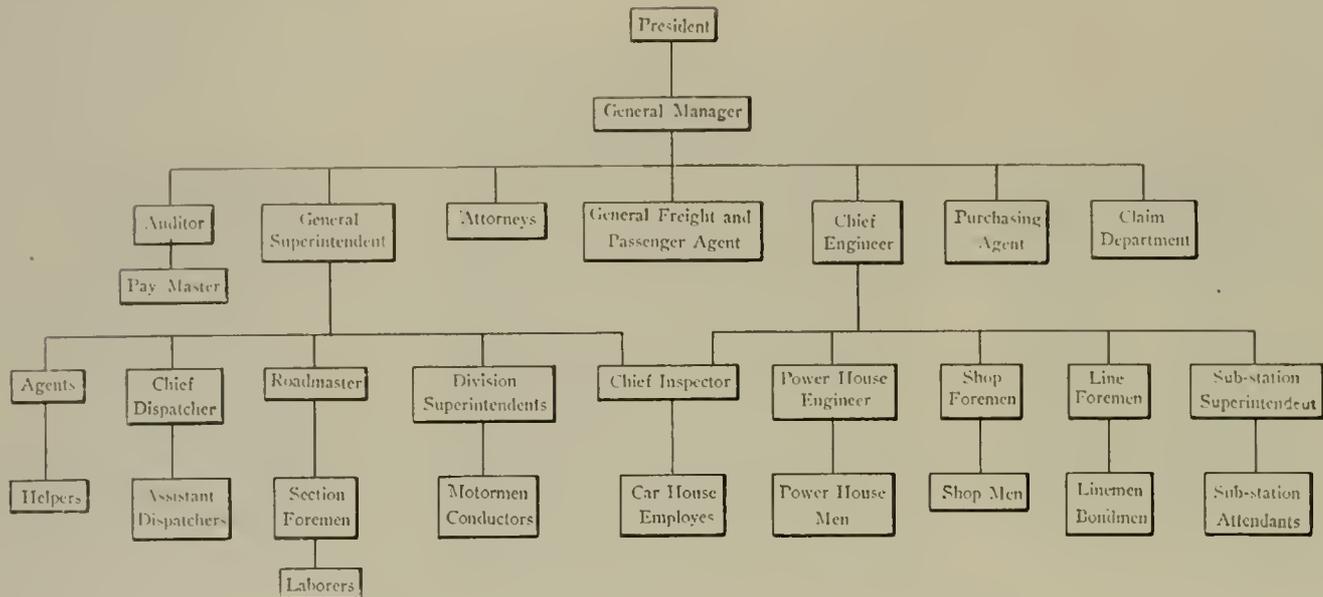


DIAGRAM OF THE ORGANIZATION OF THE RAPID RAILWAY SYSTEM.

serving the depots and hotels and in addition run frequent service to Lakeside, a fashionable resort on the shore of Lake St. Clair, about two and one-half miles distant from the city.

Power Equipment.

The general scheme of power equipment is to generate all the power at one large central power house, transmit it by means of high tension circuits to sub-stations located along the line, and there convert it to direct current. The main power house is located at New Baltimore, on Lake St. Clair. Here is generated all the power for the entire system, including the main line, the Lake Shore Division, and the Port Huron city system. The daily output at this station averages about 16,000 kilowatt-hours, this being generated in a 20-hour run.

by the freight locomotive, and during the run the coal is shoveled directly from these cars into the hoppers through large iron chutes. One man on a watch can in this way keep four boilers going. Although in normal running coal is thus used directly from the cars, there is always kept unloaded a reserve supply of coal of about 500 or 600 tons. Ohio and West Virginia slack coal is used and the coal consumption averages about 5.75 to 6 lb. per kilowatt-hour.

The water for boilers comes from Lake St. Clair, through a pipe which extends about 1,400 ft. into the lake, to avoid the mud nearer the shore. The water is quite soft, and is, in fact, remarkably free from lime and other undesirable ingredients. It undergoes no purifying process whatever, neither is any compound used in the boiler.

Epitome of the History of the Rapid Railway System.

(For relation existing between this system and the Detroit United Railway see text.)

The system was formed in the spring of 1900 by the merger of the following companies:

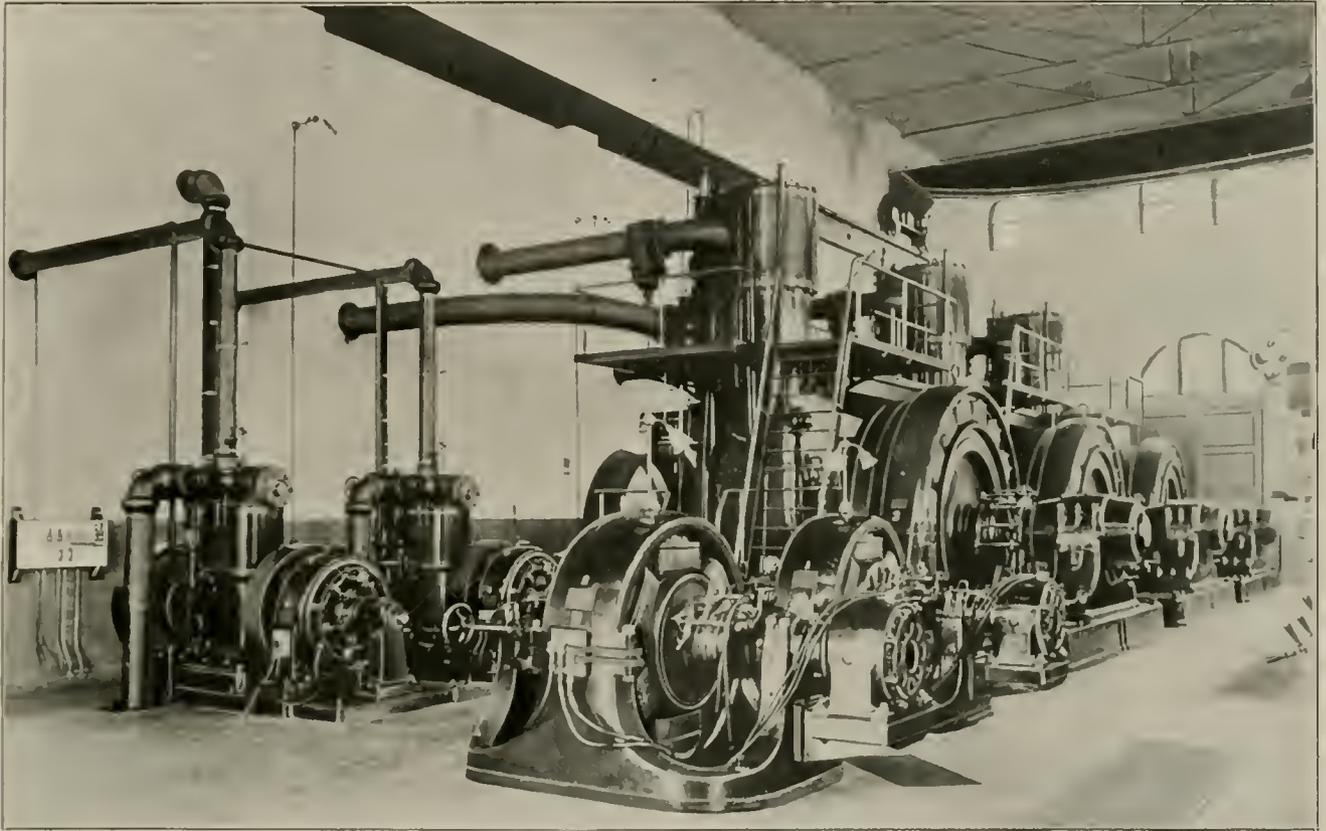
- THE RAPID RY.—Chartered March 1, 1894.
- THE DETROIT, MT. CLEMENS & MARINE CITY RY.—Chartered March 22, 1899, under the laws of Michigan. On Dec. 30, 1899, the company purchased all the properties of the following two companies:
 - MT. CLEMENS & LAKE SIDE TRACTION CO.—This company was organized June 30, 1895, as a consolidation of the Mt. Clemens Street Railway Co., Ltd., and the Mt. Clemens Lakeside Electric Street Railway & Dock Co., which two companies owned franchises in the city of Mt. Clemens, granted at various dates between 1890 and 1895.
 - THE DETROIT & RIVER ST. CLAIR RY. This company was organized Aug. 17, 1895. A receiver was appointed Jan. 9, 1897, and was discharged Dec. 31, 1899, at which time the property was purchased by The Detroit River & St. Clair Ry.
- THE PORT HURON, ST. CLAIR & MARINE CITY RAILWAY CO.—This company was organized Apr. 12, 1899.

- CITY ELECTRIC RAILWAY CO. OF PORT HURON.—This company was organized May 19, 1892.
- THE RAPID RAILROAD CO.—Organized Jan. 6, 1898, to build a connection between the Rapid Ry. and the Grand Trunk R. R. (For additional particulars see text.)
- THE CONNOR'S CREEK & CLINTON RIVER PLANK ROAD CO.—Organized Dec. 17, 1895. On Mar. 24, 1897, the company purchased all the rights and property of the DETROIT & ERIN PLANK ROAD CO., which had been organized on Feb. 7, 1857, as a consolidation of the Detroit & Erin Plank Road Co. (organized Apr. 3, 1848) and the Erin & Mt. Clemens Plank Road Co. (Organized Mar. 20, 1859.)
- DETROIT & LAKE ST. CLAIR RY.—Organized on Mar. 23, 1900, and on Mar. 24, 1900, purchased all the rights and property of the Detroit, Lake Shore & Mt. Clemens Ry., which had been organized in 1897, and built what is now the Shore Line Division of the Rapid Railway System.

The water for condensing purposes is taken directly from the end of the slip near the boiler room, through a 14-in pipe.

The engine room is 100 ft. by 42 ft., and contains three Westinghouse tandem compound engines 21½-in. and 37 in. x 22 in., sometimes designated as the World's Fair type. These are direct connected to three Westinghouse three-phase alternating current

For this purpose there are seven 400-kw. static transformers located in the basement of the engine room. These are connected in star connection. Three are used for the north line, three for the south line, and one is held in reserve. The generators, transformers, rotary converters, and lightning arresters are all of standard Westinghouse type. The engine room is provided with a



INTERIOR OF RAPID RAILWAY CENTRAL STATION—NEW BALTIMORE.

generators, rated at 500-kw. capacity, but capable of standing all the load that the 1,000-h. p. engine can carry. There are two exciter sets, each consisting of a 40-kw., 110-volt direct current generator direct connected to a Westinghouse compound engine. Each exciter is large enough to excite all three main generators and also light the entire building and grounds.

steam air compressor, and also with a traveling crane of 40,000-lb. capacity.

There are six sub-stations, counting the sub-station machinery in the main power house. These are located at Roseville, Mt. Clemens, New Baltimore, Algonac, Marine City and St. Clair. These stations are all substantial brick buildings, built for this

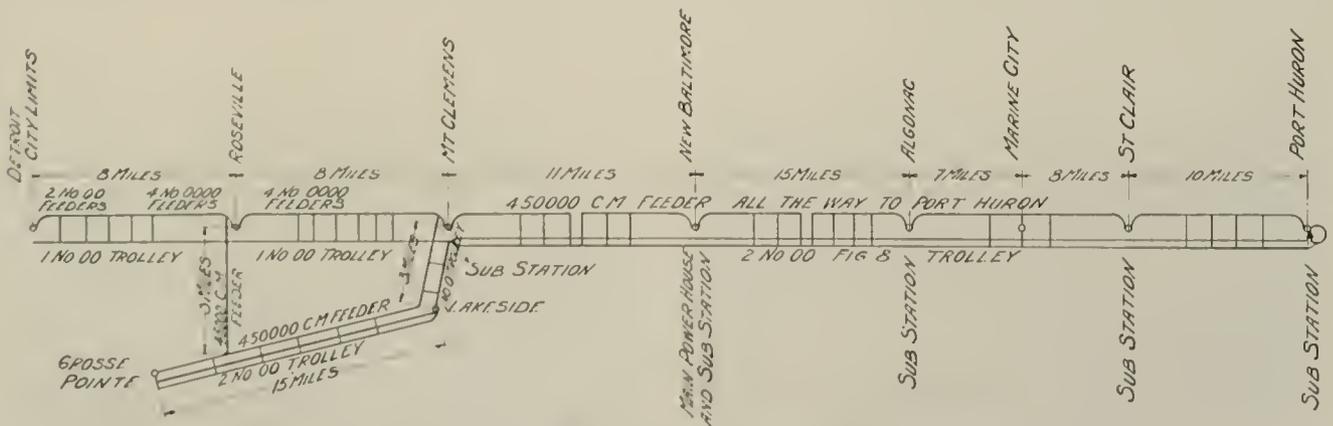


DIAGRAM OF LOW TENSION COPPER RAPID RAILWAY SYSTEM.

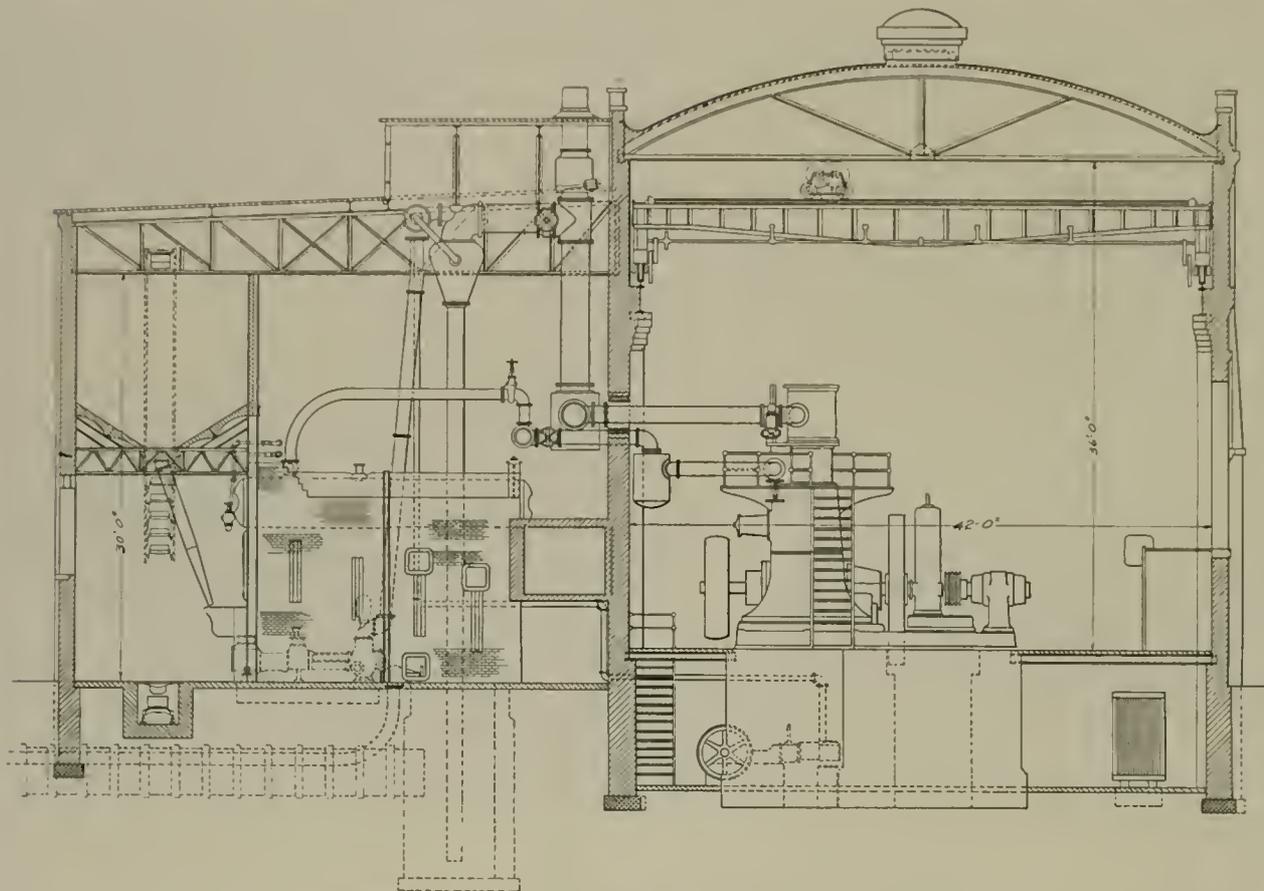
In the engine room there are also two 200-kw. rotary converters for supplying direct current to the trolley near the power house. These take alternating current directly from the bus-bars of the main switchboard. The alternators generate three phase current at 300 volts, and thus, after passing through the main switchboard, is stepped up to 10,000 volt for transmission to the sub-stations.

purpose, and most of them contain, in addition to the machinery room, a freight ware room, passenger waiting room and ticket office. The station at Roseville contains three 200-kw. rotary converters and six 150 kw. static transformers and the necessary switchboard. The high tension wires entering the building pass first through the choke coils and lightning arresters and then

through six high tension fused pole switches to the six transformers.

These transformers are connected in star connection and are grouped in two banks of three each and by means of the high tension switches and corresponding knife switches on the secondary side, either bank alone or both can be put into service. The transformers are of the oil cooled type, the coils being im-

sometimes it is hard to tell that any machinery is in operation. The floor in this station, and, in fact, in all the sub-stations, is hard maple, kept well oiled. This is considered much better, both in appearance and cleanliness, than concrete, for this type of station. Two men are required to run each sub-station, one on each watch. In addition to caring for the machinery these men act as station agents, selling tickets and attending to the general freight business.



CROSS SECTION NEW BALTIMORE STATION - RAPID RAILWAY.

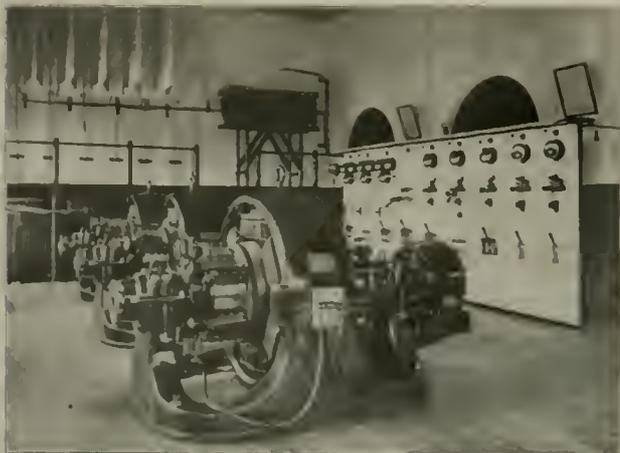
mersed in special transformer oil, contained in a corrugated iron case which radiates the heat rapidly. The temperature of these transformers rarely rises above 125° F., even on hot summer days.

The rotaries receive the three-phase alternating current at 390 volts and deliver direct current at about 600 volts. The pressure on the direct current side can be varied slightly by means of the field rheostat. All the rotaries are bolted to solid brick foundations, resting on a concrete sub-base, and they run so quietly that

The sub-station at Mt. Clemens is in the same building with the dispatcher's office, and the dispatchers look after the machinery. There are two 200-kw. rotaries and three 150-kw. transformers in this station; otherwise it is the same as Roseville.

The rotaries at New Baltimore are in the main power house and have been described.

Algonac is the next station, going north along the line. This is in the same building with the passenger and freight rooms, and



ROSEVILLE SUB-STATION - RAPID RAILWAY.



INTERIOR OF ALGONAC SUB STATION - RAPID RAILWAY.

is looked after by the station agents. Here there are two 200-kw. rotary converters and three 150-kw. transformers. Part of the time it is necessary to run both of these machines, but for the greater portion of the day one is sufficient.

St. Clair is the next going north, and is similar to Algonac in regard to operation by station agents, but it contains three 200-kw. rotaries and six 150-kw. transformers. Two of these rotaries are run all the time and one is held in reserve.

The last station is in Port Huron, at the extreme north end of the line. This station has just been installed, and it is the intention to furnish power from here for the Port Huron city system as well as the interurban cars. There are two 200-kw. rotaries and three 150-kw. transformers here, but there are foundations in for two more rotaries and three more transformers which may be installed later. This station is in the same building with the city ticket office and freight ware room, and the offices of the general superintendent and division superintendent are also here.

Line.

There is a carefully constructed high tension line about 60 miles long connecting these various stations with the main power house. This is divided into two entirely independent sections, north and south of the main power house respectively, and these are independent, even including the step-up transformers at this point.

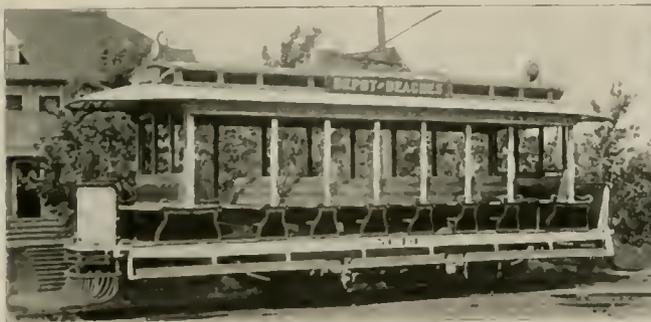
In addition to this, the high tension line can be opened at any sub-station, cutting out the line beyond that point, so that in case of trouble on the line one or two stations can still be operated, and at the same time the trouble is in this way very quickly located. The high tension wires are for the most part, on the same poles carrying the trolley and feeders.

The standard construction is a 35-ft. pole, with a 7-in. top. There is a 7-ft. cross arm at the top for the high tension wires, and a 5-ft. cross arm for the direct current feeders, placed 4 ft. below the top arm. Two of the high tension wires are carried on the arms



150-FT. MASTS CARRYING HIGH TENSION LINES OVER PINE RIVER RAPID RY.

Through Mt. Clemens and Marine City, the high tension line leaves the main line and is carried around the city on an independent pole line, in order to avoid the high trees, buildings, etc., in the central part of the town.



CARS FOR CITY SERVICE IN PORT HURON LACLEDE CAR CO.

and the middle wire is mounted directly on top of the pole. Locke porcelain insulators are used, some being No. 3 and some No. 4, the latter being considered the better. These insulators are carried on iron pins with a wooden thread and a porcelain base or sleeve surrounding the iron bolt. The wires are not arranged in an exact equilateral triangle, but they are transposed about every three



RAPID RAILWAY PASSENGER CAR—G. C. KUILMAN CAR CO.

miles. No. 1 bare copper wire is used for the entire distance for the high tension line, and the loss, at 10,000 volts, is practically negligible.

In St. Clair it was necessary to cross Pine River, a navigable stream, up which large vessels pass, having masts sometimes more than 120 ft. high. Rather than put submarine cable under this river for the high tension current, two poles were erected, one on each side of the river, each 150 ft. high and about 220 ft. apart, and the wires are carried on these.

The distribution of the direct current from sub-stations to cars is effected by a system of trolley and feeder wires. From Mt. Clemens to Port Huron on the main line there are two No. 00 trolley wires of Figure 8 section, and one bare-stranded copper feeder of 450,000 c. m. The trolley wires are carried on 9-ft. iron brackets, except through towns, where span wire construction is followed.

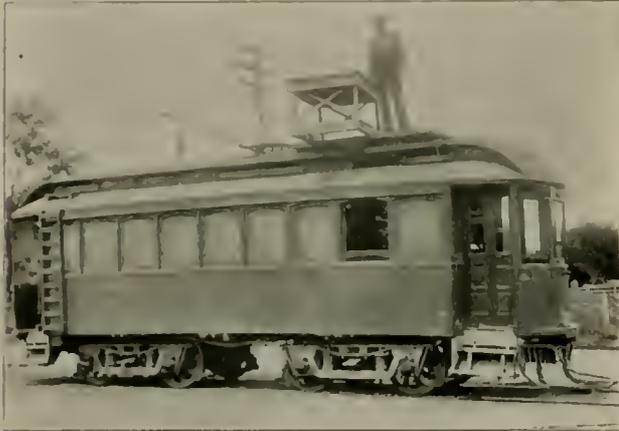
The feeder is carried on a cross arm placed 4 ft. below the high tension arm, and is tied to glass insulators on oak and locust pins. This feeder runs practically the entire length of the line, and is brought into the switchboard at each sub-station through two feeder panels. There are no taps between feeder and trolley within a mile of each sub station. This not only gives a very uniform distribution of power, but is much easier on the rotaries than would be the case were there a short connection made between the trolley and rotary. It is practically impossible to get an absolutely dead short circuit on the machines. There is a circuit breaker in the trolley in front of each sub station shunted by a heavy switch mounted on the pole. In normal running this switch

is closed, so that the trolley is solid from one end of the line to the other, but in case of trouble it can be cut up into sections.

From Mt. Clemens to Detroit, on the main line, there is but one trolley, and there are from one to four No. 0000 feeders instead of the one large one, but the general construction is the same as north of Mt. Clemens. The trolley wire is about 10 ft. from the ground, and is attached to the hangers by clunch ears almost entirely. Mechanical clips were used at first, but these are being replaced with the clunch ears as fast as possible. In the Figure 8 trolley the joints are made with a riveted splice.

Car Equipment.

The passenger car equipment consists of 12 cars 55-ft. long over all and 9-ft. wide, and 18 smaller cars about 40 ft. long over all.



LINE CAR RAPID RAILWAY SYSTEM.

The large cars are used for through service on the main line, and the smaller ones for intermediate service, more local in character. Besides these there are in Port Huron City service 16 single truck open cars and 13 single truck closed cars, and in Mt. Clemens city service 2 single truck closed cars and one single truck open car. These single truck cars are from 25 to 29 ft. long over all. Of the long cars part were built by the G. C. Kuhlman Car Co. and part by the Barney & Smith Car Co.

All the interurban cars are equipped with air brakes, each car having an independent motor compressor. There are 10 Westinghouse air brake equipments, consisting of Westinghouse rotary

follows: Four No. 76 Westinghouse motors, with L-4 controller; four No. 38B Westinghouse motors with K-14 controller; two No. 76 Westinghouse motors with K-13 controller, and two 75-h. p. Walker motors with Walker controller.

The two No. 76 motors are mounted both on the rear truck while the two 75-h. p. Walker motors are mounted one on each truck. The four No. 76 motors are given the most severe service.

An accurate record is kept of the mileage of each car, and it has been found that a car will make 15,000 miles on one set of armature bearings before getting dangerously low. A medium weight grease is used in these bearings and grease is applied about every 50 miles while the car is running.

There are three different kinds of trucks in use under the large cars, i. e., Du Pont, Barney & Smith and Brill No. 27. A standard wheel has been adopted for all future use. This has a 3-in. tread with a small bevel on the edge, a 5 $\frac{3}{8}$ -in. flange, and weighs 580 lb. for a 36-in. wheel.

In addition to the passenger equipment there is an extensive freight and construction car equipment. There are four baggage and express cars. These resemble as nearly as possible in external appearance the regular passenger cars. They are equipped with four 50-h. p. motors each.

There are about 24 flat cars which are used in general construction work and in the fall these are fitted with sides 5-ft. high and are used to haul sugar beets, there being two beet sugar factories along the line, one at Marine City and one at Mt. Clemens, and the handling of the beets is an extensive undertaking.

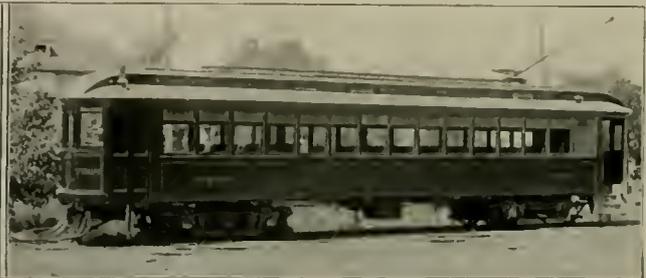
There are two single truck construction cars with motor equipment which are used for general hauling, and two line construction cars. All the line work on the 100 miles and more of line is done with these two cars, each manned by two men. In addition to this car equipment, the road owns two locomotives, ten freight and a way car, used in the steam freight business.

The repair shops are located at Roseville, and embrace a machine shop, carpenter shop, armature room, blacksmith shop, storage room, etc. The machine shop contains two good lathes, two drill presses, a shaper, emery wheels, etc., etc.

The armature room contains two coil winding machines, a press for shaping field coils, several hand presses for armature coils, a special machine for bending flat ribbon used in Walker armatures and the usual bench tools and banding reels.

There are five car houses along the line, located as follows: One brick barn at Roseville, capacity about 10 large 55-ft. cars; one brick barn in Mt. Clemens, capacity four large cars; one iron shed near Mt. Clemens, capacity 12 to 16 large cars; one frame barn at Marine City, capacity six large cars; one large brick and iron barn in Port Huron, capacity about 30 large cars.

The officers of the company are as follows: President, J. C.



MAIL AND PASSENGER CARS RAPID RAILWAY SYSTEM BARNEY & SMITH COMPANY.

motor-driven air compressors, and the rest are those of the Christensen Engineering Co., of Milwaukee. Each car is provided with a traveling trolley carriage and stand, by means of which the trolley stand can be moved from one end of the car to the other on an angle-iron track. This device is handled by H. L. Walker Co., Detroit, and is described elsewhere in this issue. All the cars are heated with the Peter Smith hot water heater, which has proved to be a very satisfactory and a very cheap method of heating. A self-oiling trolley harp and wheel is used which has given very good service, the life of some wheels being over 10,000 miles.

There are four different styles of motor equipment in use, as

Hutchins; vice-president, F. W. Brooks; treasurer, Geo. H. Russell; general manager, F. W. Brooks; general superintendent, W. O. Wood; chief engineer, A. C. Marshall; division superintendents, F. C. Hill, C. A. Culver; road master, A. N. Paisley; general foreman motive power and car department, Chas. Mear.

PERSONAL.

Mr. F. W. BROOKS began his railroad experience immediately after leaving college, in 1882. In that year he entered the engineering department of the New Orleans & Pacific Division of the Texas & Pacific R. R., and remained with this road during its construction. He left this service to take up a similar position

with the V. S. & P. Division of the Queen & Crescent Route, during its construction. He was then appointed to a responsible position with the Yazoo & Mississippi Valley R. R., which was afterward acquired by the Illinois Central R. R., and remained in this service for some time, afterward entering the operating department. He remained in this connection some eleven years, resigning in 1895 to take charge of the Rapid Railway property. He now holds the office of vice-president and general manager of the entire Rapid Railway System.

Mr. W. O. WOOD, general superintendent, began his railway career in 1885, with the Louisville & Nashville R. R., and was employed in various positions in the operating and engineering

mechanical equipment on the entire property. Mr. Marshall is a graduate from the electrical engineering course of the University of Michigan, class of 1893, and during the past ten years has had extensive experience in electric lighting and railway work, in both constructing and operating departments.

MR. CHARLES MEAR is general shop foreman and has charge of all shop employes and all repair work.

MR. F. C. HILL, division superintendent, entered the service of the Port Huron, St. Clair & Marine City Ry. in September, 1898, in charge of construction forces. After this road was completed he was appointed assistant superintendent, and on Jan. 1, 1902, was promoted to the office of division superintendent.



CHARLES MEAR,
General Foreman.



F. C. HILL,
Division Superintendent.



A. N. PAISLEY,
Roadmaster.



C. A. CULVER,
Division Superintendent.

departments until July, 1889. He then became chief clerk in the general manager's office of the J. T. & K. W. system, at Jacksonville, Florida, remaining until April, 1890. He then served as secretary to the general manager of the L. N. O. & T. R. R. until October, 1890. From October, 1890, until July, 1897, he was engaged in the service of the Illinois Central R. R. as secretary to the second vice-president, J. T. Harahan, and as chief clerk in various offices of the operating department. In July, 1900, he resigned the position of trammaster on the Illinois Central, which he had filled for three years, to enter the service of the Rapid Railway System.

Mr. A. C. MARSHALL, chief engineer, has full charge of the

MR. CHARLES A. CULVER, division superintendent, became connected with the Rapid Ry. in 1896, as conductor. He was promoted to the office of assistant superintendent in March, 1900, and was made division superintendent July 1, 1901.

MR. A. N. PAISLEY, roadmaster on the Rapid Railway System, entered the railway service in 1885 as brakeman on the F. & P. M. R. R. He was employed in this capacity and as a laborer on track for two years, and as section foreman and as foreman of construction until 1899, when he entered the service of the Rapid Railway System as foreman of construction. He was appointed roadmaster in 1900.

EXPRESS SERVICE IN DETROIT.

Extract from article written for the "Street Railway Review" by George W. Parker, General Passenger and Freight Agent, and published in the "Review" for Jan. 15, 1902, page 25.

There are now 15 electric express cars, each from 35 to 40 ft. long, on the electric railways which center in Detroit, and serve the territory within a radius of 60 miles, giving all the various towns in that territory from one to three deliveries per day.

The business is all handled from a central depot near the heart of the city. For convenience a separate company known as the Electric Depot Co., was organized to erect and operate this depot, the various interurban companies doing business with the Electric Depot Co. in about the same way as steam roads now secure terminal facilities in all the leading cities through a Union Terminal company. The expense of the electric express depot are pro-rated to the various parties to the contract on a strict tonnage basis



G. W. PARKER

(irrespective of mileage), the parties using the depot being the interurban line controlled by the Detroit United Ry. (including the Rapid Railway System), and the Detroit, Ypsilanti, Ann Arbor & Jackson Ry. Each company furnishes its own cars and crews.

On the several divisions of the Detroit properties, agents have

been placed at principal points. Some are on a salary and others on commission, this depending in a measure on the size of the town and the prospective business. Experience has demonstrated that better results can be obtained on the salary basis. Where it has been found necessary to establish agents, they have been started on commissions, the change to salary being made when the agency has been developed to a certain standard. Where no agents are located, such as prepaid stations, small combination express and waiting room shelters have been erected, where the express and freight can be placed under cover until such time as owners call for it. All shipments for these prepaid stations are accepted entirely at owner's risk of delivery, and are so receipted for. The idea is to relieve the electric road of all responsibility for delivery after freight has reached its destination.

The milk business has also grown rapidly, and in order to properly handle it, it has been found necessary to operate special milk cars on the several divisions, which cars leave the outer terminal of the line the first thing in the morning, and pick up milk all the way into Detroit. The milk traffic is handled on regular milk tickets, which are all consecutively numbered and taken into account through the cashier's office. These tickets resemble an ordinary shipping-tag; they are perforated in the middle, the lower portion being detached by the conductor carrying the cans when filled, and the other portion being left on to pass the empty cans on return trip. This ticket is printed, showing the point of shipment, destination, shipper and to whom consigned, this information being on both portions of



INTERIOR ELECTRIC EXPRESS DEPOT, DETROIT.

ticket, eliminating the possibility of errors in delivery of cans when either filled or empty. These tickets are charged for at so much per ticket, according to the distance the milk is to be hauled.

The company's baggage business is increasing rapidly. Trunks are carried in the regular express cars at a flat rate of 25 cents, irrespective of distance. Arrangements have lately been made with a local transfer company in Detroit whereby baggage is transferred to any depot or steamboat landing or to any house address upon payment of 25 cents additional, the railway company and the transfer company issuing a joint check for this purpose. This ticket is 6½ in. long by 2 in. wide, and is divided by perforated lines into three divisions. One division is detached by the conductor of the express car; the second is detached by the driver of the transfer company, and the third, or "strap check," remains attached to the baggage until claimed. The railway company collects the whole amount of 50 cents for each piece of baggage carried, and at the end of each month redeems from the transfer company all checks in the latter's possession at 25 cents each.

A description of all the blanks used in the express department,



STANDARD FREIGHT AND EXPRESS CAR.

with reproductions of the various forms, will be found in the article referred to, published in the "Review" for Jan. 15, 1902.

The express department, except for the Detroit, Ypsilanti, Ann Arbor & Jackson Railway Co., is under charge of Mr. George W. Parker, lately connected with the Grand Trunk Railway system at Pittsburg, who is general express and passenger agent, and Mr. Albert Eastman, who has had considerable experience with the Grand Trunk and Michigan Central roads and who has recently



LOADING PLATFORM, EXPRESS DEPOT, DETROIT.

been appointed traveling express agent. The electric express depot at Detroit has been placed under the supervision of Mr. A. R. Patterson, as joint express agent. Mr. Patterson has had years of experience in local office work with the Michigan Central and consequently he is well fitted for the management of this depot.

SPEED, POWER AND EFFICIENCY CURVES.

BY E. J. BURDICK, ASSISTANT SUPERINTENDENT OF MOTIVE POWER, DETROIT UNITED RY., IN CHARGE OF OVERHEAD DEPARTMENT.

When the Detroit United Ry. took over the several interurban roads there was a continual demand from the operating and mechanical departments for information bearing upon the speed, power consumption and efficiency of the different car equipments. It was found upon investigation that there were but little practical data obtainable upon this subject, and there was but one thing to do. Consequently we started in to test out our different apparatus, and after several cut-and-try methods we adopted as a standard the curves reproduced herewith, as obtained from car No. 12 on the Flint Division. These are fair samples of the different tests we have made. Our tests are made upon cars in regular service, and give us data of great value, not only in car, power house, and line operation, but also in determining to a certain extent the size of equipment necessary, and the advisability of making cuts and fills upon our right of way to overcome objectionable power-consuming grades. Hence, we claim that a practical car test made over every division, is the keynote to the whole interurban railway proposition from an operating standpoint.

Our tests are all made with instruments of standard manufacture which are frequently checked for accuracy. It will be noticed upon the curves of car No. 12 that the power comes from three different sources. From the City Hall to the six-mile road, the line is fed by the main power house, located in the city; the length of the feeders is practically 7¼ miles. From the Six-mile road to Royal Oak, about 5½ miles, the line is fed from the power house at Birmingham, upon the Detroit & Pontiac Division. From Royal Oak to Rochester, 14.6 miles, current is fed from the power house located in Rochester, this section being handled by the help of a series booster. At Rochester is also located an inverted rotary which feeds into the high tension alternating current lines which run north to sub-stations located at Oxford and Atlas, a distance of 13½ and 31 miles respectively. The Oxford sub-station rotary



E. J. BURDICK,
Assistant Superintendent Overhead
Construction.

feeds directly into the line at 600 volts, and equalizes upon the line running south with the direct current from the Rochester power house at a point intermediate, depending upon the relative position of the load. The Atlas sub-station is also equalized upon the line with the Oxford sub-station.

The curve immediately below the feeder distribution plan shows the deviation from uniform schedule, and also the average speed in miles per hour. Both curves are laid in by space averages taken at every mile post.

The integrating wattmeter curve is taken in practically the same manner, but owing to the inability to read small variations, does not show the irregularity in power consumption that actually exists. The volt and ampere readings were taken every 10 seconds, and plotted in the curves on minute averages.

COMPARATIVE CAR TESTS—FLINT DIVISION.

Date	Car	Time, hours	Stops	Stops per mile	Total Kw. h.	Kw. h. per mile	Watt-hours per ton mile
Feb. 25, 1902	No. 10	3.57	43	.65	111	1.64	49.6
July 24, 1902	No. 12	3.25	41	.60	113	1.68	50.9

The cars were each 51 ft. long over all, 8 ft. 9 in. wide, equipped with four Westinghouse No. 56 motors and K-14 controllers, mounted on Brill No. 27 trucks and weighed 33 tons.

Full data regarding the car tested will be found beneath the curves. In the small table will be found the results of two tests taken at different times.

It is found that there is a great deal of detail work preparatory to these tests, such as checking of all instruments and thoroughly instructing all assistants who take readings and make observations, as to just what their duties are, and impressing upon them the necessity of each one doing his duty—nothing more and nothing less. Upon these instructions depends the entire success of the test, as during the progress of the test there is no time for explanations or extra readings.

In closing I wish to state that I hope in the near future this subject will receive a greater amount of consideration than it has in the past. I am firmly convinced that actual running tests upon apparatus in regular service is what the average general manager and electrical engineer is after.

THE ELECTRIC RAILWAY TRAVELING EXPRESS AGENT.

BY A. EASTMAN, TRAVELING EXPRESS AGENT, DETROIT UNITED RY.

To properly represent his company, and to be able to deal intelligently with all matters pertaining to the handling of express traffic by electric car, a knowledge of the general rules of transportation is the first and most important requirement of a traveling express agent.

He is the connecting link between the company and the patrons of that department, incidentally receiving complaints from patrons of all imaginary wrongs, and making an effort to adjust to the satisfaction of both company and patron all actual grievances or existing wrongs.

It is also very essential that the traveling express agent shall have as extensive and favorable an acquaintance, as possible, with the business men and shippers at all points reached. The day of obtaining traffic for your company through the medium of a "jolly" is past, and in order to obtain your proportion of the business you must be able to show the prospective patrons some good reason why they should patronize your line. This is particularly hard to do in towns where the service of other transportation companies has already been established, and continues satisfactory. Unless you are in a position to give a better service than your competitors you cannot expect a business house or shipper to route shipments your way.

Even should your line offer no inducements by way of reduced rates, or a more frequent service, one point still remains that will recommend itself to your prospective patron; namely, that the Electric Express Co., being exclusively a local institution, the combined efforts of all persons employed in that department, from

general express agent down to messenger, are being exerted towards perfecting as complete a local transportation company as possible. Giving all their time and attention to the local traffic the result should be a very satisfactory service to the shippers and merchants in the smaller suburban towns, and a service that should be highly appreciated by all dealers in the larger towns and cities reached; also from the fact that the head of the department can be reached and arrangements entered into much more readily than can be done with the larger transportation companies.

After becoming acquainted with the prospective patron and making it clear, for the reasons just outlined, and as many others as can be mentioned, why your company should receive the preference over your competitors, and taking it for granted this prospective patron is willing to have his future shipments come via your line, a signed routing order, such as shown in the accompanying illustration, should be obtained. This is simply a signed order on shipper by consignee asking that all future shipments be forwarded via your line, and is very important, as shippers will always respect the request of a buyer as to the route goods are to be forwarded, and will decline to change routing, unless requested to do so by the buyer.

Having obtained a routing order from the consignee, and placed it with the consigner, you should make an effort to see that such shipments are properly handled, and continue to move over the road you represent. The latter information should be obtained from the local agent, as he is in a position to know the moment any of your business is being diverted to some other line, and should keep you well informed on this point.

The closest possible relations should exist between the traveling express agent and local agents, as it requires their co-operation to obtain new business and retain same after it has been acquired.

As the business transacted on electric lines is exclusively local, the company cannot afford to engage an experienced local express agent at all points, or, in other words, cannot afford to pay a salary large enough to permit the local agent to devote his entire time and attention to the Electric Express Co.'s interest. This makes it necessary that the traveling express agent shall call on local agents as often as possible, and give whatever information and assistance are required to keep both business and station accounts in as good shape as possible.

The traveling express agent should also do everything possible to keep posted, and in turn advise the head of his department, of all prospective shipments, and make an effort to obtain such shipments for his company. This can be done in various ways. The first and best way is to see the party controlling the routing of such shipments, and explain why his company should receive the preference.

One of the most worthy points to bring forward is the fact that electric express cars are so built and equipped as to make it much safer to ship goods liable to damage by breaking, etc., via the electric line.

If possible to do so, call on farmers and local dealers, and place before them the advantages of shipping their produce to the cities via electric cars, as compared with the usual manner of hauling by wagon, or sending by regular express companies.

The traveling express agent can also call on dairymen, and if a milk service is given, show them the advantages of shipping on an electric car passing, in many cases, in front of their farms, and putting the milk in the city in from one to two hours, thereby saving time and money ordinarily spent in taking the milk to regular depots.

Last, but not least, the traveling express agent should keep before patrons that as the traffic carried is exclusively local, and the Electric Express Co., being a strictly local institution, and having no through traffic to fall back on, it is very necessary that in order to maintain a satisfactory service, or, in fact, any service at all, the Electric Express Co. must receive the patronage of the local mer-



A. EASTMAN.

chant and shipper, and there are few business men, local dealers, or farmers, who do not realize that competition is the life of trade, and that the electric express has solved for them a question that has long been a perplexing one, namely, furnishing the farmer a means of delivering his produce into the heart of the city, and in the markets with the least possible delay and in first-class condition, and afford-

ing the wholesale houses the same means of placing the daily necessities of life in the small suburban towns, and at the country cross-roads and farmers' homes, making it possible for the farmers to sell their produce at a better margin than heretofore, and buy in turn their daily necessities and luxuries at a greatly reduced price, owing to the avoidance of the usual long haul from the railroad station.

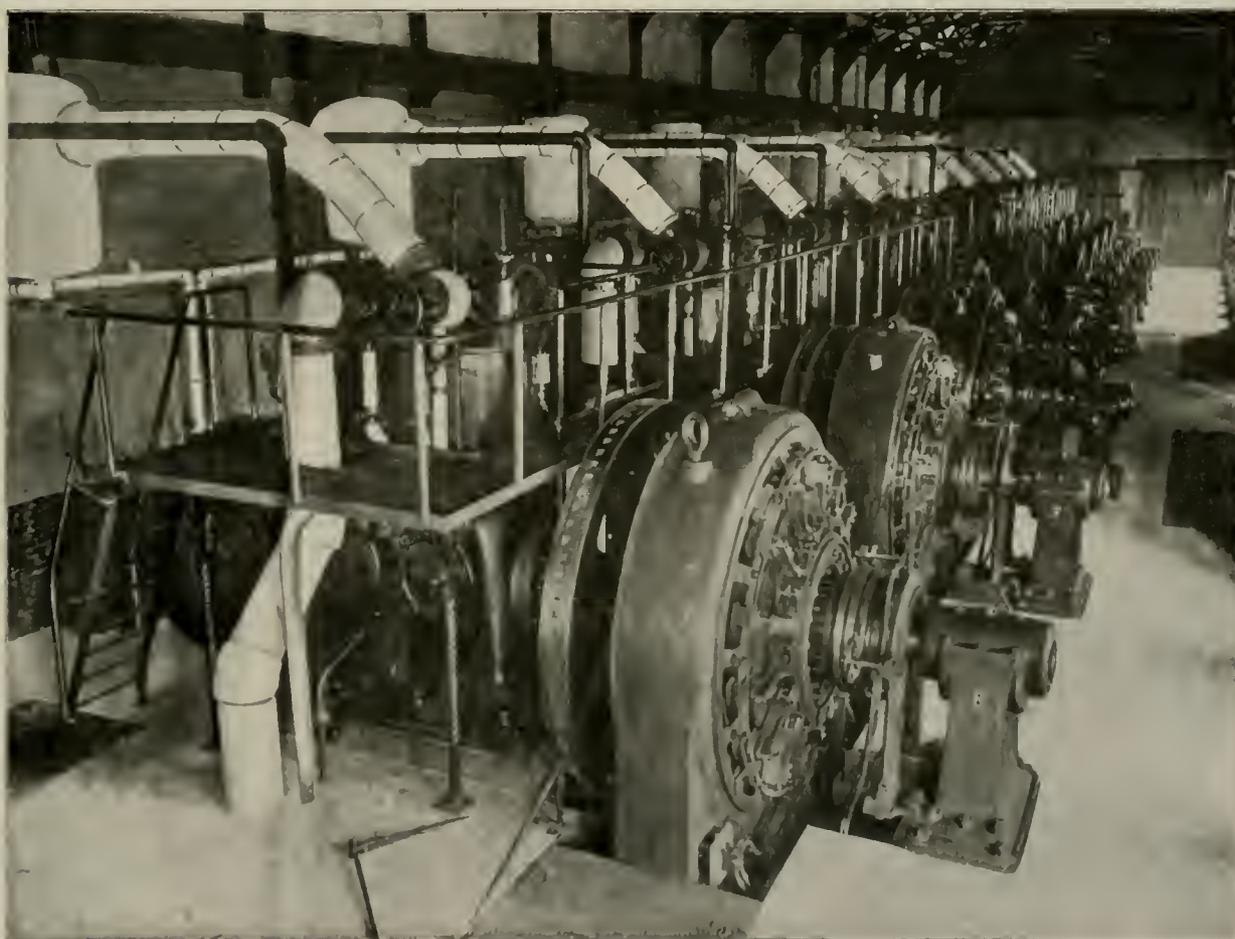
The System of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway.

BY F. E. MERRILL, MANAGER.

The Detroit, Ypsilanti & Ann Arbor Ry. was probably the pioneer long distance electric railway in this country, it being the first inter-urban road to construct 40 miles of track. The company was organized in 1897, and on December 24th of that year the first 10 miles of road was in operation from Detroit to Dearborn. During the summer of 1898 the line was extended to Ann Arbor, an addition of 30 miles. During the season of 1899 the Ypsilanti and

being one of the oldest towns in the state, having been settled in 1705. Located within its borders is a large sanitarium known as St. Joseph's Retreat, which accommodates 500 patients; the beautiful grounds and buildings make it one of the distinctive features of the village.

Eloise (the seat of the Wayne County House), is a pretty little station located on a miniature lake 15 miles from Detroit. The



INTERIOR DETROIT, YPSILANTI, ANN ARBOR & JACKSON POWER STATION WESTINGHOUSE ENGINES AND GENERATORS.

Saline line was built; this extension of 10 miles combined with the City Ry. in Ann Arbor, which had been purchased, made up a system of 60 miles of road.

In January, 1901, the Detroit, Ypsilanti, Ann Arbor & Jackson Ry. was incorporated and acquired the property of the Detroit, Ypsilanti & Ann Arbor Ry. An extension to Jackson, about 40 miles, was built during the summer and fall of 1901.

The road from Detroit to Ann Arbor is constructed in the highway along what is known as Michigan Ave. West of Ann Arbor the construction is on private right of way.

Many interesting features along the route are well worthy of attention. The village of Dearborn is a picturesque town 10 miles from Detroit, with a population of 1,000, and has the distinction of

surrounding country and the public buildings make this a particularly attractive spot, which is visited daily by excursionists.

Wayne, 18 miles from Detroit, is an enterprising town of 2,000 inhabitants; large manufacturing interests are located here, including a carriage works employing about 300 men. The town has a number of brick business blocks, several churches, fine schools, parks, etc. It is also on the line of the Pere Marquette railroad, and through connections for the North and South are made with the electric cars.

Ypsilanti, the next place of note, is 30 miles from Detroit. The large and modern power house and car barns of the company are located here. This city has a population of 8,000, and is situated on the banks of the picturesque Huron River. Its manufacturing in-

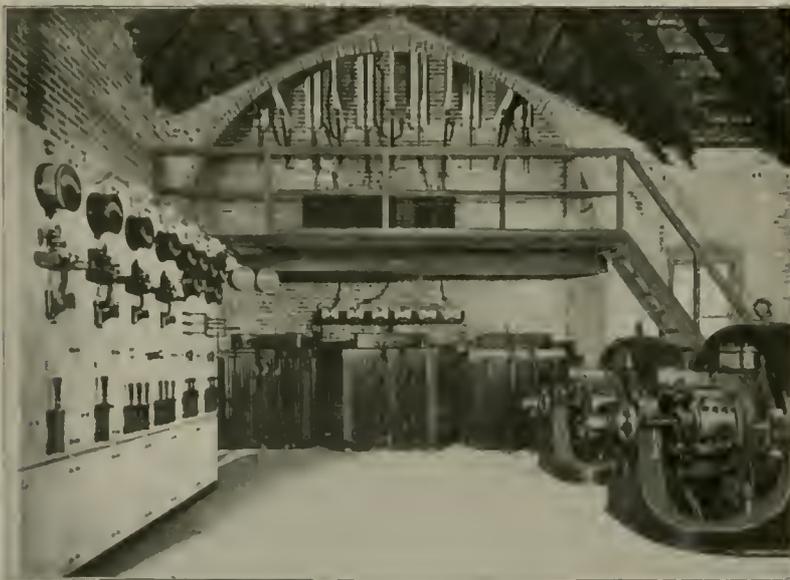
terests are many and varied. The fine buildings of the State Normal College occupy a commanding site overlooking the city, the attendance at this popular school averaging 1,200. The Cleary Business College, with an attendance of 300, is another educational institution attracting students from all parts of the state.



OFFICE BUILDING YPSILANTI LINE.

Ann Arbor, 40 miles west from Detroit, is first of all a university town. The University of Michigan, with its 4,000 students, ranks with the leading universities of the country, its beautiful art gallery and fine library; its museum and modern gymnasium being some of its attractions. Nature and art have combined to make Ann Arbor an unusually beautiful city. There are also many manufacturing industries.

Chelsea is a pretty village of 2,000, 54 miles west of Detroit, embracing a number of manufacturing plants, and is noted for its beautiful homes. The people are very enterprising and have succeeded in making their town a modern one, with electric lights, etc.



INTERIOR OF SUB-STATION.

The visitor is impressed by the up-to-date business blocks and general appearance of prosperity.

Grass Lake is located 59 miles west of Detroit. It is a very pretty town, and its population of 1,000 is made up largely of retired farmers and general business men. It has two factories which em-

ploy about 100 men. The town derives its name from the lake near which it is situated.

Jackson, the western terminus of the line, has a population of 25,000, not including those temporarily disfranchised and involuntarily confined within the walls of the State Penitentiary, located here. Jackson is a railway center for several of the great trunk lines of the west; it has large manufacturing interests and is a modern city.

The territory traversed by the lines of the Detroit, Ypsilanti, Ann Arbor & Jackson Ry. is one of the richest and best agricultural sections in the state, and all of the adjacent property is under a high



SUB-STATION, SHOWING TOWER FOR HIGH TENSION WIRE.

state of cultivation, and the fruit shipments add materially to the revenues of the railway.

Track Construction.

The total mileage is about 100 miles of single track of standard steam railroad construction. The track is laid with 75-lb A. S. C. E. standard T-rails, with 42-in. angle bars on 8-ft. cedar ties, 2 ft. c. to c., gravel ballasted. There are two substantial steel bridges at crossings over the main line of the Michigan Central R. R., one over the Rouge River, and one over the Huron River.

Rolling Stock.

The rolling stock consists of 33 closed cars and four open cars built by the Barney & Smith Manufacturing Co., of Dayton, O. The length of these cars is 52 ft. over all. The closed cars are similar to the standard type of steam railroad coach made by the Barney & Smith company, with a seating capacity for 56 people. There are two compartments, a smoking room 12 ft. long, and a passenger compartment, 32 ft. long, finished in oak. The seats have rigid backs and are upholstered in plush. Trucks are the Barney & Smith pattern, equipped with four Westinghouse motors to each car. Some of the coaches are fitted with 50-h. p. motors, and some with 75-h. p., giving from 200 to 300 h. p. to each car. Pinions and gears are made of steel, and are furnished by the Ohio Brass Co., and the Westinghouse company.

The company is using in its high speed work a special roller-bearing, self-lubricating trolley wheel with marked success. The wheels are made by an Ypsilanti brass foundry from specifications supplied by the railway company.

One of the half-tone engravings shows the wheel and bearings. The greatest diameter of this wheel is 6 in. from flange to flange, and the bearing drum is 17½ in. in diameter. Within the drum are six steel roller pins, ½ in. in diameter and 1½ in. long. The spindle (shown in the engraving) upon which the

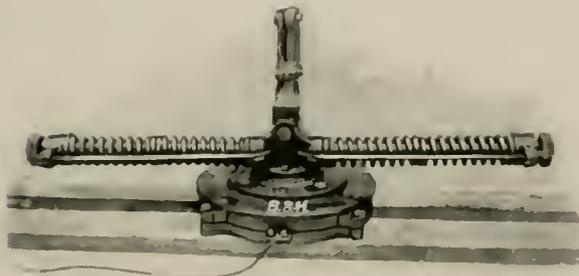
steel rolls turn is a case-hardened steel pin $\frac{1}{2}$ in. in diameter. When the rollers and the spindle are in place, the entire bearing drum is filled with grease of special make and the bearing cap is screwed into place, as shown in the assembled wheel. The groove for the trolley wire is U-shape instead of V-shape, and the harp used in connection with the wheel has all its corners rounded so there are no projections to catch in the overhead work.

The trolley base is also a special design, made by the United States Electric Railway Supply Co., for which the Henry L. Walker Co., 40 to 44 East Larned St., Detroit, is sole agent. This base is in reality a small turn table, on which any form of trolley stand may be mounted. It consists of two circular plates, the upper one rotating

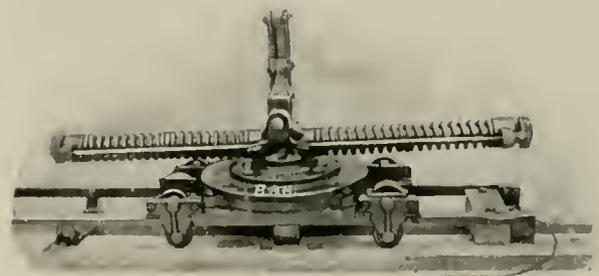
axles, it having been found that the more usual 4 and 4 $\frac{1}{2}$ -in. axles are too light for this rigorous interurban service.

Babbitt bearings are used for both armatures and axles. The brake shoes are also made at Ypsilanti, and the management has found that a good gray-iron gives best results. Just as the iron is ready to be poured into the shoe molds, a handful of steel chippings taken from the refuse under one of the shop lathes is thrown into the mixture, and this has been found to add 100 per cent to the life of the shoes. All cars are equipped with Westinghouse air brakes.

For fighting snow a heavy plate nose is bolted to the front of the regular passenger cars and these have been found to be as effective as separately propelled snow plows. With cars so equipped drifts reaching half way to the roof have been cut through without trouble,



STATIONARY TROLLEY BASE.



TRAVELING TROLLEY BASE.

upon the lower one through the medium of small roller casters. It is said to effect a considerable saving in trolley wheels, poles and overhead construction by reducing the chance of the wheel leaving the wire and by reducing the likelihood of damage to the overhead work when the wheel does leave the wire, inasmuch as the pole is free to swing or rotate, and therefore does not deliver a hard blow upon any part of the overhead work. In the new forms the base is entirely self-oiling. In some cases the base is mounted directly upon the roof of the car, and in others is mounted upon a narrow track of angle irons, attached to the roof and permitting the trolley pole and base to slide from one end of the car to the other, depending upon the direction of travel. The base may be moved to and fro on the small track by merely pulling on the trolley cord, and is held at either end by catches which can be unlocked by tugging on the cord. It will be evident, therefore, that all the movements of the base can be controlled from the ground.

and no great difficulty has ever been experienced in keeping the entire line open.

Car Houses and Shops.

The car houses and their capacities are as follows: At Dearborn, brick and steel, 6 cars; at Ypsilanti, brick and steel, 18 cars; at Ann Arbor City, corrugated iron, 6 cars; at Jackson, corrugated iron, 4 cars.

The general repair shops are in Ypsilanti. The construction is brick and steel, 102 ft. long and 67 ft. wide; the armature room, 48 ft. long and 27 ft. wide. The shop is thoroughly equipped for all kinds of repair work, a partial list of the tools comprising lathes, shapers,

On the heavy coaches the trucks have 36-in. spoke wheels weighing 575 lb. and having 2 $\frac{1}{2}$ -in. treads and 11-16-in. flanges. On the inner side away from the flange, the tread has a $\frac{1}{2}$ -in. offset. This form of wheel has been adopted after extended experiment, and has been found to fully meet the requirements. It might be remarked that the tread is somewhat narrow, and the flange somewhat shallow for high speed work, but these dimensions are made



TROLLEY WHEEL WITH AND WITHOUT BEARING IN PLACE

necessary owing to the grooved rail over which the cars enter the city, and also to fit the special work. The management believes it is better to run with whole 11-16 in. flanges than to operate with deeper flange that are constantly becoming chipped by running through special work. As a matter of fact the company has never had a wheel leave the rail as the result of flange or tread. On the contrary in one instance, when a car entered a curve at too high speed the car was lifted from the track and thrown to one side of the track without derauling one of the wheels. The spoke wheel was selected as being less noisy. Wheels are supplied by the Griffin Wheel Works.

In the line of greater safety the company is using 5 $\frac{1}{8}$ -in. steel

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boring mill, wheel press, wheel grinders, winding and taping machines. The paint shop is also located in Ypsilanti.

Passenger Service

Through cars are operated between Detroit and Jackson every hour from 6 o'clock a. m. to 9 o'clock p. m., and between Detroit and Ann Arbor every half hour from 6:15 a. m. to 11 p. m. On Saturdays and Sundays 15 minute cars are operated between Detroit and

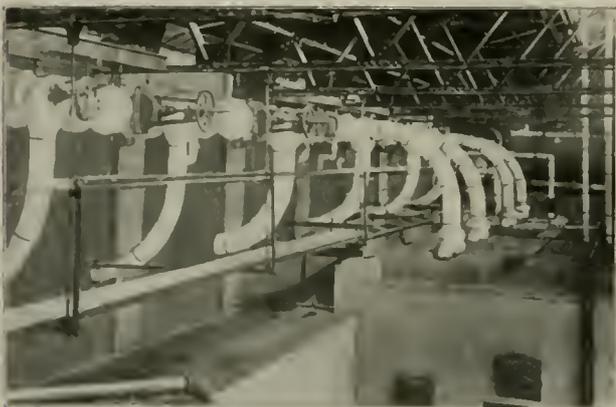


CAR HOUSE YPSILANTI LINE.

Wayne, as travel may demand. Special cars are chartered to private parties, and on special occasions. Regular cars stop at permanent stations and at street crossings in cities and towns and anywhere in the country where passengers may wish to take or leave the car.

Single and round-trip tickets are sold at regular stations, and a number of special forms are also kept on sale to suit various classes of riders. One hundred mile books are sold at the rate of 1½ cents per mile, and 1,000 mile books, good between Detroit and Ann Arbor, at the rate of 1 cent per mile. Formerly these books were made up of coupons, placed in page form, but these have now been abandoned in favor of coupons attached in one continuous strip and inserted between stiff cardboard covers. With the strips the conductor can more readily detach any number of coupons than can be done when the coupons are in leaves or pages.

For use when passengers pay fare on the cars the company employs the duplex ticket now commonly used for this work. A somewhat



HIGH PRESSURE STEAM PIPING.

new feature has been introduced, however, in that "mile posts" take the place of station names on the ticket. The conductor, in addition to the amount of fare collected, also punches the numbers of the two mile posts between which the passenger is traveling. The cash fare when paid on the cars is at the rate of 1½ cents per mile, but a somewhat cheaper rate is made on tickets purchased at the regular stations.

A special time table is printed for the government of employes and another one for public circulation. The movement of cars is directed by a central dispatcher over a private telephone system. Cars run according to time table until they become late, when their movement is governed by special orders from the dispatcher. As a special precaution against a motorman forgetting his orders, a small iron plate is laid on top of the controller, just under the controller handle. On one side of the plate are the words "No Orders," and on the other the words "Orders." The motorman before leaving a switch turns one or the other side up, as the case may be, and the words remain before him as a constant reminder of his instructions.

An extensive express and freight business is conducted by the company in addition to the passenger service. Express matter is carried under the official classification of the steam railways and the department is modeled largely after steam railroad practice. Three express cars are run each way daily between Detroit and Ann Arbor, and two between Ann Arbor and Jackson. The company uses the central electric depot in the City of Detroit, in conjunction with the several interurban lines of the Detroit United Ry. The management is inaugurating a small packet carrying business whereby packages



WAITING STATION YPSILANTI LINE.

will be picked up and left at any point on the line, instead of only at regular stations, as has been previously done.

The officers of the company are: President, J. D. Hawks; vice-president and treasurer, S. F. Angus; secretary, F. A. Hinchman; manager, F. E. Merrill; superintendent, S. J. Dill; master mechanic, J. M. Miller.

Power.

Power for the original railway from Detroit to Ann Arbor was furnished by two power houses, one at Dearborn, and one at Ypsilanti. These plants were described and illustrated in the "Review" for January, 1900. Each power house contained three 225-h. p. Babcock & Wilcox boilers, equipped with Roney mechanical stokers, three Westinghouse automatic compound engines, and three Westinghouse direct current 575-volt generators, connected to the engines by means of spring couplings. Boosters were provided in each station for raising the voltage on long feeders. Draft for the boiler plants was obtained by means of a mechanical draft plant, consisting of duplicate fans and engines, and each plant was provided with a fuel economizer.

To provide power for the extension of the line from Ann Arbor to Jackson and to obtain a more uniform and economical distribution of the power on the existing road, an alternating current system, with a main power house at Ypsilanti and six sub-stations was adopted. The Ypsilanti power house building was extended and all apparatus from the Dearborn power house, except the direct current generators, was removed to Ypsilanti. The old direct current generators at Ypsilanti were replaced by alternating current generators, and two additional units, including boilers, engines, and generators, were installed.

The power house at Ypsilanti is constructed of brick and steel and is located on the bank of the Huron River, water from which is used for condensers and boiler feed. The boiler room is 156 ft. long

by 36 ft. wide. The engine room is 156 ft. long by 31 ft. wide, and has an extension on one side 60 ft. by 18 ft., in which are located the static transformers, and the high tension wiring and apparatus for switching and protecting the same.

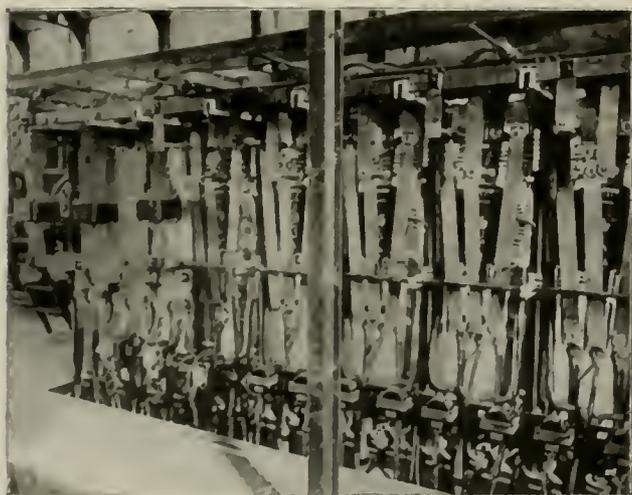
There is a basement under the entire engine room in which are the condensers and all exhaust piping.

The equipment consists of five 250-kw. 300-volt three-phase Westinghouse generators and three 250-kw. Westinghouse double-current generators, designed to furnish three-phase alternating current at 300 volts, and direct current at 650 volts, from each machine. All generators are direct connected to Westinghouse vertical single acting compound engines, having cylinders 18 in. and 30 in. by 16 in. stroke, and are operated at 250 revolutions per minute. The engines are operated condensing, and each engine is connected to an independent Worthington jet condenser.

The steam piping consists of one main steam header 10-in. in diameter, the ends of which are connected by an auxiliary header 3 in. in diameter, which serves to equalize the pressure on the header and to furnish steam to condensers, pumps, and auxiliary apparatus. The header is provided with valves between each boiler so that sections can be cut off without interfering with the operation of the plant. All pipe connections from boilers to header and from header to engines are made by long sweep pipe bends. All fittings on high pressure are extra heavy of cast iron, and all valves are extra heavy Chapman make. The water of condensation from the engine separators and steam piping is returned automatically to the boilers by means of a Holly gravity return system.

Exciting current for the generators, and also current for lighting offices, shops, and power house is furnished by two 50-kw. Westinghouse 125-volt direct current generators. Each generator is direct connected to a Westinghouse automatic compound engine having cylinders 9 in. and 15 in. in diameter by 9 in. stroke.

The boiler plant is arranged in two sections, each provided with its economizer and mechanical draft plant, engine for operating stoker, boiler feed pumps and exhaust steam feed water heater. The smoke flue, which is located back of the boilers, extends the entire length of the boiler room and is provided with necessary dampers so that either or both of the mechanical draft plants can furnish draft for the entire boiler plant. There are eight 225-h. p. Babcock & Wilcox boilers set in four batteries. The boilers are equipped with Roney mechanical stokers, operated by two 8-h. p. Westinghouse standard engines, which are also belted to a line shaft for operating the economizer scrapers. Mechanical draft plants are located at either end of the boiler room and consist of two fans and



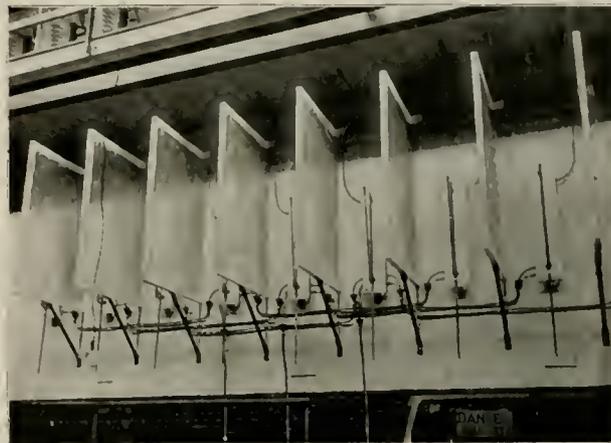
REAR OF DIRECT CURRENT SWITCHBOARD.

engine, and are provided with damper, so that either or both fans can be operated.

The boiler feed water is furnished by four outside packed pressure pattern Worthington pumps, two of which are operated at one time. The exhaust from the feed pump, condensers, and fan and stoker engine passes through exhaust steam feed water heaters, and the feed water, after going through these heaters, passes through the economizer.

Slack coal is used for fuel, about 40 tons being consumed daily. Coal is delivered on siding by the steam railroad and hauled to the power house by an electric motor car, where it is transferred to bins or coal pockets adjacent to the boiler room.

There are two switchboards which are of the Westinghouse standard type and are of white Italian marble supported by angle-iron frame. One of these boards is for the control of the alternating current system, and is made up of eleven panels, eight of which are



HIGH TENSION SWITCHBOARD WITH GLASS BARRIERS.

generator panels and three are feeder or transformer panels. On each generator panel is mounted one three-pole quick-break machine switch, one double-pole quick-break field switch, three alternating current ammeters, and one indicating wattmeter. The transformer panels control all the current from the eight generators to the transformers, and on each panel is mounted two 3,000-ampere switches, one time-limit circuit breaker, and one 6,000-ampere ammeter. A polyphase wattmeter is connected to the system and records the total alternating current output. This switchboard is also provided with two alternating current voltmeters and a synchroscope. One of the voltmeters is connected to the bus bar, and the second voltmeter to a system of receptacles so that the voltage of any generator can be obtained before it is thrown in. The synchroscope has been found to be a very valuable piece of apparatus, as it enables the station attendant to synchronize and throw the generator in without loss of time and with absolute certainty that the generator about to be connected is in phase.

The second switchboard is for the direct current system and consists of seven panels, three of which are generator panels and are for the control of the direct current end of the double-current generators. On each panel is mounted three single pole quick-break generator switches, one single-pole circuit breaker, and one ammeter. Three of the panels are for line feeders, and are mounted with one single-pole switch, one single-pole circuit breaker, and one ammeter. One panel contains necessary switching apparatus for two exciters. Two voltmeters are provided and are supported on a swinging bracket at one end of the switchboard. The switchboard also contains one recording wattmeter.

The alternating current is generated at 300 volts, three phase, at 3,500 alternations. Three 500-kw. Westinghouse self-cooling and oil insulated transformers, which are connected in delta, raise the voltage to 22,000 volts. At this voltage the current is transmitted to the several sub-stations by three circuits; one circuit of three No. 4 wires feeds east a distance of twenty miles, to Wayne and Dearborn sub-stations; one circuit of three No. 4 wires feeds west a distance of 30 miles, and supplies Ann Arbor, Lima Center, and Francisco sub-stations; the third feeder, consisting of three No. 3 wires, runs direct to Michigan Center sub-station, a distance of 41 miles. The circuits which feed the several sub-stations are looped into the sub-stations, and are connected through with fuse switches so that the line can be opened at any sub-station. All high tension wires at the power house and sub-stations are provided with high tension fuse switches. Westinghouse static interrupters and low-equivalent lightning arresters are connected to all high tension wires at the power house and at the various sub-stations. At the sub-stations the high tension current is reduced to 300 volts alternating, and con-

verted into direct current at 650 volts, which is fed direct to the line and direct current feeders. Each sub-station contains three 200-kw. oil cooled transformers, two 250 kw. rotary converters, and a switch-board of six panels—two alternating current machine panels, two direct current machine panels, and two feeder panels. All electrical apparatus at sub-stations is Westinghouse make. The machines at all stations are protected with Westinghouse tank lightning arresters and Wurtz non-arcing lightning arresters.

The sub-stations are of brick, iron and tile throughout, and are combined with the waiting room and freight room, except at Ann Arbor, where the freight business is so large that it requires a separate building, and at Dearborn, where it was not convenient to have them located in the same building.

The overhead line consists of two Figure 8, No. 000 trolley wires the entire length of the road, with a No. 3 D. C. feeder between Ypsilanti and Wayne tapped in parallel with the trolley, a 300,000 c. m. feeder from Michigan Center to Jackson, and a 400,000 c. m. feeder from Dearborn station east four miles to Detroit city limits. (Wayne station was located 12 miles from Ypsilanti for convenience of having the waiting room, freight room and sub-station combined, hence the necessity of the No. 3 feeder.)

Between Detroit and Ypsilanti the trolley wires are supported from span wires, from Ypsilanti to Jackson they are carried on Ohio Brass flexible brackets. The wires are strung 6 m. apart. On the span work, 30-ft. cedar poles were used, and on new bracket work poles from 40 to 70 ft. long have been selected.

The trolley is cut at each station by means of a line circuit breaker, but with the line switch in at all stations, the circuit is completed through the switchboard, and the trolley wires are tapped together every 500 ft. for the entire length of the line. At all regularly used turnouts the two trolley wires separate, one wire following each track, thus avoiding overhead switches. At turnouts used at infrequent intervals, both wires follow the main track and an auxiliary wire is led round over the siding. This permits a through run in either direction over the main track, but if a car is to take the siding the conductor must change the trolley wheel to the auxiliary wire.

All feeder and transmission lines are copper, with the exception of the direct current feeder from Michigan Center west to end of line. Over this section aluminum wire is being tried as an experiment.

Track Department of the Detroit United Railway.

The Detroit United Ry. is now operating about 300 miles of track, including all city and interurban lines, but excluding the Rapid Railway System. Most of the city mileage is laid with 7-in., 85-lb., or 9-in., 90-lb. grooved girder rails, on 6 in. of concrete with metal ties. Detroit was one of the first cities in the United States to use concrete construction in track work, and the results of the experiments here are interesting. The company is thoroughly satisfied

with concrete construction, but has found that in the early work the concrete foundation was not made deep enough nor heavy enough. Most of the early work was laid with 6 m. of Louisville cement, mixed with 2-4-8, laid the entire width of the road bed, and brought up on top of the ties a sufficient distance to form the foundation for the brick paving between the rails. Track so built has been in place about six years, but is now beginning to show serious cracks,



CROSSINGS ON THE DETROIT UNITED RAILWAY.

Overhead crossing over Grand Trunk,
Crossing under P. O. & N. Oxford.

Trestle near Rochester,
Trestle over Michigan Central near Orion.

extending clear through the concrete bed. In all new work, and in repairing old work, it is the practice to put in at least 1 ft. of concrete under the ties. It has also been decided to use a good quality of Portland cement in place of the Louisville mixture. No ties are used, but the track is held to gage by iron bars, which are



TEMPORARY TURNSTABLE.

attached to the rails by special clips and hook bolts, as shown by the plan of track reproduced herewith.

The interurban lines have been built at various times by different companies, and are laid with various weights of T rail, ranging from 60 to 120 lb., but in the main follow steam railroad practice.

Continuous and Weber joints are in use and there is considerable track electrically welded by the Lorain Steel Co's. method.

Mr. John Kerwin, superintendent of tracks, has designed a number of special features in connection with his department that are a little out of the ordinary.

One of his latest experiments is with concrete ties. The tie is 6x8 in. by 8 ft. long, made of concrete mixed in equal quantities of stone, sand and portland cement. Embedded in the tie are two iron bars $1\frac{1}{2}$ x2 $\frac{1}{4}$ in., and 6 ft. 4 in. long. For the purposes of spiking the rails to the ties, two pieces of 2-in. pipe are sunk into the tie on the line where the base of the rail rests. These iron pipes are filled with wooden plugs into which the rail spikes are driven. After the ties are molded they are permitted to stand three months in order to allow the cement to thoroughly set. This form of concrete tie has not been in use for a sufficiently long period to justify



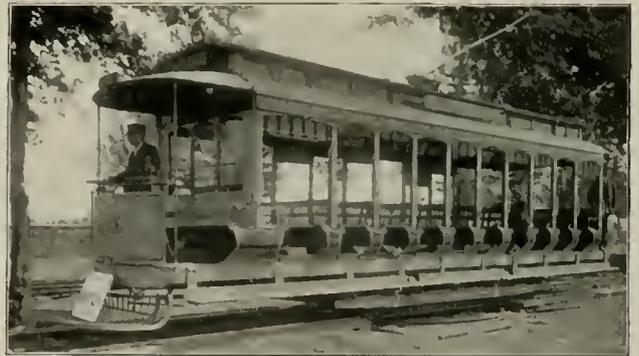
NEW SAFETY SWITCH BAR HITCHED TO SWITCH POINT.

a definite statement as to its strength and satisfactory qualities, but if it is found to fill the requirements, it will probably supersede to some extent the practice of laying a bed of concrete underneath the entire road bed.

The railway company has developed several new designs in special work. For instance, in double winged frogs, the central member

is one continuous rail to which the wings are bolted. This permits the renewing of the center rail when the head becomes unduly worn. Another departure is the method of attaching the cross bars at switch points. Ordinarily these bars are rigidly fastened to the inside of the points. This rigid fastening permits no play of the point, and if the point is thrown out of alignment by wheels of a passing car, it never again fits snugly to the head of the rail. By the new method of fastening the cross bars are hinged to the point so that if the point is pried over by a wheel or a stone, it will rock slightly on the hinge, and will immediately return to perfect alignment when the obstruction is removed.

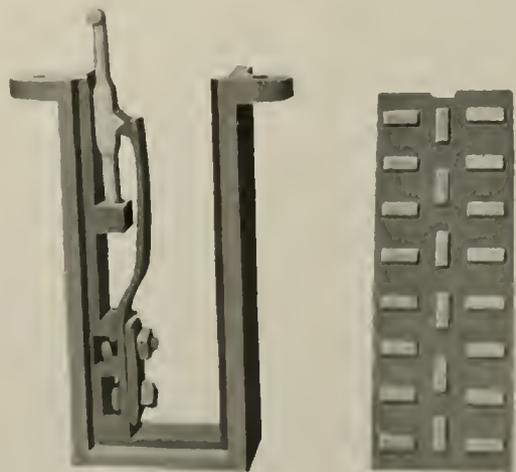
For spring switches a special mechanism has been designed to always insure positive action, and prevent the point from moving in either direction, except when movement is actually desired. The mechanism is housed in a metal box under the track. The interior of the box is illustrated in one of the half-tone engravings. As will be seen, the switch point when thrown moves a plunger having on



CAR ON TURNTABLE.

one side a projection or shoulder which engages the end of a flat plate spring. In the illustration the plunger is shown covered with white chalk in order to distinguish it. From the construction it will be evident that in order to fix the switch point in either open or closed position, it is necessary that the point be thrown the entire distance, and after it has been so thrown, it cannot be changed until sufficient force has been applied to overcome the tension of the plate spring.

To lessen the risk of motormen running into open switches on the interurban lines, Mr. Kerwin has designed a simple but novel system of levers with telltale semaphore attachment by which a semaphore positively indicates the position of the point. It some-



BOX AND MECHANISM FOR SPRING SWITCH CONTROLLER.

times happens that a small stone or other obstruction becomes lodged between the point and the rail, and although the levers may be thrown to close the switch, the stone will prevent the point from fitting closely against the rail. This may very easily occur without the employe noticing that the switch has not absolutely closed, and the conditions are, therefore, very favorable for a bad accident

caused by the next car over the track running into the open switch. In the new design of signal stand this danger is positively eliminated by attaching the semaphore independently to the extreme point of the switch, and not to the operating levers. Inasmuch as the rod that actuates the semaphore is attached to the extreme end of the switch point, the point must bear hard against the rail before the semaphore will return to its safe position, and there is absolutely no danger of running into an open switch, unless the motorman deliberately disregards the semaphore. The adjustment is such that the signal returns to danger if the switch is open even so small a distance as one quarter of an inch.

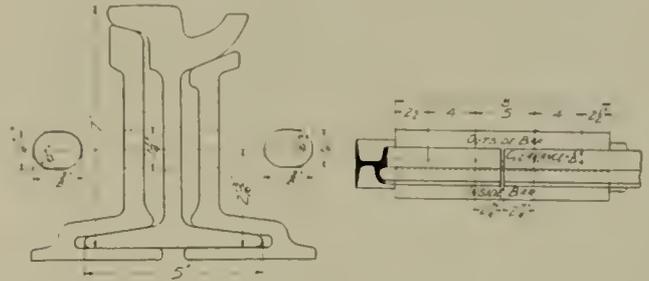
The company secures a good quality of sand from sand pits at the side of its tracks, near Farmington Junction. For loading sand into

cars there has been designed a sand elevator or conveyor, which is well shown in two of the accompanying engravings. The elevator is mounted on a low truck and consists of a double line of bucket conveyors, fastened to a sprocket chain. Each bucket is about 1 ft. long x 5 in. wide x 4 in. deep with a capacity of about 2½ cu. ft. The conveyors are operated by a 25-h. p. motor. The method of procedure is to build temporary tracks into the pit. The conveyor is then pushed onto the track in such a way that the buckets will lift the sand and gravel and deposit the material in flat

cars placed on a second track at one side. This machine requires but one man to operate it, and does work that formerly required 20 men in the gravel pit. In addition to sand and gravel to supply all of its own needs, the company screens the sand for roofing and paving gravel, and sell the material to contractors in the city. The sand is dried in a large dryer by passing it through a revolving metal cylinder under which a fire is kept burning. The cylinder is slightly inclined, the sand entering at the higher end, and leaving at the lower, there being rows of angle irons on the inside of the drum which catch the sand and carry it part way up the sides of the cylinder as it slowly revolves. The drum has a capacity of 60 cu. yd. of dry sand. The dryer is so located that the dry sand can be passed into cars down a long chute without extra handling.

The company has been able to save considerable money by the use of temporary turntables designed by the track department. One of these tables is illustrated. It is used in various emergencies, par-

upon heavy plank, a pin in the center serving to center the two plates. A ¾-in. iron washer is placed between the plates. The outside end of the two rails move upon a circular track made of light T rail. The rails on the turn-table are locked in alignment with the track rails by means of an ordinary switch throw by which lugs are thrown in and out of engagement with the ends of the turn-table rails. The car to be turned is first run upon the table and centered so that the turn-table is well balanced. It is then pushed around by hand. This turn-table can be built for \$15, and in tem-



"CONTINUOUS" RAIL JOINT, AS USED BY DETROIT UNITED RY.

porary work saves the construction of crossings which would probably cost \$300. The particular advantage will be understood when it is remembered that all cars in Detroit are run the same end on at all times.

For smoothing off the top of rail joints, and also for grinding down special work when necessary, the track department has rigged up a portable emery wheel shown in one of the illustrations. The wheel is mounted on a frame supported on three wheels as shown. The emery wheel is 11 in. in diameter, and is fitted with screw adjustments and can be raised or lowered at will. When being used the device is accompanied by a small truck upon which is mounted a



JOHN KERWIN,
Superintendent Track Construction.



SAND DRIER.

ticularly where it is desired to turn cars back without installing a loop, crossing or Y. This table consists of two rails upon which the car rests, these rails being thoroughly braced with cross bars, and mounted upon a ring plate 18 in. in diameter. The plate moves upon another plate permanently set between the rails and mounted



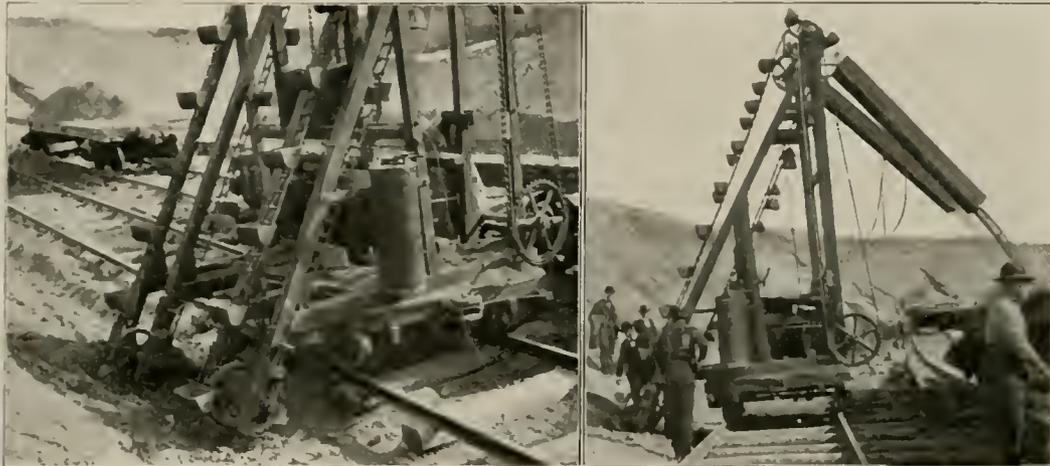
PORTABLE PILE DRIVER.

motor taking current by fish pole connection from the overhead trolley. The emery wheel is driven from this motor by means of a flexible shaft.

Another novelty in this department is a pile driver mounted upon a flat car, and designed to be used in repairing washouts, building

trestles and bridges, or anywhere where piles are to be driven in or near the track. As will be seen from one of the illustrations the driver comprises two uprights made of heavy timber 6¹/₂x8 in. x 25 ft. high. The base timbers, which are fastened to the car platform, are 6¹/₂x8 in. and 22 ft. long. The uprights are held in place by two 5x5-in. braces, which engage notches in the uprights. These braces can be disengaged at their lower ends, permitting the two uprights to swing back upon the platform of the car, the uprights being

up from the steam railroad car and deposited on the ground or in a trolley car on the adjoining track. The lifting is done by attaching the end of the hoisting rope to a motor car and pulling away from the derrick. The distance from the ground to the under side of the I-beam is 22 ft. 8 in. The width of the derrick at top is 20 ft., and at bottom 26 ft. The two uprights rest in a bed of concrete 3 ft. square and 5 ft. deep. Rails are handled in the manner shown by means of chain train sling and two heavy tongs. With



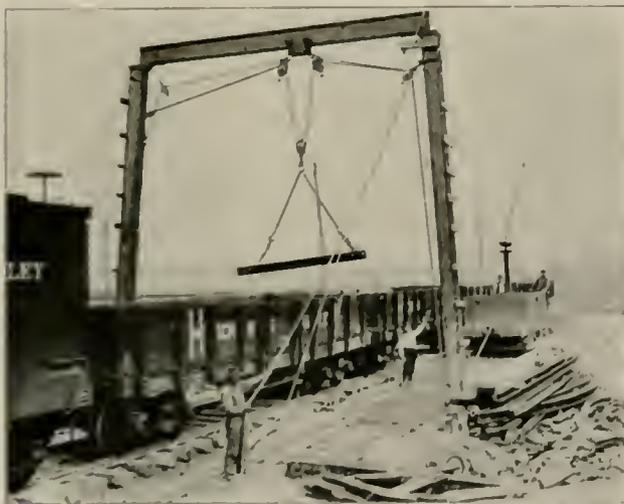
SAND ELEVATOR.

hinged to the base-pieces for this purpose. The hammer weighs about 2,200 lb., and will drive a pile 20 ft. long. Although the illustration does not show it, there is to be mounted upon the rear of the car platform a small steam-hoisting engine for operating the hammer, steam being used in place of electric motor so that the pile driver can be used along the track at night when the power is shut down. The flat car on which the pile-driver is mounted is designed to be pushed or pulled by a motor car. The framing constituting the base of the pile-driver is pivoted in the center of the car platform, permitting the driver to be swung clear around to the side, allowing it to drive a pile 2 ft. to one side of the track. The base framing moves upon a circular track made of light T rail when the driver is being swung around to the side position.

At the company's storage yards there has been rigged up a convenient derrick for unloading special work rails, and other heavy

one motor car and this derrick 60-ft. rails can be unloaded without difficulty.

Two very useful construction cars used by this company were described and illustrated in the "Street Railway Review" for March, 1901, page 160. One of these is a derrick car, which is said to have given the greatest satisfaction of any machine employed in the track department. The derrick is rigged on one end of a flat car and the boom is arranged to swing all the way around, so that the car may be run up alongside a steam railroad car and unload the heaviest special work or girder rails and place them on the



DERRIK FOR HANDLING RAILS.

shipments from car. This derrick is also shown in one of the illustrations. It consists of two uprights 12x12 in. carrying at the top a 16 in. I beam having a 5 in. web. On the web of this I beam runs a small trolley which carries the tackle used in lifting the heavy piece. It will be seen that this permits a piece of rail to be picked



PORTABLE EMORY WHEEL.

derrick car itself or on a car standing at the end of or at the opposite side of the derrick car. The cable for hoisting is run down the post of the derrick and comes out under the draw head of the car, so that any motor car on the same track can be attached to this cable to do the hoisting.

The other construction car mentioned is a track spiker by means of which the tracks are spiked to the ties without the use of hand labor. The pairs of tongs on opposite sides of the car pick up the tie and hold it firmly against the rail with a pressure of four tons, and the car is provided with a boiler and steam hammers, each of the latter driving two spikes at the same time. It is estimated that with this machine two men can spike 1,200 ties per day, which means a saving of \$15.00 per day over hand labor.

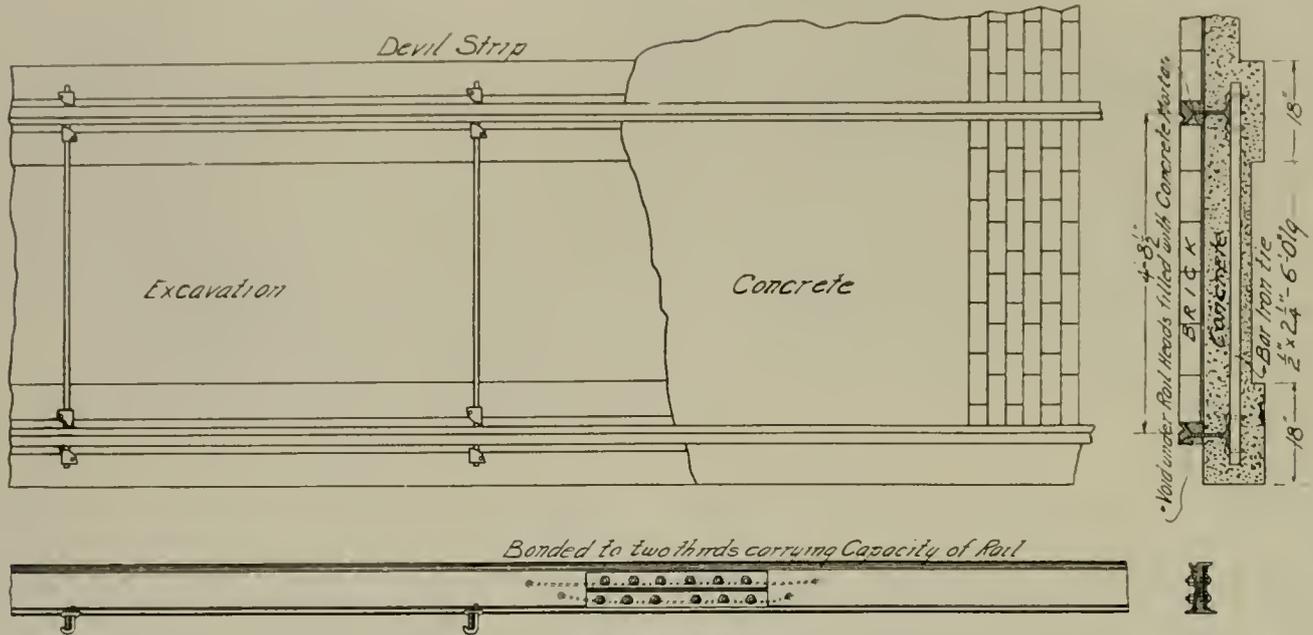
During the past season the company has been bothered a great deal by the exceedingly heavy rains which caused troublesome wash-outs on many of the interurban lines, requiring very energetic work

on the part of the track department to keep the line in repair. In this connection the manner in which a washed-out bridge was renewed is worthy of mention.

The bridge was about 60 ft. long, and was entirely washed away by a sudden rise in the river. As soon as word was received that the bridge had gone out a force of men was hurried to the scene, and the cars were again running within a few hours. In the work of repair bags were first thrown into the beds of the stream, and these were protected by building around them a hollow square of old ties laid log cabin fashion. These ties formed the abutments for the temporary bridge, and were brought up to nearly the floor level of the old bridge. A number of 60 ft. sections of 6-in. girder rail

than to adze down ties which have heaved. They are directed to be very particular to secure a uniform bearing on all shims used both on rail and on tie. White oak shims 8 in. long and 4 in. wide, are to be used, and they are to be driven under the rail from the outside. Shim $\frac{3}{4}$ in. thick and over on straight track, and 1 in. thick and over, on either rail of curve, must be accompanied by wooden rail brace, extending at least 1 ft. from the neck of the rail and securely held by spike.

Mr. Kerwin is preparing to try an experiment that is believed will greatly aid in making inspection and repairs on the interurban lines. He has nearly 300 miles of interurban track under his supervision, some of the lines being 70 miles in length, and it is often



STANDARD PAVING AND TRACK CONSTRUCTION IN DETROIT.

were then suspended over the stream, these rails resting on the tie abutments in the center, and on the old approaches at each end. The track ties were bolted to these rails. The bridge thus built has proven to be satisfactory in every way, and will be retained until a new, permanent structure can be put in place.

It is the policy of the company when necessary to resurface track not to disturb the ties by retamping, but to bring the track to surface by putting oak shims between the ties and the rails. Foremen are directed to use shims up to 1 in. in thickness if necessary, rather

necessary to go out over these lines when the power is off. He is therefore, having built a gasoline hand car which will accommodate four people and 150 lb. of tools, etc. The car is to be driven by a small gasoline engine direct coupled to the axles. It will be furnished by Fairbanks & Morris, Chicago agents for the Sheffield Car Co.

For preventing delays in case of fires the company keeps on hand 24 hose jumpers. These are simple in construction, and are made of wood with strap iron for the car to run upon.

DISTRIBUTION SYSTEM AND OVERHEAD CONSTRUCTION OF THE DETROIT UNITED RY.

The city feeder distribution system comprises about 23,000,000 c. m., capacity in overhead feeders, ranging from No. 0000 to to 500,000 c. m. The distribution scheme provides for an equalizing wire running through the center of the city, about three miles from the city power houses. All feeders crossing this section tap, through an automatic circuit breaker, into this equalizing wire, which acts as a balancing wire, and to which is also connected a storage battery, to assist in carrying the peak load.

Careful attention has been paid to the return system, the return comprising about 17,500,000 c. m., capacity in underground feeders. The district around the power house is particularly well protected, and the company is just at present putting in nearly two miles of return feeders, comprising two 1,000,000 c. m. cables, covered with asphaltum, and laid in a concrete trench with connections to track wherever the cables pass under intersecting tracks. The bonding is extra heavy "Crown" bonds, put in with drift pins. Particular attention is paid to the return circuit at special work and complicated crossings. It is the practice to run heavy bond wires underneath the entire special work itself. For this purpose the company uses old trolley wire annealed, and after the wire has been put in it is painted with a carbon paint, which is a product of gas manu-

facture. This by-product of the gas house is also used for painting poles. After the bond is placed the head of the bond and pin are also given a coat of paint. This serves to keep out moisture and brackets and overhead material; also connectors made by the Kisinger Iron Co., Cincinnati.

There is one under-grade crossing on Woodward Ave., where the street railway tracks pass under the steam road, where considerable trouble was had in keeping the trolley wheel on the wire, on account of the height of the suburban cars. This difficulty has been overcome by installing an overhead pan under the viaduct. The pan consists of a 6-in. channel iron with pan approaches, mounted on a thoroughly insulated board with tin roofing over the top of the board to keep the seepage and drainage water from working down to the face of the pan. The pan is insulated by a layer of asbestos between the tin and the board. The bolts for joining the parts together are also insulated.

In interurban work no overhead pans are used at turnouts or crossings. At turnouts the two overhead trolley wires follow the straight track, and a supplementary wire is led off around the turnout. This requires the conductor on any car that is taking a siding to change his trolley pole, but all cars that are not to take

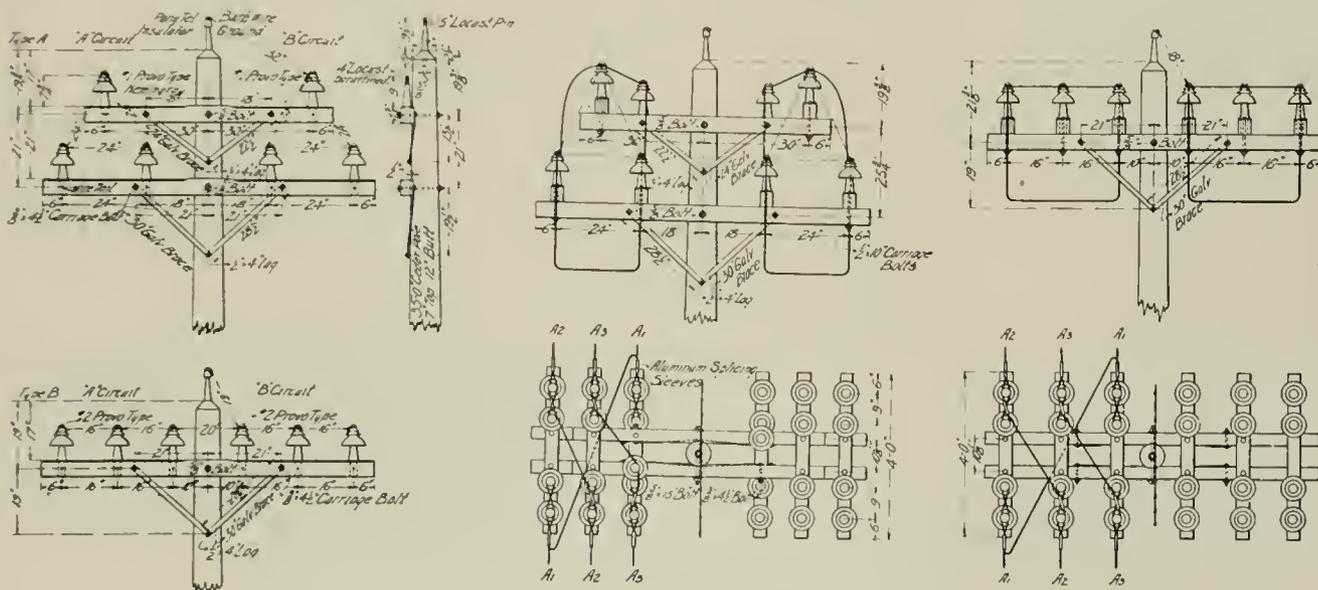
the siding can run straight through without bothering with overhead crossings or switches.

The type of construction adopted as standard in interurban work is illustrated in one of the drawings, which shows all details, including method of suspending feeders, telephone wires, the double Fig. 8 trolley wire, and also sets forth the scheme of coloring and numbering poles.

The high tension system which is operated from the Rochester power house, described in Mr. Farmer's article, comprises two circuits of No. 4 aluminium wire, furnished by the Pittsburg Reduction Co. The method of suspension and transposition is set forth in the various positions in the drawings shown herewith. For

minutes. This is done to prevent sub-station rotaries from becoming inverted, and charging back on line with high-tension current

In case of trouble upon but one high-tension circuit linemen are instructed, after having become satisfied that the circuit is clear from power house and sub-stations, to immediately locate break or breaks, and make them as safe as possible by clearing wires from track, telephone or direct-current system, and in the event of wires being in a dangerous position, are instructed to leave a man to watch them, or in case this cannot be done, are to place a danger signal at this point. You are not to try to repair while the other circuit is in operation, but wait until night time, after the shutting down of the alternating current machinery, and you are positively sure that lines are not charged.



POLE TOPS.

part of the distance the three wires for each of the circuits are carried in the same plane, but in the newer work the more modern practice of arranging the wires at the angles of an equilateral triangle has been followed. The high tension wires are suspended on Hemingway No. 1 and No. 2 "provo" glass insulators, with a 14-in. pin. In joining the aluminum wires the MacIntosh sleeve joint has been used.

In view of the general desire for information concerning the care of high-tension circuits in electric railway work, we give the following "Instructions on High-Tension Operation and Repair," as formulated by Mr. E. J. Burdick, who has charge of this department in connection with his other duties:

INSTRUCTION ON HIGH-TENSION OPERATION AND REPAIR.

In case of circuit breaker opening or fuses blowing on alternating current system, it is the duty of the engineer in charge to throw the machine back upon the line to be perfectly assured that the circuit opening was not caused by overload other than short circuit. After satisfying himself that it is not overload, he is to separately test each high-tension circuit to find if he has one good circuit remaining, and if he has, he is to continue to operate upon it.

Immediately after the test, he is to notify both sub-stations with reference to condition of circuits, etc., instructing them to clear the switchboard of all switches upon the circuit or circuits in trouble.

It will then be his duty to notify linemen, who are available at all times, of the trouble, who immediately thereafter are in full control of all alternating circuit wires until such time as they may report them clear.

Linemen are to thoroughly satisfy themselves with reference to just what conditions are, and are perfectly justified in demanding any precautionary tests or measures to insure safety, etc.

In case the power house engineer cannot reach sub-stations by telephone, he is instructed to pull open the direct current feeder switch, which feeds Oxford and Flint end, leaving it open for five

minutes. In case of both line cars being out on the trouble, it is the duty of each lineman in charge of them to call up the dispatcher or power house, stating, "I have my trouble cleared, have you heard from the other line crew?" This is very important and should always be done.

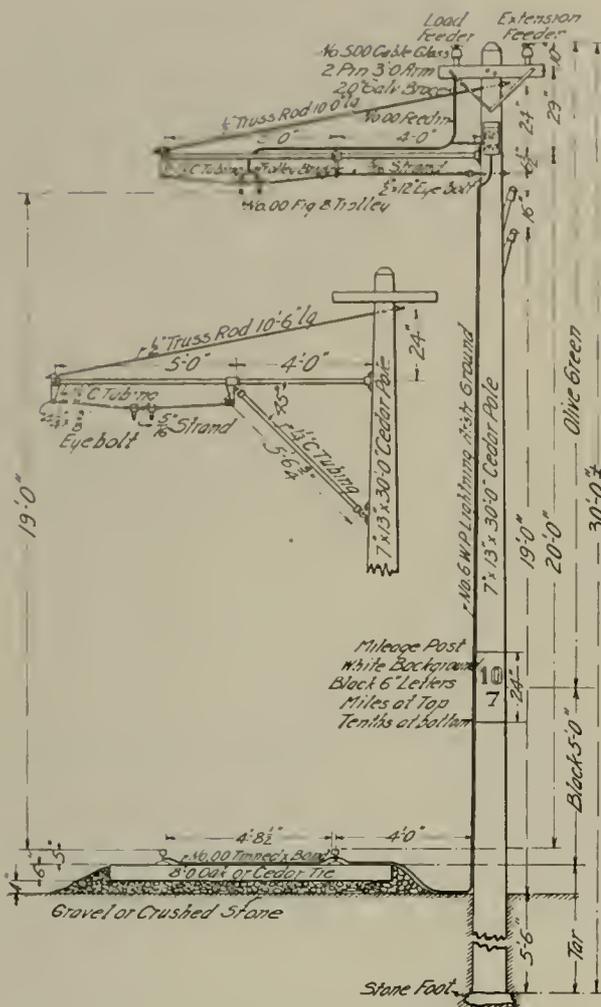
Great caution should be exercised by linemen in handling alternating current or high-tension wires, and at all times treat them as



VIEW ON FLINT DIVISION—UNITED RY.

being alive until they have been tested by the short-circuiting or grounding method. You may be positively certain that both sub-stations and power house are all cleared, but wires might be in contact at other points with the live circuit.

Linemen and all employees should use great care in working on or handling telephones, or direct current lines, in case of trouble



OVERHEAD CONSTRUCTION FOR INTERURBAN LINES.

CLOSED CARS.		OPEN CARS.		
No.	Maker.	Body, Ft.	Over all, Ft.	
10	Jones	16	36 Stephenson	28
74	St. Louis	22 ² / ₃	48 Pullman	31
27	Kuhlman	22 ² / ₃	100 Stephenson	32 ² / ₃
7	Brill	18	38 Jones	33 ² / ₃
6	Brill	20	30 Brill	34
5	Brownell	20	10 St. Louis	32 ² / ₃
34	Pullman	20	6 Brill	32
15	Stephenson	20	40 Detroit United Ry.	34 ¹ / ₂
31	Jones	22 ¹ / ₃	20 Stephenson	42
1	Jones	24	—	—
6	Jackson & Sharp	21 ¹ / ₆	328	—
12	Brill	21 ¹ / ₂	INTERURBAN CARS.	
2	Brill	21 ¹ / ₆	8 Kuhlman	33 ¹ / ₂
18	Lewis & Fowler	21 ¹ / ₆	12 Kuhlman	34
85	Stephenson	22	12 Kuhlman	40
124	Detroit United Ry.	22 ² / ₃	6 Jewett	45
457	—	—	9 Detroit United Ry.	33 ¹ / ₆
—	—	—	47	—

These cars are mounted on various types of trucks, including du Pont and Brill single trucks and du Pont, Brill, Peckham and Jackson & Sharp double trucks. They are equipped with Westinghouse



THE DETROIT SIGN.

and General Electric motors of various sizes. Gears and pinions are made by Van Dorn & Dutton. Sterling-Mecker registers are used in city cars and Ohmer registers on several of the suburban lines. In the city the cars are heated with stoves, but all the interurban cars have hot water heaters, made by the Peter Smith Heating Co., of Detroit. Car wheels are Griffin make, 33 in. in diameter, and



THE DETROIT PLATFORM.

weigh 475 lb. All the interurban cars are fitted with Magann storage air brakes, as made by the Magann Air Brake Co., of Detroit; also with the Wilson trolley catcher.

The trolley wheel used is a special design originated by Mr. Farmer. The wheel is used with a malleable iron harp, which is fit-

on the alternating-current system. Sub-station men are cautioned to use the greatest care in their operations, following these instructions explicitly. Keep in touch with the power house and linemen, and if telephones are not working, watch the high-tension circuits for static discharges, and also govern yourself by power house signals.

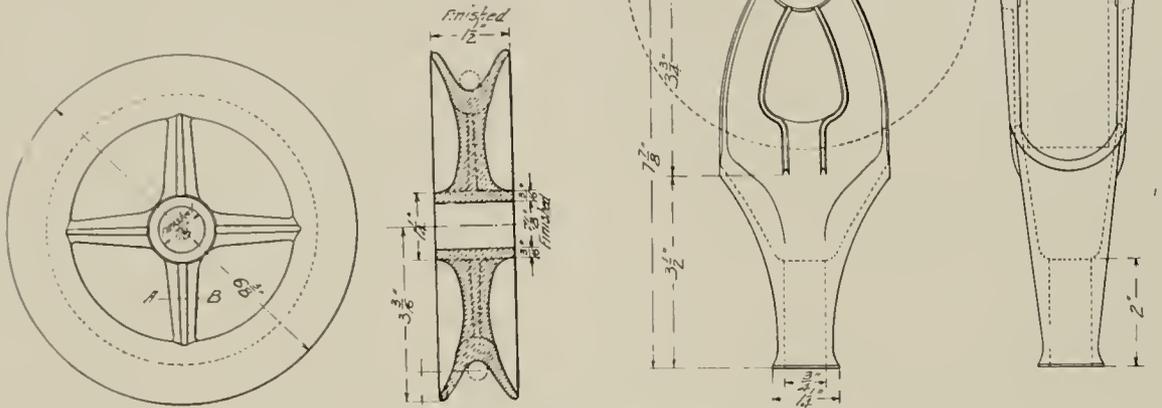
If possible, always keep direct current upon the trolley or direct-current system to facilitate the handling of line cars, etc.

All cars, both city and interurban, run the same end on at all times, and most of them are equipped with controllers at one end only. On most of the city cars the back platform is extended, thus giving increased standing room. The extended platform is 6 ft. 8 in. long, and 6 ft. 9 in. wide. The platform is permanently enclosed on one side, with a wide opening on the side of egress and exit. The timbers supporting the platform run forward under the car about 5 ft., or as close to the wheels as is possible. These platform timbers are 2¹/₄ by 8 in., reinforced by a 3¹/₈x6 in. iron plate on the inside. They are bolted through to each cross timber, and at the end cross sills are supported by two bolts with bearing plates underneath. The novel feature about the platform is an iron railing, which divides it into two portions, and is designed to prevent passengers when standing on the platform from interfering with passengers entering or leaving the car. The railing is shown in one of the engravings, and is made of 1-in. iron pipe put together with malleable iron elbows at each end. The railing is 38 in. high, and has an extreme width of 4 ft. 10 in. From the top of the rail to the step is 17 in.; from the step to the platform is 12 in.; and there is a 7-in. rise from the car platform to the car proper.

As might be expected where so many different companies have been consolidated under one management the rolling stock varies greatly. The following is a list showing the number, maker and length of body of the cars of different types:

ted with two copper contact pieces for carrying the current. The working drawings for the wheel and the harp are reproduced herewith. The bushing is seamless steel tubing, slotted, and filled with wicking to hold the lubricant.

The sign used in Detroit for designating routes is a very effective one. This sign consists of a $1\frac{1}{2}$ -in. board $8\frac{1}{4}$ in. wide, and long enough to accommodate the longest street name. The board is



DETROIT TROLLEY WHEEL AND HARP.

painted black, and the letters are cut out with a jig saw, the standard letter being 5 in. high. Over the back of the letters are tacked pieces of white celluloid, and the letters are also edged with white paint. The signs are hung in front of the deck lights by special malleable iron hangers, both over the hood and at the side of the car. The signs are all made the same size, and are, therefore, interchangeable on all cars. This sign is very easily read in daytime,

storms there are eight levelers and six nose plows, which were built in the company's own shops.

NO POWER TO REDUCE FARE.

The City Attorney of St. Paul has rendered an opinion that the Common Council of the city does not possess the power to order the

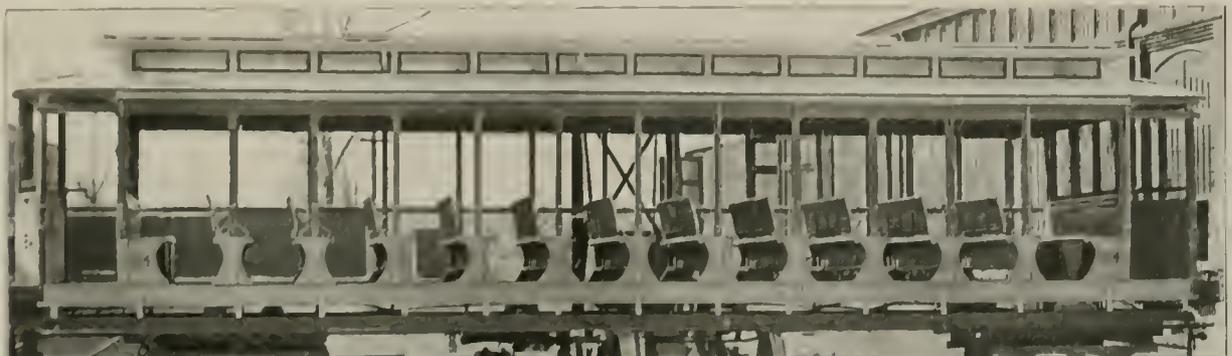


INTERURBAN PARLOR CAR FOR DETROIT UNITED RY. JEWETT CAR CO.

and at night the light from the interior of the car shining through the celluloid makes the individual letters distinguishable for a distance of several hundred feet.

In addition to the rolling stock mentioned, the company owns three line wagons, one fire hose wagon, three trolley wagons, a 7-ton truck fitted with windlass for hauling heavy pieces and material, and other wagons and vehicles. In the shops, and in emergency work, Pearson and Norton jacks are utilized. For use in snow

reduction of street car fares from 5 cents to 3 cents. The city attorney found that the enabling act passed in 1899 gives municipalities the right to provide for regulating and controlling any public franchise, but it exercises no power to fix maximum rates. A long line of decisions which have been rendered also give the City Council the right to enter into contracts with corporations, but when the contracts have been once made the powers granted to the municipality cease and the contracts must stand.



NEW OPEN CAR FOR DETROIT UNITED RY. JOHN STEPHENSON CO.

Real Estate Department of the Detroit United Railway.

BY ROBERT OAKMAN, REAL ESTATE COMMISSIONER.

The real estate and tax agent has come to be a necessary adjunct to almost every great steam railroad system in the country, but so far as the writer knows the necessity for such an officer had never made itself felt with sufficient force to bring about the establishment by a street railway company of a separate department for this work until the Detroit United Railway, after acquiring the properties of the various suburban roads centering in Detroit, created the office of Real Estate and Tax Commissioner of the Detroit United Railway.

The duties of this officer are manifold and complex because the commissioner must have an acquaintance with all the departments of the railway and must be in close touch with all of them. He must also have a thorough knowledge of the tax laws of the state and the municipalities.

The Detroit United Railway owns two million dollars worth of real estate, within the city limits of Detroit, and the assessable

on a stone, running thence northerly about 200 feet to a point opposite a hedge, thence southeasterly to a stick drove by a spotted willow tree and westerly to the place of beginning." After the road is in operation a year or so you are informed that your track and poles are not located on your own property and you are referred to the deed with the foregoing description to substantiate the claim.

After the purchase of the suburban roads one of the first steps taken by the commissioner was to secure an accurate survey of the route of the lines as now located and established, this survey showing all the property lines, lengths and widths of right of way, and former owners, fencing, kinds and dimensions of buildings near track, farm crossings, highway crossings, location of poles, stations, etc., and other special points primarily affecting the physical property of the company. On a copy of this map, we are drawing plats of all the parcels of land for which deeds have been se-

REAL ESTATE OWNED BY DETROIT UNITED RAILWAY

WARD	SIDE OF STREET	STREET	DESCRIPTION OF REAL PROPERTY		LAND			BUILDING		Total Value Real Estate Dollars	COST OF LAND	COST OF BUILDING	TOTAL COST LAND AND BUILDING	DIMENSION OF BUILDING
			LOT	Block (C)	Plat or Farm	Foot Front	Foot Deep	Assessed Value in Dollars	Material						Assessed Value in Dollars
1														
2														

LAND REGISTER—LEFT HAND PAGE (SIZE OF ORIGINAL 16 X 18 1/2 IN.; 50 LINES PER PAGE.)

valuation of the real estate and personal property of the entire system is over \$20,000,000. The real estate of the company is situated in every ward of the city, so that almost every regulation as to paving, sewerage, street opening, tearing up of streets by municipal or other corporations, is felt by the railway company, and for this reason the real estate and tax commissioner must keep himself informed as to the workings of the various city departments having these matters in charge.

It is the opinion of the real estate commissioner that a street railway company can purchase as cheaply as any other corporation, for the real estate commissioner should be thoroughly acquainted

with the workings of the various city departments having these matters in charge. By this means we are enabled to tell at a glance on what properties we are encroaching and how much, and what properties we are losing by reason of inaccurate fencing. We are also enabled to tell whether the conditions of the deeds have been complied with as to cattle guards, cattle passes, farm crossings, gates, etc., and this often becomes important for us to know.

These maps or surveys will also serve as the basis for our filing system. Each parcel of land is given a distinguishing number and the contracts, deeds, mortgages, abstracts, etc., are numbered to correspond. The originals being permanently filed, copies are

Detroit United Railway.

TAX LIST FOR TOWNSHIP, STATE AND COUNTY TAXES.

Please fill out this blank in detail and return to Robert Oakman, Real Estate Commissioner, Detroit United Railway, 12 Woodward Ave., Detroit, Mich.

A full description on this blank of each real estate and personal property will prove advantageous both to the officers of the township and of the company, and will enable the company's officers to compare such descriptions with the original deeds and papers and thus avoid errors that might invalidate the assessment.

Please separate the school tax by school districts and the road tax by road districts, and put the number of each school district in column 15 and the number of each road district in column 17.

If convenient, please state the number of miles of track assessed in the township and the number of miles of track in each village of the township, under the heading "Description" in the third column of the blank.

1 Lot	2 Block	3 DESCRIPTION	4 Sec.	5 Town.	6 Range	7	8	9	10		11	
						Acres in each Tract or Parcel.	True cash value of each Tract of Land Property as assessed.	True cash value of Personal Property as assessed.	True cash values as fixed by Board of Review		True and lawful assessments as determined by the Board of State Tax Commissioners	
						Acres.	tenths	Dollars.	Dollars	Real Property.	Personal Property.	Real Property.	Personal Property.
									Dollars.	Dollars.	Dollars.	Dollars.

LEFT HAND PAGE SIZE OF ORIGINAL 24 X 17 IN.

with land values in the districts through which the roads run, so that he can not only save his company from the sand-bagging tactics of the prospective sellers, but can also so select his purchase that real estate investments will at least approximate in earnings the earnings of the rest of the system in proportion to the money invested.

In straightening the tangles in rights of way over several hundreds of miles of suburban railways through country districts, he comes upon many queer complications, caused by the haste of the builders of the road to get the tracks down. Descriptions for rights of way are as follows: "Begin at a point marked by a brick

used for general reference. In addition there is prepared a short form record or abstract of all the deeds, contracts, mortgages, etc. of the company, which record will be published in book form.

We have classified the written records not only according to the name of "the opposite party" by a card index system, but also have arranged the documents according to the location of the property on each of the respective lines. Thus deeds numbered from 100 to 200 will describe a continuous right of way made up of one hundred separate but adjoining parcels. Our letter files are also arranged on the same system, viz., according to the location of the property concerned. Each letter as received and answered is filed

with a carbon copy of the reply under a number corresponding with the number given the parcel of land to which the letter relates, so that at any moment all the correspondence relating to any particular parcel of land is easily obtainable.

Under the Michigan statutes a street railway company must secure a franchise from each and every city, village and township through which it passes. The result is that the franchise records of any line of considerable length are very cumbersome. The Detroit United Railway files its franchises like its deeds with a safety deposit company and for general reference has duplicates neatly printed and bound in compact book form.

For real estate situated in the city of Detroit we keep an assessment and tax roll which is a duplicate of the official roll of the city and county, and besides this we have a land book in which is recorded the information called for in the blank form published herewith. All properties are set down according to the ward in which they are located and are described according to the description under which they are assessed. This land book is our working record in which changes are made from time to time.

For real estate outside of the city of Detroit a record is kept in

August and January. Water taxes are payable quarterly, while special taxes for pavement, sewers and street openings are payable at different specified times. There is also a burdensome tax of fifty cents charged for every electric freight car entering or leaving the city. Failure to pay any one of these taxes promptly results in the imposition of fines and penalties.

The good will of the officers and people along the line of a suburban railway is a valuable asset of the company and the real estate commissioner in his daily intercourse with these officers must bear in mind that the village council has the power to grant franchises, levy taxes and regulate the speed of cars, etc.; that it is the duty of the township supervisor to assess the railway property for the purpose of taxation and that the township board of which he is the chairman controls the highways, bridges, grades, franchises, taxes, etc., for the township; that the highway commissioner, the two justices of the peace and township clerk are all members of that important body known as the township board; that the treasurer and surveyor of the township have much to do with a suburban railway and that the three hundred overseers of highways or pathmasters are ever on the alert to see that the tracks are neither

IN THE CITY OF DETROIT, MICHIGAN.

WHEN PURCHASED	USED FOR	RENTED OR LEASED	FOR SALE	TITLE AND ABSTRACT	CITY TAXES WHEN PAID	COUNTY TAXES WHEN PAID	STATE TAXES WHEN PAID	SPECIAL TAXES	REMARKS
									1
									2

LAND REGISTER—RIGHT HAND PAGE [SIZE OF ORIGINAL 16 X 18 1/4 IN.; 50 LINES PER PAGE.]

a register conforming in every particular to the township assessment roll, the form for which is prescribed by law. The taxes and tax rates are also set down in this record, so that the new assessment and the new tax may be easily compared with the old. When paying the taxes the rolls of the city or county must check with the company's rolls and the tax receipts must check with both. The record of the payment of the tax is the same for the company's roll as for the city and county rolls; thus giving a perfect check system which can be easily and economically executed. After payment of the taxes the original tax receipts are filed with the deeds in the safety vault. The importance of a complete assess-

above nor below the grade and that the fences, crossings and cattle guards are in a safe condition and finally that the road district tax is promptly paid. The commissioner must know the register of deeds and the county treasurer, the heads of the counties through which the road runs and he must be on speaking terms with the sheriff and the marshal of the village, who can, if he will, protect the property of the company from thieves and vandals. Besides this, he must remember that there are tax reviewing boards in every city, village and township who can "soak" the railway for high taxes if they choose to do so.

It goes without saying that if the operating department desires

Detroit United Railway.

COMPRISING
DETROIT CITIZENS' STREET RAILWAY CO
INCLUDING THE DETROIT SUBURBAN RAILWAY.

FORT WAYNE & BELLE ISLE RAILWAY CO.
THE DETROIT RAILWAY.
WYANDOTTE & DETROIT RIVER RAILWAY
DETROIT & PONTIAC RAILWAY.
DETROIT & NORTHWESTERN RAILWAY.

DETROIT, ROCHESTER, ROMEO & LAKE ORION RAILWAY.
DETROIT, LAKE ORION & FLINT RAILWAY.
NORTH DETROIT ELECTRIC RAILWAY.
DETROIT, UTICA & ROMEO RAILWAY.

12		13		14		15		16		17		18		19		20		21		22		23		24	
State Tax		County Tax		Township Tax		No. of School District		School and Mill Tax		No. of Road Liable		Highway Tax		Tax		Tax		Tax		Tax		Total of Taxes		REMARKS	
Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.	Dolls.	Cts.		

RIGHT HAND PAGE SIZE OF ORIGINAL 24 X 17 IN.

ment and tax record cannot easily be overestimated by a large railway system in Michigan, for the system of assessment and collection of taxes is not uniform. For example, the ad valorem taxes for Detroit are payable to the receiver of taxes in July and the taxes on gross earnings are payable to the city treasurer in January and July, while state and county taxes for the city of Detroit are payable to the county treasurer in November. Again, the city and village taxes outside of Wayne County are payable at various and sundry times and the township and county taxes outside of Wayne County are payable in December and January. The innumerable road district taxes may be called for at any time between

to run a steam train at night over an electric railway whose franchise prohibits the use of steam, the commissioner is asked to obtain a franchise from the village councils and the township boards as well as to secure releases from damages from the abutting property holders. If a crossing at grade is desired over a steam railroad, the commissioner must go to the state commissioner of railroads, or to the state crossing board, who, by the way, are uniformly opposed to such crossings, and obtain a permit. These are a few of the duties imposed upon the real estate commissioner of the Detroit United Railway.

Under the constitution of Michigan all property, real and per-

sonal, not expressly exempted by law, is assessed at cash value and the statute defines cash value as the usual selling price, being the price which could be obtained therefor at private sale and not at forced or auction sale. The assessor must consider the advantages or disadvantages of location, quality of soil, franchises and other privileges. A street railway franchise is assessed with the track which is held to be personal property under our law.

The Board of State Tax Commissioners, which has supervisory control over the assessing officers of the state and which has power



ROBERT OAKMAN.

to review the assessments of the local assessing officers, estimates the value of the road as a unit taking into consideration the value of the franchises as well as the value of the physical property. It also investigates the gross earnings, the net earnings of the road and the stock and bond values. Sometimes it uses one method, sometimes another, and frequently a method of its own. It attempts to get at the value of each road as an entirety and then deduct from this sum the value of the real estate which is assessable

condition of the road at the time of the assessment. For the preparation of this blank elaborate reports are required by the real estate and tax commissioner from the various departments of the company and much time and labor is required on the part of the commissioner in order to so systematize and set forth these details as to present a comprehensive statement of values.

After the assessments have been made by the supervisors and passed upon by the local boards of review, but previous to the date set for collection of the taxes, the real estate of the company is listed according to the township it is situated, on blank "B" and the sheet sent to the local treasurer who reports to the company the exact assessment and tax against both the real estate and personal property of the company. For our preparation of this blank we refer to the land register previously mentioned. This blank serves the purpose of receiving reports as to city and village taxes as well as township taxes as the city and village officers can use the blanks columns.

[Mr. Robert Oakman was for ten years engaged in the real estate business in the City of Detroit previous to his appointment as City Assessor in that city. He served for four years as Assessor and resigned his position in order to accept an appointment under Governor Pingree as a member of the first Board of State Tax Commissioners of Michigan. While a member of that board he calculated the values of the steam roads of the state for the benefit of the State Legislature on the earning power basis, while Professors Cooley and Adams of the University of Michigan were estimating the physical property values and the franchise values on stock and bond and other bases. Mr. Oakman has held many positions of trust from city, county and state and is an authority on the Michigan Tax Law.]

CLAIM DEPARTMENT DETROIT UNITED RY.

The company's instructions to employes regarding accidents read as follows: "You will use the utmost care and vigilance to prevent accidents. Should any accident or collision, however slight, occur, or should any accident happen to a person who has just left the car before reaching the sidewalk, or should you have any trouble with passengers with reference to fares or otherwise, you must immediately fill out an accident blank in duplicate, giving the date, line, place, time, direction, car number, number of passengers on the car at the time of accident, your name, the names and addresses (business address preferred) of as many witnesses as possible, and those of the party or parties injured or with whom controversy took place, with a brief description of the accident, collision or trouble. These you must sign—one to be left at the car house for your

CITY TAX LIST
DETROIT UNITED RAILWAY

Real Estate in the City of Detroit,
For City Purposes.

YEAR 190

Make Receipt in the name of DETROIT UNITED RAILWAY and notify Robert Oakman, Real Estate Commissioner, 12 Woodward Avenue.

Filed

Payable

No of Ward	Side of Street	STREET	No of Lot	Block or Section	PLAT OR FARM	Assessed Valuation 190	REMARKS

SIZE OF ORIGINAL 11 X 17 IN.

where situated, the remainder is apportioned to the various townships in proportion to the track mileage in the township.

In order to assist the Tax Commission and the local assessing officers in arriving at the cash value of properties a statute provides that every assessing officer shall require from every person a full and correct written statement under oath of all the property he owns liable to assessment in each assessment district. The State Tax Commission provides a blank form on which to make this statement. This blank requires full and detailed information as to all classes of physical property, the original cost of each piece of property, its present condition, etc., and also a detailed statement of the financial

division superintendent, and the other to be enclosed in the proper envelope and forwarded to the claim department immediately. After 6:00 o'clock p. m. both reports will be left with the car house foreman. In case of serious accident notify telephone 2238, who in turn will immediately advise the proper persons.

"Too much emphasis cannot be laid on the necessity of getting the names and addresses of the party or parties injured and as many witnesses as possible, and getting the report to the claim department at once.

"You are absolutely prohibited from talking about any accident to any person, except the proper officers of the company.

"If any person is injured, however slight, you must render all assistance in your power, and if the services of an outsider are required, state in your report just what action was taken.

"You will send to the claim department, whenever possible, the names and addresses of anybody whom you may see indulging in reckless driving."

As soon as the report of an accident is received at the claim department, it is entered in what is known as the "Accident Record Book." The book is ruled in columns, the columns heads across the page being as follows: "Year," "Month," "Day," "Number," "Line," "Car Number," "Names of Motorman and Conductor," "Name of Injured Party," "Nature of Case," and "Remarks." All accident reports as they are received are numbered consecutively, this number being placed after each case in the column headed "Number." Just as soon as the report reaches the office, and if the passenger is badly injured, a special report is immediately sent to the company's surgeon, who, as soon thereafter as possible, calls on the injured party, secures the statement of the victim, and all the witnesses possible, and of course does everything in his power to relieve suffering and pain. It is found the employment of a special doctor in this way is productive of excellent results, inasmuch as he is able to protect the company's interests to a greater degree than would an outside physician who might be called to treat the case. It is also believed that this procedure is in the interests of the injured party, as the company's doctor is able to give expert treatment and advice without charge to the patient, whereas if the first doctor within reach was called, it might result in the patient receiving improper treatment, and in any event, the expense would be considerable.

If a claim arises out of an accident, the case is immediately entered in a book known as the "Claim Register." Each claim has a separate page, at the top of which are the headings: "File Number," "Name" and "Nature of Claim." On this page is kept a complete history of the case, including records of all papers made out, dates when papers are received and delivered out, references to witnesses' statements, etc. When the case is entered in the claim register, it is given a number known as the "Claim Number." All papers pertaining to each case are kept in a file together, and are given a number corresponding to the claim number. A force of investigators is employed for the purpose of looking up accidents, securing witnesses' statements, etc., etc. The company seldom settles a case to avoid law suits; in other words, if the company is clearly responsible it makes the best settlement possible, but if, in the opinion of its legal advisers, it is not responsible, the case is always fought out in the courts. Judge Walter Ross is the company's claim agent. In a recent interview, Judge Ross pointed out a few of the difficulties arising in the claim department of a street railway that are not encountered in steam railroad practice. For instance, the Detroit United Ry. is operating cars every half minute on the principal streets for 16 hours a day, and these cars make more stops on a single line from the river to the city limits, than the Michigan Central Railroad makes from Detroit to Chicago. The street railway company operates in the crowded public streets with teams, bicycles, pedestrians and children occupying its tracks to about the same extent as do the company's cars. In addition there is the transfer question with all the misunderstandings and disagreements arising from the same. In view of these conditions, the wonder would seem to be, not that accidents occur on street railroads, but that the number of serious accidents is as small as it is.

DISPATCHING CARS AND SAFETY PRECAUTIONS IN DETROIT.

Cars on practically all the interurban lines owned by the Detroit United Ry. are dispatched by telephone from one central office located at Royal Oak. A time table especially prepared for the guidance of employes is issued and heads of operating departments are required to see that all their subordinates are furnished with each issue of the time table and each employe must sign a receipt for his copy of the schedule. Due notice of the issue of a new schedule is given by special notice posted upon the bulletin boards. On the time table scheduled meeting or passing points are indicated by figures in full faced type. As long as these meeting times are complied with no special orders are necessary, but whenever

cars fail to make regular meeting points they immediately become subject to orders from the dispatcher and must not move without such orders.

The chief dispatcher keeps a train sheet on which he enters all orders given, leaving and arriving times, and other information for his own guidance relative to the moving of cars. The sheet is similar to several that have been reproduced in recent issues of the "Review." Mr. A. E. Rosso is chief dispatcher. The company has a private telephone line equipped with instruments made by Stromberg & Carlston, of Chicago. On its dispatching telephone line the company has adopted instruments having 60,000-ohm generators, and 1,600-ohm ringers.

HOTELS IN DETROIT.

Detroit has long been known as the "Convention City," and the hotel accommodations are second to none in any city of equal size. The A. S. R. A. headquarters will be at the Hotel Cadillac, on Michigan Ave. not far from the City Hall.

The oldest hotel in the city and a most popular one is the Russell House, directly opposite the City Hall; this hotel is first class in all appointments, having a particularly good restaurant. Accommodations may be had on either the American or European plan.

The Hotel Normandie is a handsome five-story structure at 11 to 23 Congress St., in the heart of the city, and is equipped in the most modern manner throughout; this is an American plan house and the table and service are first class.

The Griswold House, which is conveniently located for Convention attendants, is conducted on both European and American plans, the rates being \$2 to \$3 per day American, and \$1 to \$2 European; Postal & Morey are the proprietors. The same firm also conducts the Oriental-Griswold Annex, which is entirely on the European plan.

The Hotel Metropole is on Woodward Ave., near the Russell House, and conducted on the European plan, the house having an excellent restaurant.

Other down-town hotels are the Hotel Sainte Claire and the Hotel du Nord, on the American plan, and the Hotel Wayne, American and European.

KANSAS CITY NOTES.

On the night of September 1st the Troost Ave. cable of the Metropolitan Street St. was stopped for the last time, and taken out, and the following day electric cars began operating on one track while the opposite track was being relaid with 106-lb. rails.

The park season has been an exceptionally successfully one with the Metropolitan Street Railway Co. An Italian band at Troost park attracted the largest crowds that the park has ever held and at Electric Park there were 50 per cent more admissions than at any previous season, about 571,000 persons being admitted to the park during the season. A loop the loop railway proved one of the principal attractions. During the month of August while the large band was at Troost Park the local band and moving pictures were removed to Budd Park, a handsome park owned by the city, and although the attractions were free at this park, they did not prove much of a success, people evidently preferring to pay admission to the other parks.

The ducts for operating the high tension alternating current cables from the new power stations to the sub-stations are being put in place very rapidly. They are being laid with a view to future extensions and several times as many ducts are being put in place as are required for present use. The ducts are of glazed tile set in Portland cement mortar forming a very substantial construction. They all contain No. 6 lead covered cables.

Early on the morning of September 2d two men overpowered the night watchman at the Carbondale Division car barn and commanded him to open the safe that contained all the receipts of Labor Day. As the night man did not have the combination of the safe the men proceeded to blow it open with dynamite. While they were engaged in this work an officer happened to come into the barn and in the fight which ensued the officer was killed and the night man was shot twice and probably fatally wounded. The robbers left without securing anything. The company at once offered \$500 reward for the capture of the men, and they were taken into custody before the following night.



LIGHT GUARD ARMORY - THE CONVENTION HALL.

OFFICERS A. S. R. A.

President—H. H. Vreland, president Metropolitan Street Railway Co., New York, N. Y.
 First Vice-President—Charles W. Wason, president Cleveland, Painesville Eastern Railway Co., Cleveland, O.
 Second Vice-President—Edwin C. Foster, vice-president Boston & Northern Railroad Co., Boston, Mass.
 Third Vice-President—H. M. Sloan, general manager Calumet Electric Street Railway Co., Chicago, Ill.
 Secretary and Treasurer—T. C. Pennington, treasurer Chicago City Railway Co., Chicago, Ill.
 Executive Committee—The president, the vice-presidents and Walton H. Holmes, Kansas City, Mo.; John A. Rigg, president Union Traction Co., Reading, Pa.; Daniel B. Dyer, president Augusta Railway & Electric Co., Augusta, Ga.; T. J. Nicholl, vice-president Rochester Railway Co., Rochester, N. Y.; George W. Dickinson, vice-president Seattle Electric Co., Seattle, Wash.

A complete list of the cities where the conventions have been held and the presiding officer is as follows:

Boston	Moody Merrill	1882
Chicago	H. H. Littell	1883
New York	William H. Hazzard	1884
St. Louis	*Calvin S. Richards	1885
Cincinnati	Julius S. Walsh	1886
Philadelphia	*Thomas W. Ackley	1887
Washington	Charles B. Holmes	1888
Minneapolis	George B. Kerper	1889
Buffalo	Thomas Lowry	1890
Pittsburg	Henry M. Watson	1891
Cleveland	John G. Holmes	1892
Milwaukee	D. F. Longstreet	1893
Atlanta	Henry C. Payne	1894
Montreal	Joel Hurt	1895
St. Louis	H. M. Littell	1896
Niagara Falls	Robert McCulloch	1897
Boston	Albion E. Lang	1898
Chicago	C. S. Sergeant	1899
Kansas City	J. M. Roach	1900
New York	Walton H. Holmes	1901
Detroit	H. H. Vreland	1902

*Deceased.

The Light Guard Armory, of Detroit, which has been selected for the Convention Hall, is a well-built brick building in the business center of the city, and is conveniently located to hotels and street railway lines. Ample provisions have been made for heat, light and power, and both alternating and direct current will be at the disposal of exhibitors. A heavy wooden flooring will be put in place so that exhibits can be bolted or nailed down if desired.

LOCAL COMMITTEES.

GENERAL COMMITTEE.

Jere C. Hutchins, Chairman.
 George H. Russell.
 John H. Fry.
 Albert E. Peters.
 Walter Ross.
 Albert H. Stanley.
 Irwin Fullerton.

EXHIBIT COMMITTEE.

John H. Fry, Chairman.
 Thomas Farmer.
 John Kerwin.
 Edward J. Burdick.
 W. O. Wood.
 F. E. Merrill.
 James Bullen.
 Albert Eastman.
 William Webber.
 W. O. Russell.
 Fred C. Peters.
 James Anderson.
 F. W. Heninger.

PUBLICITY AND INFORMATION COMMITTEE.

Albert E. Peters, Chairman.
 Thomas Patterson.
 Harry V. Catlin.
 W. F. Bien.
 R. W. F. Peters.
 Paul Dohrman.
 David Brown.
 Thomas B. Lynch.
 C. B. King.
 Thomas Beath.
 W. C. Hopper.

ENTERTAINMENT COMMITTEE.

Irwin Fullerton, Chairman.
 F. A. Hinchman.
 Robert Oakman.
 George W. Parker.
 Joseph Bampton.
 F. W. Brooks.
 A. F. Edwards.
 John Twomey.
 Edward H. Ives.
 Wm. R. Frazer.
 Louis Schneider.
 Ernst Klussman.

LADIES' COMMITTEE.

Albert H. Stanley, Chairman.
 Harry Bullen.
 W. J. Dawson.
 Dr. Hedley Williamson.
 Mrs. George H. Russel.
 Mrs. Michael Brennan.
 Mrs. A. B. du Pont.
 Mrs. John H. Fry.
 Mrs. Albert H. Stanley.
 Mrs. Irwin Fullerton.
 Mrs. G. B. Gunderson.
 Mrs. W. J. Gray.
 Mrs. John C. Donnelly.
 Mrs. C. J. Reilly.
 Mrs. Walter Ross.
 Mrs. C. D. Joslyn.
 Mrs. Thomas T. Leete.
 John L. Ross.
 H. S. Swift.
 Charles Roe.
 Robert Johnson.
 Mrs. James T. Keena.
 Mrs. Arthur Pack.
 Mrs. W. R. Frazer.
 Mrs. Thomas Farmer.
 Mrs. F. A. Hinchman.
 Mrs. J. D. Hawks.
 Mrs. C. M. Swift.
 Mrs. S. F. Angus.
 Mrs. F. W. Brooks.
 Mrs. C. B. King.
 Miss Sarah H. Russel.
 Miss Fanny M. M. Peters.

RECEPTION COMMITTEE.

George H. Russel, Chairman.
 Gov. A. T. Bliss.
 Mayor William C. Maybury.
 C. J. Reilly.
 H. M. Duffield.
 Arthur Pack.
 J. B. Corliss.
 F. J. Hecker.
 Dr. Benjamin P. Brodie.
 C. D. Joslyn.
 Benton R. Hanchett, Jr.
 Thomas T. Leete, Jr.
 G. B. Gunderson.
 W. E. Quimby.
 James E. Scripps.
 H. A. Everett.
 E. W. Moore.
 R. A. Harman.
 C. M. Swift.
 J. D. Hawks.
 S. F. Angus.
 George Hendrie.
 Clarence Black.
 O. B. Taylor.
 J. T. Keena.
 Michael Brennan.
 Fred Smith.
 John C. Donnelly.
 William J. Gray.

PRESS COMMITTEE.

Walter Ross, Chairman.
 P. C. Baker, Detroit Evening News.
 James Schermerhorn, Detroit Today.
 George E. Miller, Detroit Tribune.
 Theodore E. Quimby, Detroit Free Press.

OFFICERS AND EXECUTIVE COMMITTEE OF THE AMERICAN STREET RAILWAY ASSOCIATION.



C. W. WASON,
First Vice-President.



H. H. VREELAND,
President.



E. C. FOSTER,
Second Vice-President.



H. M. SLOAN,
Third Vice-President.



W. H. HOLMES.



JOHN A. RIGG.



T. C. PENINGTON,
Secretary and Treasurer.



D. B. DYLK.



T. J. NICHOLL.



GEO. W. DICKINSON.

Henry P. Hetherington, Detroit Journal.
Curt Hoffman, Abend Post.
Adolph Niederrhein, Michigan Volksblatt.
PRESS AGENT G. Walter Meade.

The headquarters of the "Daily Street Railway Review" during the Convention will be Space No. 28 at the Convention Hall, where

representatives of the "Review" will be on hand to welcome all visitors. Both the members of the Associations and the supply men attending the Convention are cordially invited to visit the headquarters of the "Review," where conveniences for correspondence, etc., will be at their disposal. The "Daily Review" will be issued on the morning of October 8, 9, 10 and 11, and will contain complete proceedings of the sessions of the Associations.

A. S. R. A. PROGRAM.

Papers will be presented at the American Street Railway Association convention on the following subjects:

"Registration of Transfers"—Brooklyn Heights Railroad Co., by C. D. Meenly, secretary and treasurer.

"Benefit Associations"—Metropolitan Street Railway Co., of New York, by Oren W. Root, assistant general manager.

"Discipline of Employes by the Merit System"—Metropolitan Street Railway Co., of Kansas City, by W. A. Satterlee, general superintendent.

"Transportation of Light Express and Parcel Delivery"—Detroit United Railway, by George W. Parker, general express agent.

"The Steam Turbine: Its Commercial Aspect"—E. H. Sniffen, of Westinghouse, Church, Kerr & Co., New York.

"Signals for Urban and Interurban Railways"—Old Colony Railway Co., Boston, by G. W. Palmer, jr., electrical engineer.

"The Adjustment of Damage Claims"—Chicago City Railway Co., by M. B. Starring, assistant general council.

Report of Committee on Standards: N. H. Heft, president Meriden (Conn.) Electric R. R., chairman; E. G. Connette, vice-president and general manager, Syracuse (N. Y.) Rapid Transit Co.; C. F. Holmes, Kansas City; John I. Beggs, president and general manager Milwaukee Electrical Railway & Light Co.; E. A. Newman, general manager, Portland (Me.) Railroad Co.; R. T. Laffin, general manager, Worcester (Mass.) Consolidated Street Railway Co.; Will Christy, vice-president Northern Ohio Traction Co., Akron, O.

Report of committee on Rules for the Government of Employes: J. C. Brackenridge, general manager Brooklyn Heights R. R., chairman; E. C. Foster, general manager Old Colony Street Railway Co.; W. E. Harrington, general manager Camden (N. J.) & Suburban Railway Co.

The annual banquet will be at the Hotel Cadillac, the association headquarters, Friday evening, October 10th.

Thursday, October 9th, has been set apart as "Exhibitors' Day," and no meetings of the association will be held on that day.

The papers have not yet been assigned to the different sessions, but other details of the program are as follows:

WEDNESDAY.

Address of welcome by Mayor W. C. Maybury, of Detroit.

Roll call.

Invitations extended to join the association.

Address of President.

Report of Executive Committee.

Report of Secretary and Treasurer.

Appointment of committee on nomination of officers and selection of next place of meeting.

THURSDAY.

No business session will be held on Thursday.

FRIDAY.

Report of committee on standard rules for government of employes.

Report of committee on standards.

Election of officers.

ENTERTAINMENTS.**WEDNESDAY,**

An informal reception will be tendered the ladies in attendance at the convention from 10 a. m. to 4 p. m. at Hotel Cadillac.

A general reception will be held at Hotel Cadillac at 8 o'clock in the evening.

THURSDAY,

The entire day will be devoted to the examination of exhibits at Convention Hall.

Thursday evening there will be a theater party at the Detroit Opera House to see "When Johnnie Comes Marching Home."

FRIDAY,

A trolley ride will be given for the ladies on Friday morning, leaving Hotel Cadillac at 10 a. m. for Mount Clemens, via the Rapid Ry. and Gratiot Ave., returning via the Shore Line to the Country Club, Grosse Pointe, where luncheon will be served at 1 o'clock. The return to the city will be made at 4 p. m.

The banquet will be held at Hotel Cadillac at 8 o'clock, at which the installation of the officers elect will be held.

ANNOUNCEMENTS.

Badges of the association will be honored on all city and interurban lines.

Information bureaus will be established at Hotel Cadillac and at Exhibition Hall.

The Western Union and Postal Telegraph companies will establish offices in the Exhibition Hall and the Michigan Bell Telephone Co. has installed telephone instruments for the use of the delegates at the hall.

The American District Telegraph Co. will also install its service at Exhibition Hall.

The power houses and storage battery stations at Riopelle St. and Hancock and Third Aves., in Detroit, and at Farmington Junction, Birmingham, Rochester, Ecorse, New Baltimore, Ypsilanti, on the interurban lines, will be open for inspection of delegates at the convention.

PROGRAM OF ACCOUNTANTS' ASSOCIATION.

Tuesday, Oct. 7, 1902.

Meeting of the Executive Committee, Hotel Cadillac.

Wednesday, Oct. 8, 1902, 10 a. m.

Address of Welcome by Hon. F. A. Blades, Comptroller of the City of Detroit.

Annual Address of President.

Annual Report of Executive Committee.

Annual Report of Secretary and Treasurer.

Paper: "The Collection and Reporting of Fares on City and Interurban Lines," by Wm. C. Sampson, treasurer, Union Traction Co. of Indiana.

Appointment of Convention Committees on Nominations and Resolutions.

Afternoon, 2 o'clock.

Annual Report of Committee on Standard Material and Supply Accounting.

Paper: "The Stationery Store-room," by J. R. Shurtz, auditor South Jersey Gas, Electric & Traction Co., Camden, N. J.

No Session on Thursday, Oct. 9, 1902.

Friday, Oct. 10, 1902, 10 a. m.

Chart of Street Railway Blanks, suggested by G. E. Tripp, general auditor, Stone & Webster's Co's., Boston, Mass.

Annual Report of Standardization Committee.

Afternoon, 2 o'clock.

Report of Committee on Standard Form of Report for Electric Railways.

Report of Committee on Nominations.

Election of Officers.

Report of Committee on Resolutions.

Installation of Officers.

Adjournment.

OFFICERS ACCOUNTANTS' ASSOCIATION.

President, H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

First Vice-President, C. L. S. Tingley, secretary American Railways Co., Philadelphia, Pa.

Second Vice-President, W. B. Longyear, auditor Brooklyn Rapid Transit Co., Brooklyn, N. Y.

Third Vice-President, S. C. Cooper, secretary Cincinnati Traction Co., Cincinnati, O.

Secretary and Treasurer, W. B. Brockway.

Executive Committee, the officers and—

W. F. Ham, comptroller Washington Traction & Electric Co., Washington, D. C.

F. R. Henry, auditor St. Louis Transit Co., St. Louis, Mo.

Irwin Fullerton, auditor Detroit United Ry., Detroit, Mich.

D. D. Bartlett, auditor Massachusetts Electric Companies, Boston.

OFFICERS OF THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.



C. L. S. TINGLEY,
First Vice-President.



S. C. COOPER,
Third Vice-President.



H. C. MACKAY,
President.



W. B. LONGYEAR,
Second Vice-President.



W. B. BROCKWAY,
Secretary and Treasurer.



W. F. HAM.



F. R. HENRY.



IRWIN FULLERTON.



D. DANA BARTLETT.

A list of the cities where the Street Railway Accountants' Association has held meetings and the presiding officers is as follows:

Cleveland	.....	*Morris W. Hall, Chairman	.....	1897
Niagara Falls	.....	C. N. Duffy, Vice-President	.....	1897
Boston	.....	H. L. Wilson	.....	1898
Chicago	.....	J. E. Calderwood	.....	1899
Kansas City	.....	C. N. Duffy	.....	1900
New York	.....	W. F. Ham	.....	1901
Detroit	.....	H. C. Mackay	.....	1902

* Deceased.

ADDITIONAL EXHIBITORS.

In addition to the list of exhibitors at the convention as given in the supplement to our July issue, the following companies and firms will have exhibits.

- American Electric Switch Co., Pittsburg.
- Allen & Morrison Brake Shoe & Manufacturing Co., Chicago.
- Armspear Manufacturing Co., 447 West 53d St., New York, N. Y.
- H. B. Camp Co., Aultman, O.
- Detroit Trolley & Manufacturing Co., Detroit, Mich.
- Dorner Truck & Foundry Co., Logansport, Ind.
- C. S. Knowles, 7 Arch St., Boston, Mass.
- Kinnear Manufacturing Co., Columbus, O.
- Merritt & Co., 1024 Ridge Ave., Philadelphia, Pa.
- Nernst Lamp Co., Pittsburg, Pa.
- Peckham Truck Co., Havemeyer Bldg., New York, N. Y.
- John Stephenson Co., Elizabeth, N. J.
- Scarritt Car Seat Works, 805 N. Main St., St. Louis, Mo.
- Standard Paint Co., 100 William St., New York.
- Edward G. Thomas, 4 State St., Boston.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. XII.

SEPTEMBER 20, 1902.

NO. 9

The "Daily Street Railway Review" will be published at Detroit October 8th, 9th, 10th and 11th, and each number should be preserved and filed for binding. The "Daily" supplements the regular monthly issues of the "Review" and its pages will be numbered consecutively, following this issue. The "Daily Street Railway Review" will be mailed to all subscribers and give them the first complete reports of the two conventions.

As the date for the conventions approaches it becomes more certain that the Detroit meetings will justify the use of the well-worn phrase "better than any preceding convention." Secretary Pennington, of the A. S. R. A., had printed copies of all the convention papers and reports in the hands of members over three weeks before the date of the meeting, and his successful efforts in this direction will make it possible for the convention sessions to be devoted more exclusively to discussions than has been customary. Secretary Brockway, of the Accountants' Association, also arranged to have the reports and papers on subjects requiring special preparation for discussion, sent to the members well in advance of the meeting. We doubtless appreciate better than do members of the associations the difficulties to be met in thus securing the papers in advance, and we extend our congratulations to the secretaries.

Occasionally city street railway companies are asked to change the practice, which is now practically universal in this country, of stopping at the far side of street crossings. Stopping cars on the near side of crossings may at times be a convenience to a small minority of patrons, but it has two serious disadvantages. By far the greater number of passengers board and leave cars by the rear platform (many companies in fact prohibit passengers using the front platform) and when the car is halted on the near side of the street, the rear end is some distance from the crosswalk, the passenger having to step into a too-often muddy street and walk several yards through mud or, in winter, slush to the curb. The principal objection is the increase in the number of collisions with

vehicles and pedestrians resulting from attempts to pass in front of street cars in the belief that the car will stop before crossing the street, when such a stop is unnecessary and consequently is not made. Experience in several of the larger cities, and especially in Chicago, has shown that accidents from the cause mentioned can only be prevented by having a uniform rule; thus at boulevards and railroad crossings cars are always halted on the near side, stopping on the far side also if there are persons wishing to board the car at that point.

It is now practically certain that the organization of an association of street railway manufacturers and suppliers will be one of the important features of the Detroit convention. At a meeting of exhibitors at New York last year a committee was appointed to discuss plans for a "Street Railway Manufacturers' Association," and this committee has issued a call for a meeting to be held at Detroit on October 8th, the first day of the convention, for the purpose of organization.

It will be remembered that at the meeting of the executive committee of the American Street Railway Association held in Detroit last February, it voted "to make no change in the manner of handling exhibits." This action of the committee was, we understand, intended as a rejection of a plan submitted at that time which was in substance as follows: That the entire matter of the exhibits and convention entertainments, aside from the banquet, be placed in charge of an association or committee representing the suppliers, who would provide an exhibit hall at their own expense and also bear the cost of the various excursions and entertainments.

We believe that all parties in interest heartily approve of the A. S. R. A. executive committee in rejecting this proposition which was volunteered by some person, whom we do not know, not a member of the committee appointed by the suppliers at New York. The plan outlined by those representing the Street Railway Manufacturers' Association contemplates no changes in the relations heretofore and now existing between the A. S. R. A. and exhibitors at conventions, but is designed to relieve the street railway officials in the convention city of many of the responsibilities and annoyances now imposed upon them, and to enable the exhibitors themselves to handle matters relating to the transportation, installation and removal of exhibits in a more systematic and economical manner.

The call for the organization meeting of the Street Railway Manufacturers' Association will be published in the first number of the "Daily Review."

The change of name of the Union Internationale Permanente de Tramways, of Europe, to include both street railways and light railways, which is noted elsewhere in this issue, suggests the propriety of a change of the name of the American Street Railway Association to one which would be more characteristic of the present scope of the organization. Twenty-one years ago when the Association was organized its name was admirably chosen and it then represented exactly the province to which its business was limited. At that time street railways were comparatively short lines built with strap rails laid on stringers and the cars were exceedingly small, compared with present standards, and were universally propelled by horses or mules. The most important subjects before the Association then were the proper care of the live stock and of the stables, but during the last few years all this has changed and the street railway of olden times has practically ceased to exist. It is of course true that there are some companies operating cable and horse railways, which are members of the association, but it is now, we believe, ten years since a paper on cable railways has been read at one of the annual meetings; horse railway subjects have not been discussed for eleven years.

The definition of a street railway as given by Booth in his work on the "Law of Street Railways" was a road "constructed in streets, whether on, below, or above the surface, along and over which cars are propelled by animal or other power on fixed tracks as common carriers of passengers for the convenience and accommodation of the people living upon or near such highways, and to facilitate the transportation of travelers thereon." Street railways have always been distinguished in law from other railways by reason of the fact that they might, in common with the general

public, use the public highways, while steam railroads had the exclusive use of their roadbeds. Even so late as 1898, the special committee on the "Relations between Cities and Towns and Street Railway Companies," appointed by the Massachusetts Legislature, said of the street railway: "This is all the street railway was fifty years ago, when first laid; it is all it is now,—an improved line of omnibuses, running over a special pavement."

Obviously these definitions fail to define the membership of the American Street Railway Association today and the reason is that since the introduction of electricity there has come into existence a new class of roads which was formerly unknown; these are the suburban, interurban and what are known in Europe as light railways, on all of which electricity is the motive power. The Association is now concerned solely with electric railways, of which the strictly urban lines are by no means the most prominent.

So long as electric suburban and interurban railways confined themselves to the highways there was some propriety in calling them "street" railways, but now that these companies organize under the general railroad laws and build over private rights of way they certainly can not be called street railways. In fact at the time the Massachusetts Committee thus characterized street railways, emphasizing the use of the streets, there were 18 electric railways in that state which in the aggregate had 33 miles of road on private rights of way; four years later there were 51 roads built partly on private rights of way, in the aggregate 118 miles.

Yet the natural affiliations of the electric railway are with the American Street Railway Association, and they have but little in common with the members of steam railroad associations. Within ten years the name Street Railway Association has been outgrown because of the development of the business.

The "American Electric Railway Association" suggests itself as a name which would be eminently in keeping with the present scope of the organization and one which exactly defines its field today. Many of its most prominent representatives are able electrical engineers, in fact, even if not by title, and a perusal of the programs of the annual meetings for several years back will show the proceedings to have consisted largely of papers and discussions on electrical engineering subjects of a highly technical character.

We are convinced that what has been said concerning the name of the American Street Railway Association applies with equal, and possibly greater, force to the name of the "Street Railway Review," and we therefore make the announcement that beginning with our 13th volume in January, 1903, this paper will be known as the "Electric Railway Review."

At this time among the most important problems confronting the men charged with operating high-speed electric railways are the selection and perfecting of train-dispatching and signal systems, and the institution of a satisfactory discipline among the operating force. At the meeting of the New York State Street Railway Association there were several papers dealing with one or more of these subjects—Mr. C. B. Fairchild discussed discipline, Mr. T. E. Mitten presented a paper on car dispatching, Mr. C. R. Barnes, the electrical expert of the New York Railroad Commission, in an extended review of "Accidents on Electric Railroads" touched upon signals, dispatching and discipline, as well as accidents, and in addition a "Standard Code of Rules" for street railway men was submitted. On examination of the program for the Detroit convention of the American Street Railway Association it will be found that the merit system of discipline and signals for urban and interurban railway will be treated in papers, and that a committee will report a set of "Standard Rules." It is quite evident that the electric railway men of the country appreciate the importance of these questions and have them under consideration.

After reviewing the statistics on electric railway accidents in New York and discussing the causes Mr. Barnes recommended two subjects to the action of the association:

First—Every company should adopt a book of rules based on the standard rules. When the companies ask the commission for a copy of the standard rules they are unable to furnish them, as there are no official standard rules. There should be a standard set of rules adopted by the convention immediately.

Second—In nearly every head-on or rear-end collision which occurs, one of the cars telescopes the other. This is caused by difference in height of buffer and difference in construction of cars. This association should adopt a standard set of specifications for the con-

struction of the various sizes of cars, all to be of uniform height of buffer and uniform construction for each size of car.

Mr. Barnes states that "the ideal method of operation on any suburban or interurban railroad is the running of cars under a telegraphic train dispatching system," although he says in the next sentence that on most roads in New York this is impracticable. The relative merits of the telegraph and the telephone for car dispatching have been much discussed of late and there is by no means general acquiescence in regard to the telegraph system being the ideal one or even the best one. While the Hudson Valley Railway Co. has recently abandoned the telephone in favor of the telegraph, it is, we believe, the only electric railway that has done so; on the other hand, the present tendency of steam railroad companies is towards adopting telephones, the Illinois Central being one of the companies that considers the telephone more desirable for dispatching.

Apropos of discipline and accidents reference should be made to the strike with which the Hudson Valley Railway Co. is now contending. Two motormen were discharged because in the opinion of the superintendent, who had carefully investigated the matter, they had been guilty of negligence that caused collisions. The union to which the employes belonged demanded that the two men be reinstated, and on this demand being refused declared a strike that tied up the road for weeks by which its operation is still seriously crippled. It must be apparent that good discipline, such as is absolutely necessary to insure the safety of patrons, cannot co-exist with an organization of employes so unreasonable in its demands.

This number of the "Review" being our annual "Convention Souvenir," it is quite appropriate that a considerable portion of the paper should be devoted to the railways in and about the convention city. The history of the Detroit United Railway, which includes not only an extensive urban system, but also all but one of the seven electric interurban lines entering the city, is identified with more of the controverted questions connected with the development of electric railways than is the case with any other city system. As a result of the attempt to provide competing street railways which should charge a fare of but 3 cents the Detroit railway has had to confront some peculiar conditions. We believe that although the fare on some of the Detroit city lines is today but 3 cents (and it must be remembered in this connection that the city imposes certain burdens in matter of paving and repairs) it is recognized by the public that a 3-cent fare will not enable a railway company to operate its lines and by extensions into unremunerative territory assist in developing the suburbs of the city, which has everywhere been so important a function of street railways.

Some of the interesting features of operation in Detroit have been discussed by Mr. Stanley in his article on page 512. Among these are the conditions resulting from a reduced fare at certain hours; the congestion of traffic during a few hours morning and evening is phenomenal even when compared with the "rush hours" in other cities, the conditions in Detroit being aggravated, because all institutions employing large numbers of men arrange their working hours so that employes may avail themselves of the lower fare on the railways.

Mr. Stanley also refers to the transfer question and the arrangements made to dispense with transfer points in the down-town district, thus avoiding conditions favorable to the abuse of the transfer privilege. The experience at Detroit in the matter of track construction and rolling stock will doubtless prove instructive. The concrete sub-construction for tracks is pronounced highly satisfactory, provided the foundation be made deep enough. In the matter of rolling stock it is considered that a 12-bench open car 33 ft. long is as large as is desirable, while the present standard closed car (22-ft. body) could be enlarged with satisfactory results; the objections to larger open cars are that too much time is required for passengers to enter or leave the car and the difficulty the conductor has in collecting all the fares.

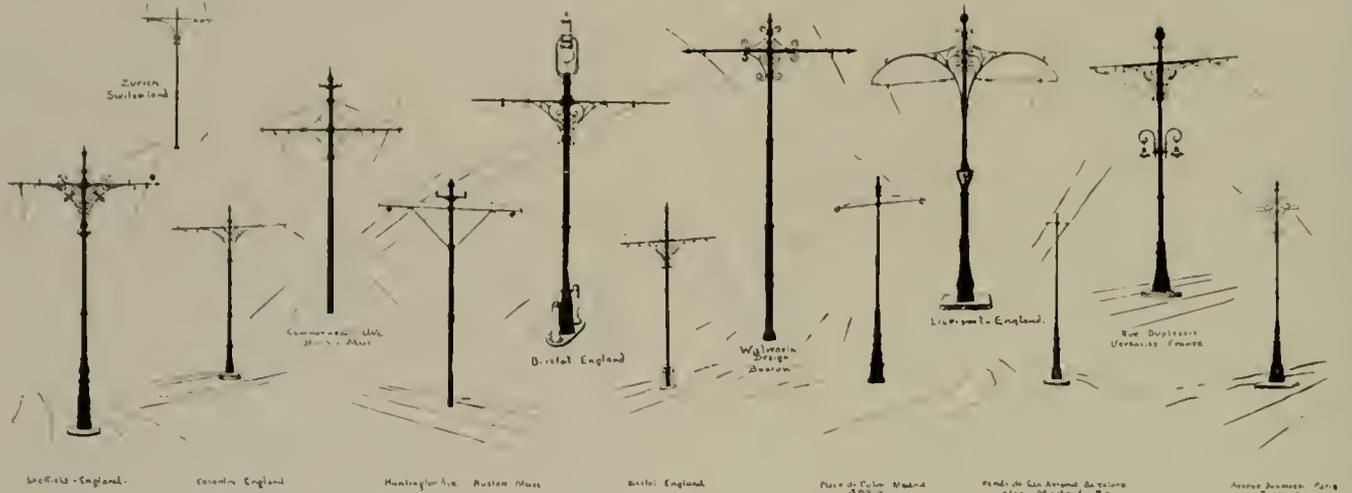
The numerous interurban lines centering in Detroit, some 300 miles of which are a part of the United Railway system, have favored the development of special services; pleasure riding has been promoted by the existence of favorably located parks and a special car which is designed for the use of visitors desiring to see the city has proved a paying venture, and the freight and express business of the city has required the organization of a special department which is fully described elsewhere.

The Artistic Treatment of Electric Railway Line Construction.

BY H. P. QUICK.

In the United States at least, the earliest street railways using the overhead trolley wires were not situated where an attempt at artistic design in the matter of supports for these wires was thought necessary, or desirable, on account of the extra expense. The double wooden pole span wire construction was used in most suburban and cross country work, and even in the small towns and

have been more successful in the older countries, and there the long established artistic standards for public works have brought about the development of ornamental street railway poles, to a high degree. So much so that municipalities which spurned the American idea of two-pole span wire construction have allowed the introduction of electric railways, long delayed, using the center and side

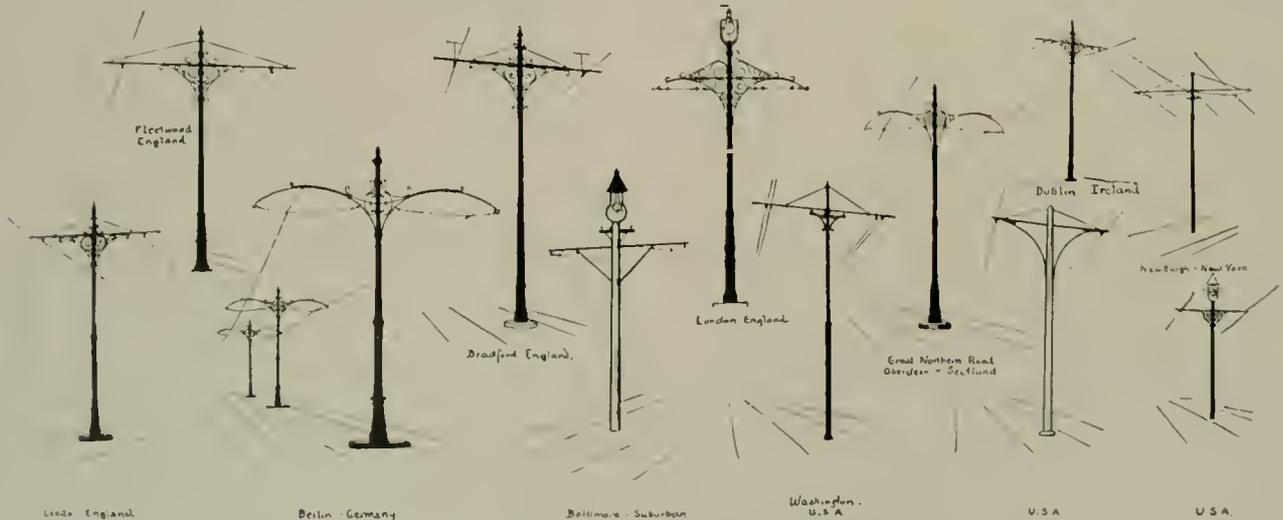


cities these poles were considered no worse than the existing telegraph poles. Municipal authorities in the thickly settled places soon demanded a more durable type, however, and the telescopic iron or steel pole was brought out and continues today most universally used.

It was soon discovered that old world street railways were using a more elaborate pole design, ornamenting it in various ways, and various influences were brought to bear upon railway companies in this country to follow in the old world's footsteps. Certain city developments coincident with the electrification of street railways favored this and so on boulevards and street reservations today

poles with bracket arms of an artistic pattern, and frequently electric light fixtures attached.

This difference in the treatment of such things is with us, I take it, not due to lack of skill or talent, but to lack of appreciation of the finer influences of such designs, and to greater haste in construction for a short lived usefulness, rather than for everlasting endurance. In the older countries centuries of existence seem to have brought the matter of the architectural adornment of streets to the point where nothing has been allowed to interfere with the standards set generations ago, for the beautifying of all the principal show places of the various cities, and this inherited artistic sense



may be seen many attempts at improvement in the character of pole design. Some of these are allowed to suffer from weather wear, or lack of paint and repair, and are burdened with various inelegant crossarms, braces, guard wires and poor looking wire connections until their faults have become so conspicuous that a return to two-pole span wires is considered more desirable in those cases. This is not so everywhere.

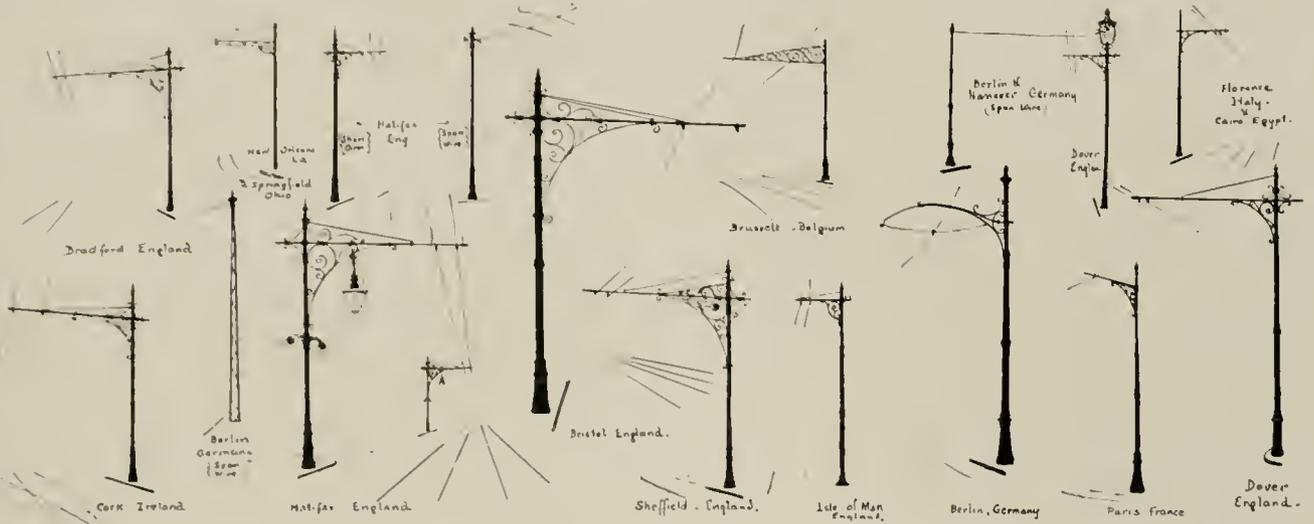
It must be confessed that the efforts to do this sort of work well

is ever observable in the finest works of the past and present generations, not only in buildings, walls, bridges, and architectural adornments, but in various other features of a city's outdoor embellishment. To this of course there are exceptions, but on the whole the statement is true, and we are constantly being reminded by people of the older countries of our defects in these lines. Nevertheless, with us the artistic sense is being developed and already there are signs that the germs of ideas which our architects and artists have

long had stored up from observation and study of the old world's work, are taking on forms that will ultimately influence public opinion to the extent of demanding greater attention to the artistic lines possible, even in commonplace things such as street signs, lanterns, gates, lights, and railway poles.

The influence of our great expositions is being felt, especially in public buildings, and when some one shall exhibit at such a place in connection with the general scheme, and in the most conspicuous

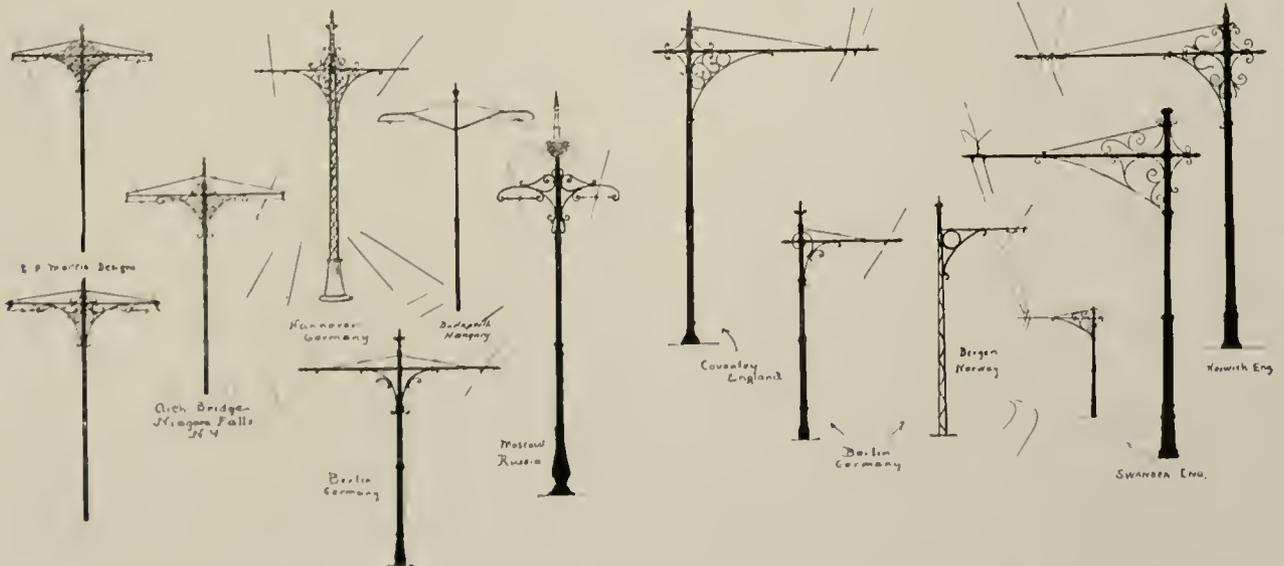
must be said that the latter is away ahead of the former, but the features of some foreign types of railway are so advantageous to the working out of ornamental line construction that they will be referred to here. The usual type of trolley pole or contact device used on top of the cars there, for example, is quite different from that in the United States because of the extensive use of double decked cars having roof seats requiring the pole to be placed on one side of the car roof. Further than that, the use of a horizontal



part of it, an example of the highest development possible, in street railway construction, together with all other street features, then will there be an influence at work in the matter of our street construction which no amount of other illustration will bring about.

All this is from the standpoint of the artist, engineer, or philanthropic citizen who looks at it with the eyes of a benefactor. It will usually be argued that the railway managers are not of this way of thinking, unless they see ultimate profit in that course. That there is a profit cannot be definitely proved, but it is generally noticed that attention to the appearance of lines and equipment, tends to draw people out and increase traffic, to make resi-

dwelling trolley contact is general and these features allow the wire to be placed so far to one side of the center of the track that when two tracks are close together with center or side pole bracket arms, these arms can be very short as some of the designs show, and hence the artistic treatment becomes easier and simpler. Where there is one track, the problem is still simpler, and the side pole becomes more decorative. Abroad there is frequently greater space allowed between tracks and this permits the use of center poles with islands about them which is more attractive and protects the poles better. The civil authorities too are more zealous for the public weal and taste, and require the carrying out of a great deal of



dence along the lines attractive. That such means are being used in the pole line is evident from a glance at the illustrations here with given, which are taken direct from photograph of actual construction in various parts of the world. They illustrate the variety possible, yet not all can be said to be worth reproducing. Some are more or less overladen with ornamentation, and others show a partial absence of it.

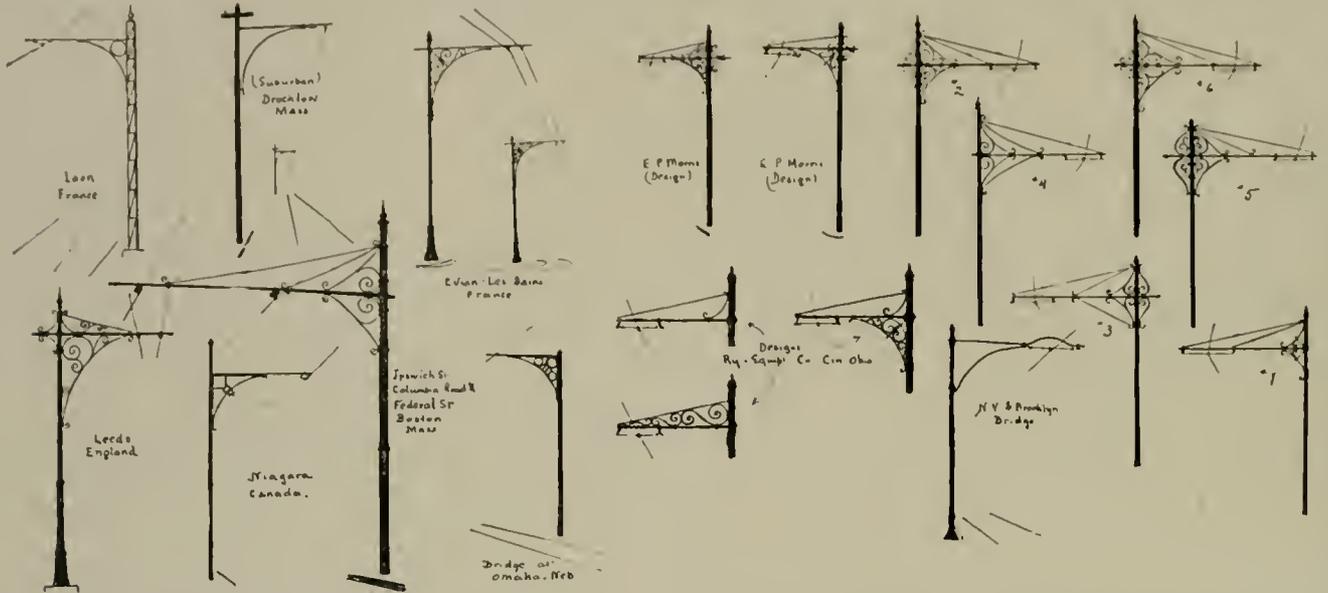
In comparing American with foreign practice in this regard it

ornamentation and as before stated, often require the combination of electric lights with the railway poles, adding much to the attractiveness of the streets.

In this country, however, the civil authorities are not to any extent influenced by the sensitive artistic natures of individual cities, but seem rather to advocate anything that will be financially profitable to them, or their constituents, while the interests of the railway company of course are those of erecting the most economical and

servicable pole considered consistent with its financial ability. If authorities do require a little ornamentation, it is left to the railway company to suit its convenience in getting that design and it will probably either be done by its mechanical foreman or some stock design of a manufacturer will be chosen, which may not have the merit of being hand wrought or artistic. On the other hand an architect if employed will most always overload a plain shaft with unnecessary ornamentation. The best results should come

moisture, inaccessibility to painting, and as with ordinary poles the use of concrete foundations extending above surface of ground far enough to prevent moisture working in to the joint; covering all pipe ends with caps, using short span wires under arms for hangers rather than long rigid bare arms, with no flexibility in connection. With these points looked after, there will be no more trouble with broken wires than on any ordinary span construction. Examples of most satisfactory and artistic center poles with short

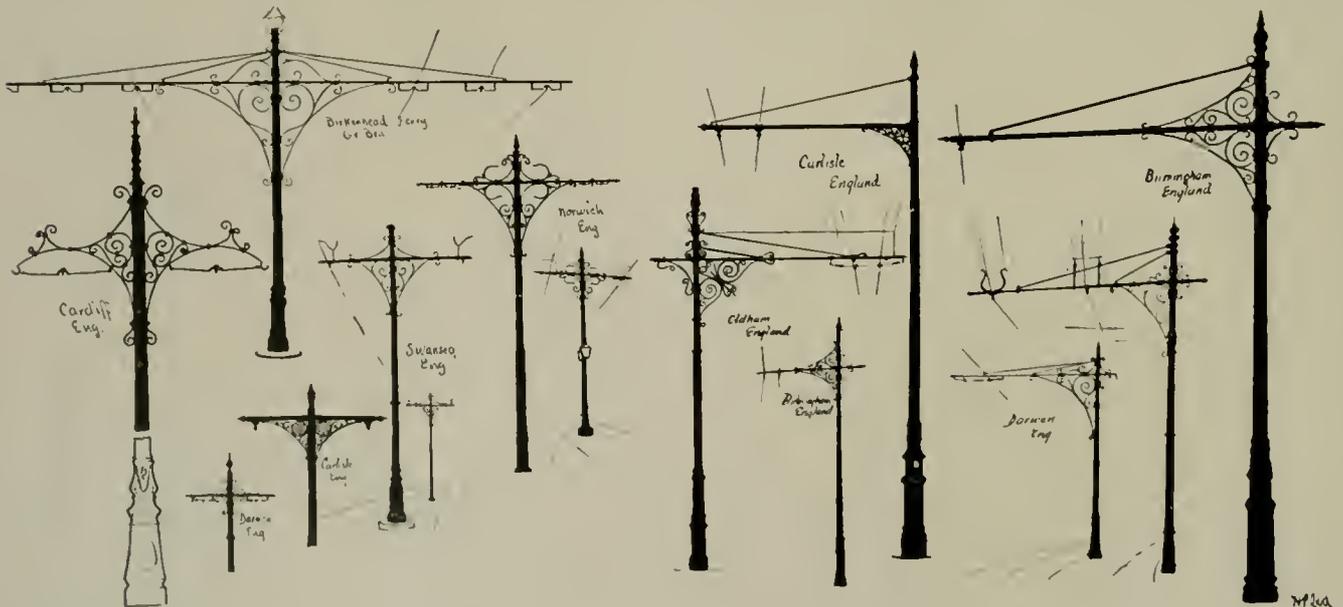


from the artistic mechanical engineer who knows how to come down to the level of the pole and invade the territory of the ornamental without making too great contrasts or injuring its practical value from the standpoint of construction, or operation, or exceeding the limit set upon decoration by the management.

A segmental or telescopic pole is not a beautiful form by itself, and requires some treatment in keeping with even the simplest

arms are those at Moscow, Russia, and Avenue Daumesnil, Paris, and for a wide span those at Berlin, Germany, or Norwich, England, could not be excelled. For a simple ornamentation with braces adapted to the line of strain, that on Commonwealth Avenue, Boston, is satisfactory from a practical point of view.

For side poles an artistic short arm construction is that at Paris, and Evian les Bains, France, and at Berlin, while for a long arm



bracket arms ornamentation. The joints, base, top and junctions of arms are usually ugly points needing attention and concealment.

If this be done the simpler and more massive the arm bracings are, the better. The main points to look after are flexibility in the span wire which carries the insulating ear or wire hanger, rigidity under both the upward pressure of the trolley pole and the downward pull of the wire with the vibrations in both instances, and provision for shocks due to flying poles, avoidance of pockets for

type those at Berlin, at Norwich, England, or at Boston and Birmingham are well balanced designs.

In this country it will be admitted it is generally impracticable and often dangerous to attempt to use either center or side bracket arm poles. The space between passing cars will not admit their use, nor are the widths of streets or location of tracks with relation to curbs suitable. But for parks, bridges, boulevards and reservations they are eminently suitable and desirable.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

DUTY TO REGULATE SPEED APPROACHING CROSSINGS.

West Chicago Street Railroad Co. v. Petters (Ill.), 63 N. E. Rep. 662. Apr. 16, 1902.

It was the duty of the company and its servants, in approaching crossings, the supreme court of Illinois holds, to so regulate the speed of its cars that collisions with other persons having the right to cross such streets could, by the exercise of ordinary care, be avoided.

INJURY TO PASSENGER BY SUDDEN STOPPING OF CAR BY AND TO AVOID COLLISION—CULPABILITY ESSENTIAL TO LIABILITY.

Cleveland City Railway Co. v. Osborn (Ohio), 63 N. E. Rep. 664. Feb. 25, 1902.

Where a passenger on a street railway car was thrown from the car and injured by the sudden stopping of the car in an effort to avoid a collision, and by the shock of a collision which was not brought about by the negligence of the company, the supreme court of Ohio holds that it was *dammum absque injuria*, a loss without a wrong, or that kind of damage for which an action will not lie. It says that in an action to recover for personal injury occasioned by negligence of the defendant, the plaintiff cannot recover by merely proving an act of the defendant which was the proximate cause of the injury; but, to authorize a recovery, the plaintiff must also show that such act resulted from culpable negligence by the defendant.

CONSTRUCTION AND OPERATION OF ROAD UNDER AUTHORIZED ORDINANCE WILL NOT PREVENT GRANT TO ANOTHER COMPANY—"EXTENSION" DEFINED—CONSTRUCTION OF INDEPENDENT RAILWAY AS EXTENSION.

Pennsylvania Railroad Co. v. Inhabitants of Hamilton Township and Mercer County Traction Co. (N. J. Sup.), 51 Atl. Rep. 926. Feb. 24, 1902.

A street railway company, the supreme court of New Jersey holds, obtains no such rights in a public road or street by the construction and operation of a railway therein under an ordinance passed ultra vires or beyond the lawful capacity or powers, say of a township, as will prevent the township committee from granting permission to another railway company to construct and operate its railways in the same public roads or streets. An "extension" of a railway, as the word signifies, it says, is a prolongation of it from one of its termini to some other designated point. And it holds that a grant of permission to construct as an extension what is rather an independent railway is beyond the powers of a township committee, and altogether nugatory, and that the mere construction, maintenance, and operation of such an extension can give no rights to the company.

MUST PROTECT PASSENGERS AGAINST INJURY FROM WILLFUL MISCONDUCT OF EMPLOYEES.

Johnson v. Detroit Ypsilanti & Ann Arbor Railway (Mich.), 60 N. W. Rep. 274. May 8, 1902.

A passenger who paid his fare to a certain place and received a check or ticket in receipt for it was informed, after a change of conductors, that the ticket was not good, and, on his refusing to pay his fare, was ejected from the car. He again boarded the car, paid his fare again, and, it was testified, demanded the return of the ticket which was refused. A few minutes later, he went to the rear platform, where the conductor was, and again demanded the return of the ticket. In an altercation which ensued the conductor struck him and inflicted the injuries sued for. The principal contention of the company was that it was not liable for this act of the conductor, because not within the scope of his authority. The supreme court of Michigan, however, affirms a judgment

in the passenger's favor. It says that it thinks the rule relieving the master from liability for a malicious injury inflicted by his servant when not acting within the scope of his employment does not apply between a common carrier of passengers and a passenger, and that it is the duty of the carrier to protect its passengers against injury from the willful misconduct of its servants while performing the contract to carry.

FRANCHISE CONDITIONS ENFORCEABLE BY MANDAMUS AGAINST PURCHASING COMPANY.

Township of Grosse Pointe v. Detroit & Lake St. Clair Railway (Mich.), 90 N. W. Rep. 42. Apr. 22, 1902.

In this case a peremptory writ of mandamus was issued by the circuit court, on petition of the township, requiring the Detroit, Lake Shore & Mt. Clemens Railway and the Detroit & Lake St. Clair Railway to comply with certain conditions of a franchise granted by the township to the first company, its successors and assigns, and accepted by such company, which afterwards sold its railroad, franchise rights, and other property to the second company. The writ commanded both companies to maintain certain electric lights during the hours of darkness, while actually engaged in running cars, and to run a car over said line daily, except Sundays, at such an hour that passengers thereon might make convenient connection at the terminus of said railway in Grosse Pointe Farms, with a car on the Citizens' line, reaching Woodward avenue, in Detroit, at 7 o'clock a. m., local time. The purchasing company contended that the writ of mandamus should not have issued against it—First, upon the ground that the franchise or license of a town board was a mere contract, and did not rise to the dignity of a statute, and therefore that the duty to perform the acts required by the writ was not a duty imposed by law, but a mere contractual obligation; and, second, upon the ground that it was not shown to have accepted the conditions of the franchise. With neither contention, however, does the supreme court of Michigan agree. It says that authority to occupy the highway was derived from the statute. The only limitation was that the consent of the local authorities be first obtained, and when that was obtained, the conditions were as binding as though imposed in the statute. As to the contention that the purchasing company was not liable to be proceeded against in the same manner as its grantor was, the court thinks it, unsound. It says that the only rights derived were by purchase, it was true, but it seems clear that such a purchasing company takes the road subject to all the obligations resting upon its grantor. Hence, the court holds that the writ of mandamus was properly directed to the purchasing company. But the other company having sold out to it, and not being in position to comply with the requirements of the writ, the order as to it was reversed.

BACKING DELIVERY WAGON UP TO CURB WITH TEAM ON TRACK—DUTY OF EMPLOYEES TO NOTICE CONDITIONS PREVAILING ALONG TRACK—DUTY OF MOTORMAN APPROACHING WAGON.

Fenner v. Wilkesbarre & Wyoming Valley Traction Co. (Pa.), 51 Atl. Rep. 1034. May 12, 1902.

When a delivery wagon which was so constructed that the front wheels would not turn under the bed was backed up and stood against the curb, which was 12 feet 8 inches from the street railway track, at a place where a delivery was to be made, the horses were necessarily standing on the track. This was the position in which the driver was required to place his team to make the delivery. The supreme court of Pennsylvania says that it was upon the public highway, where the driver had the right to be, and where, in the performance of his duty, he was required to be. It was not a place of known danger, and the presence of the railway tracks upon the street did not make it so. The right of the company to use the track was superior to his right to occupy it, but this well-established rule did not prohibit him from using it temporarily for a

legal purpose, nor authorize the company's employes in charge of the car to endanger his life, when, by the observance of their duty, it could have been avoided. The place of the accident was in the public street, where both parties had a right to be, and where each, therefore, was bound to be on the lookout for the other. The position of the driver of the wagon became perilous not by reason of an illegal act in placing his team on the street car track, but by the subsequent recklessness and negligent conduct of the conductor and motorman on the car, which he could not, and was not required to anticipate. It was not in evidence that he saw an approaching car when he placed his wagon against the curb, nor that he had reason to apprehend the presence of one before he could deliver his goods and depart. The inference from the facts disclosed by the testimony was directly to the contrary. Whether he used ordinary and reasonable care under the circumstances disclosed by the evidence was a question for the jury.

Again, the court says that the street was narrow, and the community was thickly populated. Certain obstructions in front of the property where the delivery was to be made which necessitated the backing in of the wagon to unload it on the premises had been there for five or six months prior to the accident, and the company's employes in charge of the car knew this fact. It was their duty to take notice of the conditions prevailing along the track at the time of the accident, and which, according to their own testimony, they knew, and to run their car at a rate of speed which would not endanger the safety of those who might lawfully be on the track. A failure to observe these precautions was negligence. The undisputed fact here was that the motorman had a clear, unobstructed view of the team for a distance of more than 200 yards, and therefore his duty required him not only to run his car at a reasonably safe speed, but also to give warning of its approach to the wagon, regardless of the fact that it was on the track, not at a crossing. It was a place of danger,—where a collision might occur,—and hence it was his duty to take the necessary precautions to avoid an accident.

EJECTION OF PASSENGER HOLDING WRONG COUPONS THROUGH MISTAKE OF PRIOR CONDUCTOR—MEASURE OF DAMAGES.

Brown v. Rapid Railway Co. (Mich.), 90 N. W. Rep. 290. May 8, 1902.

A round-trip ticket consisted of eight coupons. Four of these coupons, colored respectively white, pink, yellow, and blue, were the "going portions of the ticket," and four coupons, colored respectively blue, yellow, pink, and white were for the return in inverse order. Each coupon contained the names of the stations between which it was good, and the words, "Detroit to Marine City, and Return," and "Void if Detached from Signature Coupon." The third conductor on the going trip discovered, and notified the passenger, that the previous conductors had made a mistake, and had taken coupons from the wrong end of the ticket; tore off and handed him the first two going coupons, and himself took the third one. The passenger asked if he could use the detached portions, and was told that they would be accepted by succeeding conductors. On the return trip, however, the conductor in charge of the car refused to honor these coupons, notwithstanding the passenger's explanation and offer to corroborate his statement by other passengers, and, on his refusal to pay another fare, expelled him from the car, after which he took the next car an hour later and paid his fare, on the conductor's refusal to accept the coupons after learning of the other conductor's action. Testimony was offered to show that the passenger had been sick, and suffered a relapse, being confined to his bed four or five weeks thereafter. In justice court he recovered a judgment for \$500, and the company appealed to the circuit court, where a verdict was directed in its favor. But the judgment of the latter court is reversed by the supreme court of Michigan, and a new trial ordered, though without costs to either party.

The supreme court says, in further explanation, that the most serious inconvenience that the passenger need have suffered was to pay 40 cents for his return fare, present his tickets, with proof of the circumstances, and get his money refunded. He was not content to do this. Rather than lose 40 cents, or be to the trouble of asking that it be refunded, he preferred to refuse to recognize the reasonable rule of the company. He refused to leave the car, notwithstanding the suggestion of the conductor that he pay his fare, and have it refunded later, and allowed the conductor to drag

him through the car, and actually made him lift him off. The supreme court says that it has several cases which hold that under such circumstances as these the conductor does not commit a wrong by ejecting from his train one who has no ticket, and refuses to pay, and that it would be absurd to hold that the conductor must take his passenger's word regarding his failure to have an appropriate ticket, or take the evidence of fellow passengers, and determine the matter at his peril, or that of the company. These two coupons which the passenger had were the first that should have been detached. Had he succeeded in riding over the first two sections without detection by the conductor, and detached them himself, he could have made the same claim, or sold them to another for second use. The law permits these companies to make reasonable rules for their protection, and this passenger had no cause of action arising out of his ejection from the car, as the circuit judge properly held. But, under the proofs, he paid 40 cents by reason of the inadvertence of the conductor, and, under his declaration, which alleged the contract and its breach, as well as the expulsion in aggravation of it, he had a right to recover that amount, though he had no right to expect a verdict of \$500.

ABUTTER MAY ENJOIN UNAUTHORIZED LAYING OF TRACK—RIGHT TO QUESTION POWER—CONSTRUCTION OF DELEGATIONS OF POWER—INDIVIDUALS NOT ENTITLED TO CONSTRUCT STREET RAILWAYS—WHAT STATUTE MEANS BY STREET RAILWAY.

Allen v. Clausen (Wis.), 90 N. W. Rep. 181. Apr. 22, 1902.

An abutting lot owner, the supreme court of Wisconsin holds, must submit without remedy or compensation to the injury caused by the construction of a street railway, when the acts are done within the street by authority of law, but may enjoin the laying of a railway track which is about to be laid without authority of law on the street in front of his premises.

A number of cases, the court says, have established the law in Wisconsin that the vacating of a franchise granted by the state can be accomplished only by proceeding in the nature of quo warranto in the name of the state, and that it is not within the province of a court of equity, at the suit of a private plaintiff, to question the regularity of the proceedings by which a municipality has, under duly delegated authority, granted a franchise on behalf of the state, of which the grantee is in de facto or actual exercise and enjoyment. It has, however, never been held that, where one attempts to justify acts by a pretended license or franchise which the grantor had no power whatever to confer, a court, whether of law or equity, cannot discover that fact and deny the claim of justification. It matters not whether such defect of power rests upon the state itself or upon any of its subordinate agencies attempting its exercise. The readiness of courts so to do has been evinced in many cases in this state and elsewhere.

As a corollary of the doctrine that the highways of the state are under the control of the general state government, and that the right to use the same for street railways, etc., is by franchise emanating from the state, the court says that it results that the municipal corporations have power to make such grants only by delegation from the state. It is a general proposition that a municipal corporation possesses and can exercise only powers granted by express words, or those necessarily implied in or incident thereto, or those essential to the declared purposes; not merely convenient, but indispensable. Any ambiguity or doubt as to existence of a power is to be resolved against the corporation, and the power denied. Another cardinal rule of construction is that the grant of a power under specified circumstances, or accompanied by defined conditions or limitations, excludes that power otherwise. The maxim, "Expressio unius, exclusio alterius," that is, "the expression of one thing is the exclusion of another," is especially controlling upon such legislation. The application of such rules of construction to section 1862 of the Revised Statutes of Wisconsin of 1898 must, of course, result in denial of power in any city to grant franchise to use streets for a street railway, except to a corporation organized for the purpose of operating such establishment under the Wisconsin statutes, or to persons "who have a right to construct, maintain, and operate a street railway," the section providing that any municipal corporation or county may grant to any such corporation, or to any

such person, the use of any streets or bridges within its limits. The last class obviously does not contemplate persons who have merely the common right to do business, for to that end the quoted words would be meaningless. The legislature must have intended to limit such franchises to persons distinguished from the great mass of mankind by the qualifying description. The descriptive words used with reference to the permitted grantees are well adapted to segregate those who have already had franchises from the rest of mankind. Those who have not received such franchise cannot, in any fair sense, be said to have the "right to construct, maintain, and operate a street railway." Men generally may have the natural right to build and use a railway on their own land or on that of others by their license; but a street railway, as mentioned in the statutes, means one laid in a street, and no man has a right to either construct or operate a railway there without permission so to do from the state. That an authorization to grant such franchises only to corporations excludes any power to confer one on individuals, and renders void any attempt so to do, has been often decided by other courts. The reasons for such holdings are obvious. The legislature having created corporations for the public purpose of operating street railways, having hedged them about with a code of statutory regulations for the safety and convenience of the public, and having the reserved right to change and control them, even to destroy them, may well adopt a policy of conferring extraordinary rights in its highways only upon the corporate bodies so within its control. The court cannot doubt that such legislative policy and purpose is apparent in the Wisconsin statutes, and that from the municipal corporations has been withheld any power to grant to individuals, except of a specified class, franchises to construct or operate street railways in or over the public streets.

BUFFALO RAILWAY EMPLOYES' OUTING.

The International Railway Co., of Buffalo, gave each of its employes a day's outing this summer. This annual outing commenced on July 14th, and continued for eleven days, until every employe of the company had been afforded a pleasant day's excursion at Olcott Beach, the company's summer resort. The men were divided into eleven different sections, or groups, each group comprising the employes of one station, and it was planned to give each station force one day of freedom from railway cares and an opportunity for recreation at one of the finest resorts on Lake Ontario. Every man in the company's employ was afforded a pleasant day at the beach with his wife and children and friends. The company furnished free transportation for all, and its records show that 7,649 persons took advantage of the trip.

The entire beach and all of its amusement features were at the



A FEW OF THE BOYS.

service of the men and their friends, and everything was free, the company standing all the expense. No tickets were collected at the theater, and refreshments consisting of ice cream, lemonade, coffee, etc., were served free. Each section of excursionists arranged a program of games and sports for the day, all of which were carried out with much enthusiasm. A good band was in

attendance to furnish music for the occasion, and when the games and sports were over the Casino was thrown open for dancing, while the children crowded the merry-go-rounds and other amusement features.

One of the accompanying illustrations gives a view of a train carrying a station force to the beach. This train left the station



BUFFALO RAILWAY EMPLOYES' TRAIN TO OLCOTT BEACH.

at 8:30 a. m., accompanied by a band of music and with decorations flying. On some days the trains were 17 cars in length, and they attracted much attention from the stores and windows as they passed out Main St. on their way to Olcott Beach. The men all wore white outing caps and badges, and presented a fine appearance. Each day was voted a complete success by the excursionists, and all returned to their homes at night fully appreciating the favor which the company had bestowed upon them.

On the day following the last excursion to the beach the premiums which the company gives to its employes every six months for good conduct and for avoiding accidents were distributed among the men. The sum of \$15,000 was distributed at this time, and many of the fortunate ones were made glad hearted by reason of full pockets.

The premium plan inaugurated by this company, which was described in detail in the "Review" for February, 1902, has proved to be very successful, and the number of accidents has been reduced during the present year by a large percentage over that of former years.

KIOTO ELECTRIC TRACTION CO.

A new electric railroad is in course of construction in Kioto, Japan, which is expected to be completed and in operation during the present month. The road consists of 8½ miles of city line and four miles of suburban line. The company was chartered in May, 1895, and has an authorized capital stock of \$600,000, of which \$362,500 is paid up. The officers of the company are: Bumpei Takagi, president; Z. Ozawa, vice-president; G. Iwahashi, secretary; H. Furuya, treasurer; T. Ido, general manager; Y. Kawarabayashi, superintendent, and Ichiro Goto, electrical and mechanical engineer. The power house contains one 14 x 28 x 36-in. cross compound condensing engine, built by the Allis-Chalmers Co., and two 200-h. p. Heine safety boilers. The generating unit consists of one 225-kw. Westinghouse machine. In addition to this equipment there has been ordered this year one 16 x 32 x 36-in. Reynolds-Corliss engine, one 30-kw. General Electric generating set, one 250-h. p. Heine boiler, and one 166-tube Green economizer. The company has 46 closed motor cars 20-ft. long by 6-ft. wide. No trailers are used, as they are forbidden by law. The company builds its own cars and 12 additional cars will be added this year to the company's rolling stock.

The cars are mounted on Brill 21 E trucks, and are equipped with G. E. 800 motors.

The Saginaw Valley Traction Co., of Saginaw, Mich., has sued the city for damages as the result of closing the Genesee Ave. bridge to the cars of the company's lines.

RAILWAY PARK AT OIL CITY, PA.

Situated just midway between Franklin and Oil City, Pa., being about five miles from each of these places, is an extremely attractive railway park, owned and operated by the Citizen's Traction Co., of Oil City, Pa. The park might indeed be called a summer resort, for its beautiful scenery and delightful location have led a number of persons from the two cities to build cottages on its grounds and make their homes there during part of the summer.

The park covers 60 acres, half of which is open and diligently cared for by an expert landscape gardener.

The most striking feature of the park is the number of mineral springs upon its grounds, there being seven in all, and each sending forth a different mineral water. The most remarkable of these springs is that known as the "Boiling" water; this spring comes up through black quicksand, is 20 ft. in circumference, and it is very interesting to watch the water boiling up and turning the sand over and over. A distance of only 500 ft. from this spring is another boiling out of white quicksand, with a 6-in. stream. The waters from the different springs meet and make a beautiful brook, winding its way through the park. Well-kept flower beds and electric fountains adorn the grounds, and rustic seats, hammocks and



MERRY-GO-ROUND AT OIL CITY RAILWAY PARK.

swings with an abundance of shade add to the pleasure of all visitors.

A great deal of money has been spent to make the park both comfortable and handsome. A large theater is fitted with modern furniture and scenes, and performances are given every evening, or the hall devoted to parties and dances. A large double-deck restaurant, 59 x 90 ft., supplies all those who do not bring their baskets to the park, and here one may be as well served as in any modern hotel in the state. Besides this accommodation there is a public hall provided for those who bring their lunch, and a kitchen is also provided where patrons may make themselves coffee and cook short-order dishes.

Another striking feature is the electric tower, a miniature of the Pan-American electric tower. It has a 20-ft. base, is 112 ft. high, covered with 3,000 lights of different colors, making a very brilliant display.

There are amusement parlors fitted with all the modern slot machine amusements; a band pagoda, where a good band plays every afternoon and evening; a merry-go-round and a miniature railway. The merry-go-round is nicely located under its own house, and the miniature railway, which makes a circuit around the park just inside a fine bicycle track, furnishes a grand amusement for the children. The merry-go-round and miniature railway were built by the Armitage-Herschell Co., of North Tonawanda, N. Y. Much care has been taken with these two features and they have been a source of great revenue to the company. Contrary to the usual plan of covering the merry-go-round with a tent, this company has seen fit to give it a real house, as shown in accompanying illustration, and from the enthusiasm of the managers of the Citizen's Traction Co. it would seem that the managers of other railways have made a great mistake by not owning their own merry-go-

rounds for their parks. During 20 days in July this merry-go-round and miniature railway took in \$1,256, which is certainly a fine return on the investment.

In handling the crowd to and from the park the railway company experiences very little difficulty, because the work is done with system. A nicely finished depot 30 x 150 ft. is equipped with turnstiles, where all fares are collected as people pass out from the park. Passengers are unloaded at one place and taken on at another, so that there is no rushing over each other. A check room is provided for all who desire the convenience, and a charge of 5 cents is made for checking.

The police regulation of this park is of the best, each guard being a deputy sheriff. No intoxicated persons and no spirituous liquors are permitted on the ground.

The buildings are neatly constructed and nicely painted; the water works, which are complete in every way, are owned by the railway company, and the sanitary arrangements are perfect in every detail.

During the past season the superintendent, Mr. J. H. Forebush, has given much of his time to the park, and his efforts have been quite successful in making it a popular resort.

CONTEST FOR RIGHT OF WAY IN INDIANA.

An interesting legal controversy has arisen between two electric interurban railway companies in Indiana, the course of which will be closely followed by electric railway men in that state, as the decision will give an interpretation of recent Indiana electric railway legislation. The Indiana legislature, at its 1901 session, amended the electric railway law, giving electric interurban companies practically the same rights of condemnation as steam railroads had previously enjoyed. The act provides that the railway companies may enter upon lands to make its surveys and if it cannot agree with land owners for the purchase of the route desired, it may file articles of appropriation and thus secure the exclusive use of the land for the purpose named, whereupon the circuit court appoints appraisers to determine the value of the land appropriated.

The facts of the controversy are as follows: In November, 1901, the Lafayette & Indianapolis Rapid Railway Co. was incorporated to build an electric railway between the cities named in the title, and after a favorable report on the project had been made by Mr. Damon of the Arnold Electric Power Station Co., of Chicago, the railway company surveyed and established its route between Lafayette and Indianapolis, closely following that of the Big Four railroad. About the same time the Indianapolis, Lebanon & Frankfort Traction Co. was incorporated to build an electric road from Indianapolis to Lebanon and thence to Frankfort, and located its line for fifteen miles (about half) of the distance between Indianapolis and Lebanon on the route chosen by the Lafayette & Indianapolis company, and began to get optional contracts from the owners of lands embraced in the right of way established by the Lafayette & Indianapolis company. The Lafayette & Indianapolis company endeavored to make agreement with the landowners, and failing to do so filed articles of appropriation as provided in the statute referred to (See St. Ry. Rev., July, 1901, p. 422) and appraisers were appointed by the Boone Circuit Court. In the meantime, Townsend, Reed & Co., the contractors for the Indianapolis, Lebanon & Frankfort company, began grading over the disputed right of way, completing the work for some ten miles. The Lafayette & Indianapolis company thereupon brought suit against the Indianapolis, Lebanon & Frankfort company, asking for a permanent injunction restraining the latter not only from constructing its road but from operating it if completed.

The question involved, that is whether the company first surveying and locating its route has the prior right, has not been decided in Indiana where railroads are involved, but the Lafayette & Indianapolis company relies upon the decisions on similar statements of fact in other jurisdictions and particularly upon that rendered in the case of the Indiana Power Co. v. St. Joseph & Elkhart Power Co. (63 N. E. 304). In this case it was held that a hydraulic company organized under the act (Burns Revised Statutes, 1901, paragraph 4827) authorizing the incorporation of such companies, and which files an instrument for the appropriation of real estate with the clerk of the court, as required by the act, may include

therein and condemn lands purchased by another company, incorporated prior to the incorporation of the company condemning the land, for the purpose of constructing similar works, but which has failed to file an instrument of appropriation, even though the water power in question is capable of being utilized by one company only. The eminent domain act under which this case was decided is substantially the same as the railroad act, and in fact was copied from the railroad act.

PRESIDENT'S ACCIDENT AT PITTSFIELD, MASS.

President Roosevelt's recent New England trip was marred by a very sad accident on the morning of September 3d, while the President's party was en route from Pittsfield, Mass., to the Country Club at Lenox. As the result of collision with a trolley car one of the President's attendants, William Craig, of the Secret Service, was killed outright, Mr. Roosevelt and Secretary Cortelyou were badly shaken up and more or less injured, while the driver of their carriage, David J. Pratt, was so severely hurt that for some time his life was despaired of, but he is convalescing. In the carriage with President Roosevelt, and at his side, was Governor Crane of Massachusetts, who, fortunately, escaped practically unhurt.

The accident occurred about 3½ miles out of Pittsfield and about 200 yards from the Country Club, where were gathered many members and friends to greet the presidential party. The President



THE PRESIDENT'S CARRIAGE AFTER THE ACCIDENT NEAR PITTSFIELD, MASS.

and Governor Crane occupied the rear seat of the barouche and Secretary Cortelyou sat opposite. Detective Craig was on the box with the driver. Following the President's carriage were five others, containing men of prominence, including Dr. Lung, the surgeon assigned by the navy department to accompany the President. The carriages were going at a good rate of speed along North street, a broad macadam turnpike with a trolley line on it. About 200 yards from the Country Club, on the Pittsfield side, the track shifts from the middle of the road to the left hand side. The carriages were on the left side of the track as they started down the incline approaching the rise on which the Country Club stands. The driver swung the leaders a little as he approached the turn of the track, so the wheels of the barouche would not slide along the rails. The leaders had barely crossed the track when the car struck them, but as Craig turned with extended arm to warn the President.

Mr. Roosevelt and Governor Crane were thrown to the right, while Craig fell directly in front of the car and was terribly mangled by the wheels. Secretary Cortelyou was thrown backward and suffered a contusion on the back of his head. The driver was rendered unconscious. One of the horses was so badly injured that it was shot. Three of the carriage wheels were smashed. The only thing that saved the President and Governor Crane was their being thrown to the right, instead of the left.

Dr. Lung ran to the President's assistance, but it is character-

istic of the man that he thought of others first. Mr. Roosevelt's injuries were such that if received by a less sturdy man they would have been pretty serious. A blow on the right side of his face caused it to swell and the right eye was blackened, as in fact, was all the upper part of his face. Blood was drawn from a slight scratch on his cheek. The President said to a friend that he had received worse injuries in foot ball and polo, and if it were not for poor Craig's death he wouldn't give a snap of his finger for what happened.

After the accident the management of the Pittsfield Electric Street Railway Co. was severely criticised for permitting cars to operate on the road while the President's party was en route. Superintendent P. H. Dolan of the company, in an interview denies the published reports that the company was ordered or requested to stop running cars while the presidential party was in the city, but as a matter of fact operation was suspended while the carriages were passing through the city proper. The management, however, saw no good reason why cars should not run along the highway to the Country Club, as there were many officials and invited guests who had no other way of reaching the club grounds. The car that figured in the accident was a special car chartered by members of the Country Club to make the run to the clubhouse, and Mr. Dolan states it otherwise would not have been sent out, although he saw no reason at the time for suspending operation of cars on that line.

NEW ALTERNATING CURRENT TRACTION SYSTEM.

The Washington, Baltimore & Annapolis Electric Railway Co., which is now building from Washington to Baltimore, a distance of 31 miles, is preparing to install a new electric system using alternating current apparatus throughout.

The current will be generated by three 1,500-kw. single-phase generators in the main power station, located at Hyattsville, and will be distributed at 15,000 volts to transformer stations located along the line. These sub-stations will contain only stationary transformers and the necessary switches and fuses, and will not require the presence of an attendant. From the sub-stations the current will be fed to a single overhead trolley wire at a pressure of 1,000 volts.

The cars, which will be about 60 ft. in length, will be equipped with four motors, each of 100 h. p. capacity, which it is expected will permit of a speed of from 45 to 60 miles per hour. The motor, which is the novel feature of the system, is a variable speed alternating current motor, which has been developed by the Westinghouse Electric & Manufacturing Co., under the supervision of Mr. B. G. Lamme, assistant chief engineer, and it is claimed to have characteristics specially adapted to railway service.

The company is to take over a small direct-current road running from Washington to Laurel, Md., and current for this road will be supplied by two 200-kw. single-phase rotary converters located at the main power house; this apparatus is also novel. The building of the road is being done by the Cleveland Construction Co. The officers of the Washington, Baltimore & Annapolis Electric Railway Co. are: W. H. Lamprecht, president, and Otto Miller, secretary, both of Cleveland, O.

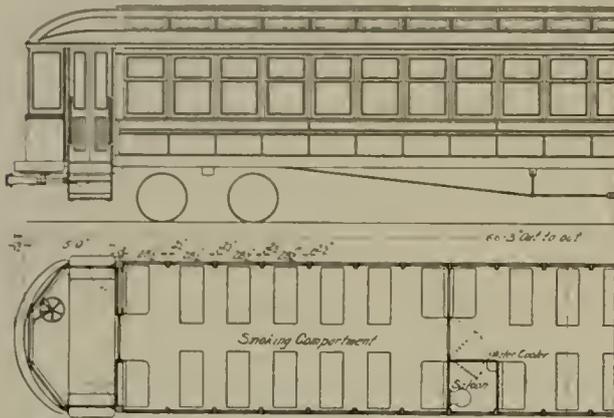
NO 3-CENT FARES FOR CLEVELAND.

The 3-cent fare railway proposed for Cleveland seems to be practically dead. John B. Hoelgen, who obtained a franchise some time ago for an extensive system of 3-cent fare roads in Cleveland, which was afterwards declared invalid by the courts, states that he did not bid for a franchise for the 3-cent-fare lines which were offered last month. The old 3-cent fare franchises were declared illegal, and the case is now before the state supreme court. Pending the final decision on this point the city council planned to get proposals for new 3-cent fare franchises, which were supposedly legal.

August 17th the cylinder head was blown out of the engine in the power house of the Logansport, Rochester & Northern Traction Co., and no cars were run for two days and a half following until the damage was repaired.

THE LARGEST INTERURBAN CAR.

Fig. 1 shows an excursion car for the Columbus, Delaware & Marion Ry., several of which are in course of construction at the shops of the Jewett Car Co. These cars are 66 ft. 3 in. long over the buffers and are, we believe, the longest interurban cars by 5 ft. ever attempted by any car builder for electric interurban service. Fig. 2 shows the floor framing. The side sill consists of one piece $4\frac{5}{8}$ x $7\frac{1}{2}$ in. and one piece $14\frac{1}{2}$ x $5\frac{1}{2}$ in. long leaf yellow pine in one continuous piece without splicing, with a 6 x $\frac{1}{2}$ in. steel plate between the sills and a



FLOOR PLAN AND ELEVATION.

7 x $\frac{1}{2}$ in. steel plate on the outside, these being thoroughly bolted together.

The center and intermediate sills are $3\frac{5}{8}$ x $5\frac{1}{2}$ in. long leaf yellow pine in one continuous piece without splicing. The over-truss is a truss plank 9 x 2 in. yellow pine in a continuous piece, securely bolted to the side sills. The under-truss consists of four $1\frac{1}{4}$ -in. rods going the full length of the car, over bolsters and through the end sills. The end sill is also plated with 6 x $\frac{1}{2}$ -in. steel. The bolster is made of two steel plates, 8 x $\frac{3}{4}$ and 8 x 1-in. M. C. B. type of construction.

The platform construction of these cars is exceptionally strong to prevent any possibility of sagging. The outside platform knees are made of 5 x $\frac{5}{8}$ -in. steel plates with suitable oak filling, and the center

These cars have all modern conveniences, such as toilet room, drinking fountain, etc., and also have a smoking room.

A special feature of the cars is that the glass is only $28\frac{1}{2}$ in. from the floor, which gives quite an unobstructed view from the inside and gives the effect of riding in an observation car.

Each end of the car is provided with "Providence" fenders, and Van Dorn automatic draw bars. The steps are of the Stanwood type and the step openings are closed with the Jewett automatic trap door. The cars are mounted on Peckham No. 32 M. C. B. trucks and equipped with GE No. 73-A motors. The weight of the car complete, ready for service, is about 35,000 lb.

CANADIAN NOTES.

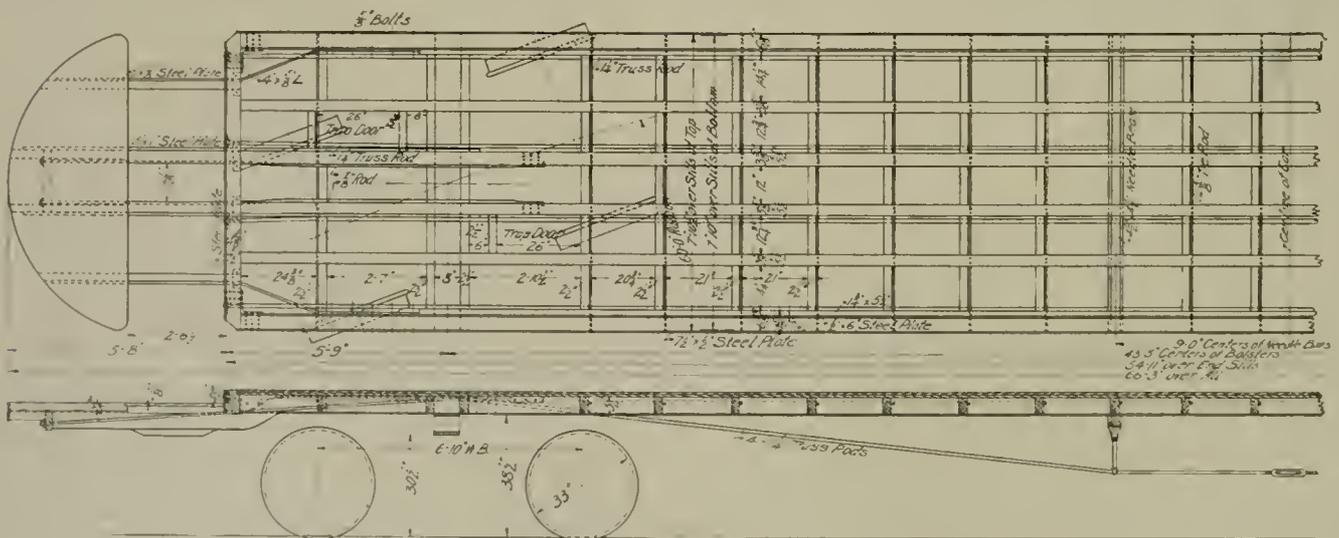
The Southwestern Traction Co., incorporated by special act of the legislature, has applied for a franchise in London. The company's charter covers a main trunk line from Hamilton through to Glencoe and Strathroy, a distance of 105 miles, passing through Brantford, Paris, Woodstock, Ingersoll and London, besides thriving villages every few miles. It is the intention of the company to build during the first year some 29 miles of road between Ingersoll, London and Delaware. The whole of the proposed route is through a rich and fertile farming country with a population of between 90,000 and 100,000. The municipalities of Ekfrid, Caradoc, Westminster and Delaware (covering all the line between London and Strathroy) have granted 50-year franchises, with free right of way over the public highways and exemption from taxes for 20 years. The capital of the company has been almost entirely subscribed by local capitalists. The officers are: F. G. Rumball, of London, president; F. B. Leys, London, first vice-president; Robt. McEwan, of Byron, second vice-president, and A. E. Welch, of London, managing director.

It is stated that Cleveland capitalists are anxious to secure the charter for the proposed electric road between Toronto and Hamilton, a distance of about 44 miles. This route is considered one of the most desirable in Canada.

There is considerable discussion at Phoenix, B. C., regarding the construction of an electric line to Greenwood.

The Hamilton, Grimsby & Beamsville Electric Ry. has been granted free right of way through the township of Clinton for its 12-mile extension from Vineland to St. Catharines, where it will connect with the Niagara, St. Catharines & Toronto Ry.

A franchise has been granted for the construction of a line of



FLOOR FRAMING PLAN OF 66-FT. INTERURBAN CAR—JEWETT CAR CO.

knees are made of 5 x 1-in. steel plates extending back through the bolster, and have filling for bolting the buffer. For further strengthening the platform, two rods are put in the center of the car, which act also as draft rods. The seating capacity of this car is 123.

The construction of the side of the car is such as to allow an exceptionally long seat, which will accommodate three passengers. They are of the "Walkover type," made by the Hale & Kilburn Manufacturing Co. and upholstered with rattan.

electric railway between Picton, Ont., and Wellington. Mr. M. R. Allison, of Picton, is one of those principally interested.

The Halifax Tramway Co. has secured the contract for lighting the dockyard.

The Canadian Pacific Railway Co. has purchased the Hull & Alymer electric road. The purchase price is said to be between \$700,000 and \$800,000.

The Ottawa & Hull Power Co. expects to complete its works in

about three months, when it will have developed 12,500 h. p. The construction of the power house is well advanced; five dynamos of 2,500 h. p. each will be installed.

Mr. E. S. Harrison, of Winnipeg, states that tenders for preliminary construction work on the proposed electric railway between Winnipeg and Headingly, Man., will be called for immediately. There will be four divisions of 2 $\frac{1}{4}$ miles each.

The town council of Cookshire, Que., has decided to purchase the water power on the St. Francis River, situated a few miles above Angus. It is proposed to develop the power electrically and transmit it to Cookshire, a distance of 20 miles.

An agreement has been reached between the town council of Sault Ste. Marie, Ont., and the Intercolonial Transit Co. by which the latter agrees to have electric cars running in the town by October next.

The Montreal Street Ry. Co. has now completed the survey for the extension of its line to Longue Pointe, a 10-year franchise having been obtained from the municipal council. The new line will be about three miles in length, two miles of which will be double tracked and will run from the present terminus at Viauville eastward along the river bank to about one mile east of Longue Pointe.

The Montreal Terminal Railway Co. are making rapid progress on its new line into the city and expects to have it completed in a short time. This company has just placed a contract for 16 new cars of a special pattern, and contemplates double tracking the line between Montreal and Bout de l'Île.

Arrangements are being made to utilize the water power available at Kingston mills for the purpose of supplying power to the Kingston Street Ry.

The St. Lawrence River Electric Power Co. has been incorporated with a capital stock of \$250,000 by M. W. Beach and W. J. Redmond, of Iroquois; Erwin Halliard, of Morrisburg; W. H. Meldrum, of Peterborough, and D. A. King, of Winchester. The company intends to build and operate an electric railway from Ottawa to Lachine, where it will connect with the city lines.

It is the purpose of the Canadian Pacific Railway Co. to build an electric power house at Fort William, Ont., although the plans are not yet complete.

The municipalities interested in the proposed Huron, Bruce & Grey Electric Ry. are holding meetings for the purpose of discussing the situation. At the last session of the legislature a charter was granted for this road, to run from Wiarton to Owen Sound, with branches to Seaforth and Blyth.

An offer has been made the Sherbrooke Gas & Electric Co. by a syndicate representing local and foreign capitalists to purchase the company's stock at \$78.00 per share. The capital stock of the electric company is placed at \$200,000, and the new company proposes to take over also the floating debt of the company, which is \$60,000. It is stated that the new syndicate is also after the Sherbrooke Street Ry. and the Peoples Telephone Co., and if the offer of the syndicate is accepted the three companies will be merged.

The Galt, Preston & Hespeler Electric Ry. has been granted permission to extend its lines to Puslinch Lake, a popular summer resort near that town, and work is to be commenced at once.

The Schomberg & Aurora Electric Ry. is now in operation. The road extends from Aurora, an Ontario town some 30 miles north of Toronto, to Schomberg, at the head of the water outlet of Lake Simcoe, where it connects with the Metropolitan Electric Ry., thus securing an entrance to Toronto. Freight sheds and yards are to be erected at the terminal near Bond Lake.

The following figures showing the gross receipts of the Toronto Railway Co. for the month of July during the past five years, will be of interest as showing the remarkable increase during that period: 1898, \$103,679; 1899, \$117,689; 1900, \$125,723; 1901, \$150,620; 1902, \$160,043.

The Atlanta (Ga.) summer resort, Ponce de Leon springs, is to undergo great alterations and improvements at the hands of the Georgia Railway, Gas & Electric Co. The company has engaged a landscape gardener from New England, who will lay out entirely new plans for the springs. Immense flower beds, winding walks and ornamental shrubbery are to be introduced, and a casino capable of accommodating 1,000 guests will be erected. A large electric fountain is to be operated in front of the Ponce de Leon spring which is the central point of attraction of the park.

MODERN CAR WIRING.

There are many places in car barns, power shops, and on both surface and elevated trains, where it is necessary to employ a conduit for wiring which is not only flexible but also very durable, being weather proof and proof against mechanical injury, and the flexible products manufactured under the Greenfield patents by the Sprague Electric Co. are designed to meet every requirement of this class of work.

The "Flexible Metallic Conduit" has been on the market a number of years, and has been used in many of the most prominent public and private buildings in this country. The design of the conduit is such that while affording the greatest ease in bending to a curved formation, it absolutely prevents the possibility of flattening. The interior is thus of uniform diameter and symmetrical proportions, at whatever angle the conduit may be bent. The amount of energy required to bend this conduit is no more than is required



FLEXIBLE STEEL ARMORED CONDUCTORS LEAD COVERED.

to bend a piece of new manila rope of the same size. The conduit is composed of convex and concave metal strips wound spirally upon each other in such a manner as to provide thorough ventilation and also to afford complete protection from mechanical and other injuries.

The "Flexible" steel armored conductors are a more recent invention, and consist of twin wires surrounded with the best high-grade insulation and covered with a flexible steel armor, thus giving the wires both electrical and mechanical protection and eliminating the necessity of fishing or drawing in wires. Both these products represent the latest advance in the art of electric wiring, and reduce installation to great simplicity. The "Flexible" steel armored conductors are also made with an additional cover of lead, which makes them desirable for use in wet or damp locations. The steel armored "Flexible" cord for lamp pendants and portables are very desirable for use in such places as engine and boiler rooms, machine shops, mills, factories, show-windows and other places where the ordinary cord is impractical or positively prohibited. The use of these flexible armored products is very highly recommended by first-class engineers, contractors, architects and others who have to do with electric wiring. The tools required for working these flexible products are simple, few and inexpensive.

Delegates to the convention in Detroit will be interested to know that over 60,000 ft. of "Flexible" metallic conduit is installed in the Wayne County Building.

This conduit is also installed in the Cadillac Hotel and the late Senator McMillan's residence, Detroit.

OBSERVATION CAR IN CLEVELAND.

An observation car will be put in commission in the city of Cleveland, O., next spring, which will make regular trips through the city at scheduled times, for the purpose of giving visitors an opportunity to see the city. The fare will be 25 cents for the trip and an attendant will point out the principal places of interest along the route. The car which is to be used for this purpose is now being built. It is to be luxuriously furnished and handsomely appointed in every respect.

There has always been a great demand for positions on the cars of the Union Traction Co. of Indiana, and at the present time there are more than 500 applications on file for positions of motormen or conductors.

LONDON LETTER.

The present condition of steam railways gives very little more satisfaction to the public whom they serve than to that other more limited public to whom they pay—or undertake to pay dividends. As regards long journeys this dissatisfaction at present finds vent in nothing very practical or effective—the established lines must of necessity be patronized at any cost, and the traveller puts up more or less thankfully with whatever minimum of dirt, discomfort and delay the companies can see their way to providing. But in the matter of short distances, of local and suburban traffic, a change has made itself very distinctly felt of late, the monopoly of the steam railway companies has not only been threatened but quite effectually encroached upon, and the question of a change to more up to date methods can no longer be ignored or postponed. Wherever electric tramways have been opened between city and suburb, they have played incredible havoc with the receipts of the local steam railway lines, and that obviously not because tramways are in themselves more popular or more suited to the public taste and needs than railways, but because they are worked by electricity and possess all the advantages thereby implied. Traffic is not a matter of fashion or caprice, and with methods of locomotion above all things it is a case of the survival of the fittest. The electric tramways have not only invariably tempted away a public that until then had patronized the local railways, they have in many places created an entirely new pleasure traffic and have greatly helped to develop new neighborhoods. What has been achieved by electric surface tramways has been done with even more conspicuous success by short lines of electric railway. Where there is any question of long tunnels or underground routes, electric traction is essential to ensure even the reasonable comfort of the passengers. In the St. Gothard tunnel it is on record that trains have on more than one occasion had to be stopped to prevent the men in charge from being asphyxiated, and though the passengers were not exposed to the same dangers, the pleasure trip is attended with very considerable discomfort. There is indeed no longer any question that electricity is the best motive power for underground and overhead railways. It is interesting to remember that Great Britain was after all the pioneer even in electric railway enterprise, and that the first electric railway in the world was that built in 1883 between Portrush and the Giants' Causeway in Ireland. The first underground electric railway was the City & South London, built in 1890, and the first overhead electric line that which runs along the docks at Liverpool. After this we proceeded as usual to do nothing, while the rest of the world went ahead, thriving on our discoveries and learning by our mishaps.

The cause of this slackness, if all circumstances be taken into account, was probably very largely a financial one. The outburst of speculation between 1879 and 1881 led to a great commercial crisis and a consequent distrust of all undertakings of the kind. We have always had a tendency, too, in this country, either to invest in consols or to bestow our favor on undertakings of a distinctly problematical character, to the detriment of useful and legitimate industrial enterprise, which in many cases had had to go abroad for capital. Now, however, the distrust in electrical engineering undertakings is fast becoming a thing of the past, and we have lately done much to make up the leeway we had lost. In 1896 six millions were invested in this country in electric railways and tramways, in 1900 this total had increased to twenty-six millions, without counting nearly four millions similarly invested by various municipalities. In fact, the boom that was to be expected to make up for past inaction, has come. The Waterloo & City Railway was opened in 1898, the Central London in 1900. The forthcoming electrification of the Metropolitan marks the beginning of an even more important era, since we have here not the building of a new line, but the successful adaptation of already existing resources, and in this direction much of the future of electric traction must necessarily lie. The journey round the Inner Circle, we are told, will for the future be performed in 50 minutes instead of 70; the expenses of working the line with the new equipment will be reduced 30 per cent, while the carrying capacity will be increased 35 per cent.

From the North we hear the news of the electric line on the mono-rail system between Liverpool and Manchester, which will of course get most of the passenger traffic at present divided between three railways, in addition to a great deal that does not yet exist, but will assuredly come into being when the distance between the two cities

can be covered in 20 minutes. The working expenses are estimated at 7½d. per traction car mile, and the company expects to get a dividend of 5 per cent on the capital invested. The Mersey Railway has contracted with the British Westinghouse Co. to convert the line to electric traction on the unit control system. A line between London and Brighton is planned and others will rapidly follow. Of the existing main lines not a few are reported to be considering the question of adopting electric traction. The steam railways have reached a very critical turning-point in their career. On every side companies are springing into existence to establish electric traction either on tramways or on short lines of railway between busy centers of commerce and manufacture. Several bills have lately been passed to sanction the erection of large central power stations at convenient industrial centers on the Tyne, the Clyde, in South Lancashire, South Yorkshire and South Wales. Very soon electrical energy will be available at various points throughout the country for traction and industrial purposes. The railway companies possess a monopoly, but one of a precarious nature. Will they avail themselves now of their unique opportunity, and make the monopoly a lasting asset, or will they fall victims to the fatal mistake made once before in our industrial history—and that by their own opponents? The towns which in the early days of railway enterprise refused to countenance the building of the new lines through their territory, cut themselves off from the main line of traffic and business, and in spite of all subsequent efforts to recover lost ground, impaired their prosperity forever. The railways which insist on closing their eyes to the possibilities that lie before them, are very likely to suffer the same fate.

D. N. D.

RIVALS FOR MARYLAND FRANCHISE.

An interesting trolley war is being carried on between the Elkton & Chesapeake City Electric Railway Co. and the Cecil & Kent Electric Railway Co., for a franchise to use the county roads from the Delaware state line to Chesapeake City, a distance of nine miles. Two years ago the Elkton & Chesapeake company obtained a franchise for this road from the County Commissioners of Cecil County, but no attempt has since been made to build a road between these points. Recently the Cecil & Kent Electric Co. petitioned the commissioners for a franchise for the same route and offered a cash deposit as a guarantee that the road would be completed within eight months. The counsel for the former company contend that a franchise already given cannot be revoked, as no time was fixed in it for the completion of the road. The new company states, however, that if the commissioners grant it the right of way it would give the people of Cecil County a direct trolley line from Philadelphia to Galena, passing through Wilmington, Newark and Elkton. The commissioners have taken the matter under consideration and action on the franchises has been deferred for a time.

LEVIS COUNTY RAILWAY.

A new electric railway is in course of construction in Levis County, Can., which will connect Levis, St. Joseph, Bienville and St. Romuald, which is on the St. Lawrence River, directly opposite Quebec. The company's car barn, located at St. Romuald, is nearly completed. It is a substantial brick structure having two towers on the front, facing the river. The sub-station of the road has been completed for some time, and the machinery for this building, which is made by the Bullock Electric Manufacturing Co., of Cincinnati, is already on the ground. The power for operating the road has been contracted for with the Canadian Electric Light Co. This will be transmitted at a pressure of 10,000 volts. The pole line has been completed for the greater part of the route, and all the overhead material is on hand and will be put in place as soon as the roadbed is completed, which is expected to be ready during the present month. The company has completed a private telephone system on its line which is already in operation.

The Birmingham (Ala.) Railway, Light & Power Co. has built a new car barn and is busy connecting the new building with its tracks and overhead system. The new tracks which are being laid down may also be used by some of the interurban cars to reach the center of the city.

NEW YORK STATE STREET RAILWAY ASSOCIATION MEETING.

The twentieth annual meeting of the Street Railway Association of the State of New York was held at the Fort William Henry Hotel, Caldwell, N. Y., on Lake George, Tuesday and Wednesday, Sept. 9-10, 1902. About 200 delegates and supply men were in attendance, and the character of the papers and the discussions, the ideal location on Lake George at the gateway of the Adirondacks, and the cordial hospitality extended by the officers of the Hudson Valley Railway Co., all combined to make this one of the most valuable and enjoyable conventions ever held by the New York State Association.

The opening session was called to order at 11 a. m. Tuesday morning with President G. Tracy Rogers in the chair. After the preliminary order of business, a paper was presented on "Accidents on Electric Railroads," by C. R. Barnes, electrical engineer to the New York Board of Railroad Commissioners.

The paper was fully discussed, and was followed by a paper prepared by Judge J. H. Daly of New York, general counsel for the Metropolitan Street Railway system, and dealing with the legal aspects of accidents. The afternoon session convened about 3 o'clock, the first order of business being the reading of President Rogers' annual address. In his paper President Rogers as usual gave an elaborate and exceedingly valuable review of street railway matters and development in New York state.

This was followed by the presentation of the Executive Committee's annual report, and the treasurer's report which showed the New York Association to be in excellent condition, both as regards membership and financial affairs.

The following papers were read and thoroughly discussed: "Supply House Methods," by A. C. Tully, purchasing agent and general store keeper of the Metropolitan Street Railway System; "Power House Accounting," by R. E. Danforth of Rochester; "Discipline," by C. B. Fairchild of New York; Report of Committee on Rules.

Owing to the lateness of the hour, discussion of the report of the Committee on Rules was postponed until the Wednesday morning session.

The Wednesday morning session was called to order in good time, and the standard code of rules suggested by the committee was made the first order of business. After considerable discussion, it was decided to merely discuss these rules, and a resolution was passed to the effect that all the members of the association be requested to make written suggestions to the committee, within 30 days, each member company to have the privilege of suggesting new rules or modifications of the code presented by the committee. The Committee on Rules was instructed to consider all these suggestions and report to the Executive Committee within 30 days after the expiration of the first 30 days a code of rules embodying as far as possible the suggestions received. The Executive Committee was also given authority to promulgate and distribute the committee's report with the official sanction of the association.

Papers were then read on the following subjects: "Dispatching," by T. E. Mitten of Buffalo; "Removal of Snow and Ice," by W. B. Reed, engineer maintenance of way of the Metropolitan system of New York; "Methods for Removing Snow and Ice," by R. E. Danforth, assistant manager of the Rochester Railway Co.; "Signal System," by J. A. Powers, general manager of the Hudson Valley Ry.

President Rogers then read letters and telegrams of regret from many street railway and supply men who were unable to be present.

The committee on nominations consisting of Messrs. Fasset, Allen and Mitten, presented the following list of officers for the ensuing year, their report being unanimously adopted. President, G. Tracy Rogers; first vice president, E. G. Connette of Syracuse; second vice president, A. B. Colvin of Glens Falls; secretary and treasurer, H. A. Robinson of New York. Executive Committee: G. T. Rogers; H. H. Vreeland; W. Caryl Ely; T. J. Nicholl, of Rochester; and J. L. Greatinger of Brooklyn.

By invitation of Mr. Connette, Syracuse was selected as the place of meeting next year.

After a few general remarks by Messrs. Vreeland, Ely and others, and the adoption of a vote of thanks to the officers of the Hudson Valley Ry. for the cordial reception extended, the convention adjourned to meet in Syracuse next September.

ENTERTAINMENTS.

Several pleasant trips and outings were arranged by the Hudson Valley company, these including a drive for the ladies, trip up Prospect Mountain, and a steamboat ride on Lake George. The usual banquet was held at Fort William Henry Hotel, and was attended by about 150 guests. For the first time at any banquet of the New York State Association, the ladies were invited to partake of the dinner, and this feature was pronounced by all to be a very capital idea. Mr. Colvin made a very witty toastmaster, and kept the diners in happy mood by his unique introductions when presenting the various speakers. Among those who responded to toasts were Messrs. Vreeland, O'Connor, Cole, Dale, Stedman, Powers and Ely.

Music was furnished by an excellent orchestra, and to add to the informality of the occasion cards were passed around bearing the words of the various popular airs rendered by the orchestra, and between courses the guests joined in singing the popular songs.

PRESIDENT ROGERS' ANNUAL ADDRESS BEFORE THE NEW YORK STREET RAILWAY ASSOCIATION.

In behalf of the Association and the Hudson Valley Railway Co., whose guests we are, it gives me great pleasure to extend a hearty welcome and cordial greeting to you all. We assemble upon this occasion, following a year of general thrift and prosperity. This is, indeed, fortunate, as without this condition of affairs disastrous results to the business interests we represent might have ensued, inasmuch as the summer months just passed (the harvest season of street railways, particularly those of smaller cities and interurban lines) have proved the most unseasonable, stormy and disagreeable the country has ever experienced, a fact probably so plainly manifest to you all that even a casual allusion to the unfortunate condition of affairs is not necessary. I consider it proper to congratulate the street railroads of the state upon the excellent showing made under the adverse conditions that have existed.

When this year in the life of this Association is completed, two decades will have passed since its birth and one has but to review the published proceedings of the twenty annual conventions to comprehend the wonderful changes which have taken place in the street railroad world during that time. What the next two decades will unfold to us is difficult to predict. During the first ten years of the Association's existence the principal topic of discussion at these meetings was that of the care of horses and mules. During the last decade each succeeding meeting has proved a series of important and instructive surprises in the new and advanced ideas presented affecting street railways, their development, advancement and betterment. Instead of a few hours devoted to the business proceedings of the meeting, now the greater portion of two days is insufficient to give proper consideration to the many subjects of practical interest that could be profitably considered. In the early days of the Association the number of different operating companies in New York City alone was almost equal to the present number of roads throughout the state, and the number of organizations in each city was in the same relative proportion, each charging a five-cent fare over their respective lines, requiring a day's travel and a pocketful of nickels to reach a distant point in a large city. Truly, what a wonderful change. To-day there is hardly a city which has more than one company and in many cases the one company serves not only to its own city, but many of the surrounding cities, towns and villages. Cars are no longer moved by horse or mule power, and in place of the bolttail cars running over tracks composed of a stringer and a strap rail, we have at present palatial cars, lighted, heated and propelled by electricity, operated over an almost perfect track. Now, in nearly every city one may travel from one point to another and over different lines for one five-cent fare, due entirely to the general transfer system adopted within the last ten years, and to consolidation or lease.

Were we to review in detail the evolution of the street railroad methods during the past twenty years and consider what has been accomplished in the interest of both street railroad properties and the public during that period, the time of this meeting would be more than fully occupied. We are now, without doubt, the best and most highly organized industrial body in the business world.

Years ago street railroad properties were small; served limited sections only and each respective road operated exclusively over its own lines within the confines of the city or village in which it was constructed, interurban street railway intercourse and the transfer system being practically unknown. These properties were owned by a few local men, who were usually officers of the company. To-day the public owns the street railroads, the stock and bonds are held for investment by all classes of men and financial institutions. The men in charge of the practical operation of street railroads are employed on account of their fitness and ability to manage the properties in the interest of the stock and bond holders and to serve the public as the ostensible owners of the property.

The perplexities and cares of a successful management cannot be understood by the people at large. They are, unfortunately, too ready and willing to denounce the management of a road, when the cause of the criticism is often entirely outside of the company's control.

Does the public appreciate the efforts made by a street railroad company in its behalf? Apparently not, when compared with the horse and mule car days when the captious public and press had little or nothing to say in the way of criticism or fault finding, and public franchises were dealt out by municipal officials for the asking. On the contrary, with the broad development and increased transportation facilities provided by the up-to-date street railway systems, and notwithstanding the company is striving to serve their best interests, often at a loss financially, the people generally are too ready to denounce them as grasping, greedy, dishonest and anxious for its own interests alone. This spirit is shown in a more pronounced way when the company seeks any courtesy or extension of franchises at the hands of the public authorities. It is then that our requests are viewed with suspicion and criticised; we are subject to all forms of abuse, inconvenience and loss of time and money. This should not be, as railroads to-day do not ask for franchises or grants unless they are needed to better subserve the comfort and accommodation of the people, as is clearly shown when these advanced ideas are put into practice; it is then that the public realizes more fully the benefit it derives as a result of the company's efforts in its behalf. Franchises are only valuable to the extent that they may be made to serve the people. It is the high state of development of street railroading of to-day that has given life and value to these franchises—that has, so to speak, created them. There is no public serving corporation more important to a community than a street railroad; the people are dependent upon it in all walks of life. There should be more sympathy, than now exists, between the street railroad and the public and this must come from the people. In nearly all cases the street railroad is striving to meet the public requirements, and the situation is not benefited by the adoption of drastic laws and ordinances, ostensibly for the welfare of the public, but which are, in their ultimate effects, antagonistic to both railroad and public.

The electric road is so important, not only to the cities, but to the development of the country at large, that its growth should be assisted and not impeded or retarded, either through adverse public criticism, by curtailing of franchises, by the imposing of burdensome taxation or by the press, which too often caters to public clamor, inviting and exciting public hostilities for sensational purposes. The science of transportation is the greatest study of the day.

It is unnecessary for me to attempt to call public attention or the attention of the delegates here assembled to the enormous work that is being done by the electric railroads in the improvement of social conditions and the augmentation of values and populations. The civilized world has already recognized its value—for the electric railway has taken its place as one of the economic factors in all of the countries of the globe. Where communities have been isolated by topographical conditions, electric roads have made it possible, so to speak, to give freedom and expansion to the people by making other areas of land accessible for both residential and commercial uses and occupation—by, in fact, annexing the adjacent territory. Factories, extensive manufacturing plants and villages have grown up in waste places as well as outlying cities and these have been made tributary to commercial and shipping centers. While farmers and cultivators of market gardens have found readier access for marketing their products.

A phase of the usefulness of the electric street railway, of its

power for good in the direction of building up the moral, as well as the physical health of the people, is the opportunity that is afforded for outings and entertainment to the tired worker and his family whether he be a worker of the office or factory, or the farm. For him the interurban railway especially affords the ever present opportunity for a cheap and health giving ride amid fields, woods and pleasant scenes; and still more is this noticeable where the company maintains a pleasure park, a casino, or perhaps a vaudeville entertainment as an adjunct to the railway system. In nearly all these cases that I know of, where such an additional attraction, of a strictly moral nature, is maintained, the investment has been more than satisfactory and in many cases self-sustaining. Many of these resorts have been built upon a decidedly elaborate scale. But even if there be no pleasure resort, the outing itself is an invigorating ride and a means of entertainment as well as a promoter to the health of the minds as well as the bodies of the people. I may indeed suggest that in this regard the trolley ride proves a moral factor also, by drawing people away from baser resorts within the closely built and summer-heated cities.

It is my belief that in the near future the steam roads will seek ownership or a closer alliance with electric lines which will serve as feeders to them, as is illustrated by the acquisition and extensive construction of roads by the New York, New Haven and Hartford, and other steam railways. The advantages of such an alliance to both parties are numerous and cannot help but be a benefit to the public and property. The recent decision by the Court of Appeals in the suit brought by the Hudson Valley Ry. to compel the Boston & Maine railroad to make a physical connection of their tracks and to interchange freight, in which the court held that the legislature of the state has recognized electric railways as a part of the transportation system of the state, and that travelers and shippers of freight are entitled to the benefit of all the facilities provided for in the articles of incorporation of transportation companies as well as the duties imposed by the railroad law of the state. The court after stating that the steam railroads have become great arteries over which the greater part of the commerce of our country is carried, says: "It has not been considered profitable or practicable for steam roads to be constructed to every village, hamlet or productive district in the country. This, however, is being rapidly accomplished by the numerous electric roads that are in process of construction or are contemplated. By their means the farmer and mill owner and the merchandise vendor in distant places may be able to reach the steam roads, and through them the great markets of our cities, with their merchandise and products and in this way one road may become the feeder and distributor for the other."

It can readily be seen that the court does not consider the two classes of roads antagonistic, but the electric road is rendering a service that both the steam road and the people alike require. In many cases the steam roads have recognized our usefulness and have welcomed a connection with our tracks, realizing that transportation begets transportation, and that development produces freight and through passenger travel. This fact is illustrated by the development of the Hudson Valley Ry., which company has adopted largely steam railroad methods of construction and operation.

In my opinion, the progressive interurban electric road must adopt the best methods of both the steam and electric railroads. In our construction of roads, outside of cities and villages, we are now building, to a great extent, on our own right of way, with double tracks, and in many instances in conformity to steam railroad principles of construction. In a number of cases, steam and electric service is now carried on over the same rails and road-bed.

The great activity in electric railroad building, which surpasses the most sanguine expectations of a few years ago, is in a large measure accountable for the falling off of the increase of new mileage by the steam railroads of over fifty per cent between 1890 and 1900 as compared with the interim between 1880 and 1890. When a steam road is requested to give additional train service by the public, the public is often met with the reply, "another train won't pay." By this policy they do not stimulate travel. The electric road doesn't wait for business but goes after it, and the result is that when it taps a territory of an existing steam railroad, it increases the rides

per capita per annum many fold over what they were with the steam roads. This is largely due to lower fares and more frequent service. The cordial relation existing between the steam railroads and street railways of this state is a matter of favorable comment and congratulation, and makes possible a great deal in the way of development and interchange of business from which the general public inherit an untold benefit that would not be available if this friendly relation did not exist.

I may here be permitted to call attention to the prevalence of harassing and expensive litigation through damage claims.

Many bills are introduced each year in the legislature in the interest of the Negligence Lawyer, more commonly known as the "Ambulance Chaser." Each year they become bolder in their legislative demands and to such an extent that they have fallen by their own weight and accomplished little or nothing. In the large cities their methods are no better than the highwayman who uses more violent means to accomplish his purpose. The legal profession has been seriously compromised by this class of lawyers. Equally prominent in fomenting litigation is the doctor who recommends his particular friend as a lawyer and not infrequently is a sharer in the unfair percentage wrongfully collected out of the company's treasury. In this connection I might state that, in my opinion, no better claim agent, especially for the smaller road, can be secured than the honest, upright company surgeon, who at all times works in the interest of the company. Juries are often biased and easily prejudiced by unfair counsel. They do not hear the insidious entreaties of the shark lawyer or his agent to be allowed to bring the case upon a basis of 50 per cent and often larger. Some very good work has been done of late in exposing their methods and it is to be hoped with good results. As the law now stands, a suit can be brought for ten dollars; the company must either settle or stand an expensive litigation and take its chances on the fairness of the jury. In my opinion, a large percentage of this speculative litigation of the "hold-up" class can be overcome by proper and just legislation. I am aware that the Court of Appeals of our state has approved in general language of agreements between lawyers and their clients whereby the former should receive a percentage of the recovery for their professional services. However fair this may seem to be in those cases where the amount is fixed in the contract or promissory note, I am unalterably of the opinion that this course of dealing should not be allowed in suits for personal injuries, but that on the contrary, the fee should be one fixed by statute or by a competent authority to pass equitably on cases of this nature. The sharing in the recovery whereby the counsel becomes as much interested financially as the client in the recovery is a condition to be deprecated by all right minded persons. This is exactly what congress has found it necessary to do and has done by legislation in the cases of the compensation which attorneys are allowed to collect for services in pension claims against the government.

I will also call your attention to the injustice of the present law whereby an action can be brought against us in an accident case any time within three years without giving notice. We and the individual or other corporations are entitled to the same consideration in this respect that is now given to the municipalities, whereby notice is required of the accident. This question has been before the legislature for a number of years and I believe it is the duty of every member of the association to strenuously urge that some law be passed to remedy this evil. In my opinion the association should make a determined effort to have a law passed, to the end suggested, thereby in a degree stemming the tide of unjust, speculative litigation which is so rapidly increasing.

The mutual benefit association so generally inaugurated on our roads still continues to be of untold value to all. The plan of furnishing pleasant club rooms for our men is another step in the right direction; too much interest cannot be taken in endeavoring to raise the standard of our men and looking after their comforts, by elevating them to a higher degree of efficiency and improved discipline.

The sentiment and enthusiasm of the employe toward his work has more to do with the success of the street railroad than most any other business, as the dealings are more direct with the public than any other industry, and the success of the operation depends largely upon the policy of the company towards its employes. The discipline and handling of men is one of the most important of a street railroad. Each year finds a marked improvement in the class of men

on our roads. This improvement has been brought about, not only through care in selecting the men, but largely by the conditions we have surrounded them with, and this class of men must have just and fair treatment.

A number of street railroads are refusing to continue carrying the mails at a loss. I have referred to the fact in my previous report that the rate paid per car mile for the transportation of the mails is insufficient to meet the expense; at the present rate we are simply paying for the privilege; some step should be taken to have this injustice corrected.

The unfortunate recurrence of some half dozen severe and fatal accidents within the present summer brings to the members of the association, in the most forcible manner, the ever present obligation of ceaseless care and vigilance in the management and operation of their respective roads. It is a simple matter to lay down a formula for the "prevention" of such accidents, but so long as human nature is fallible, railway accidents can never be wholly prevented. The most that can be done is to minimize the risk or possibility of accidents. You all know what elements of care, of prudence, enter into this consideration—substantial construction, complete equipment, good discipline, and last of all, but of the highest importance, constant inspection and accountability. When due attention is given to these four elements, accidents will be very rare, and then will only occur through the failure of the human elements,—the forgetful inspector, the careless motorman, the confused car dispatcher, or the incidents of storms or other unavoidable occurrences. We owe it to the public, as well as to ourselves, and to the reputation of industrial and mechanical intelligence, that every safeguard which experience, caution and liberal expenditure of money affords shall be applied to the carrying on of our several enterprises.

The standardization of equipment for electric railways is a subject which is year by year engrossing more closely the attention of both operating officers and manufacturers, and it is only necessary for me to say here that it is a matter worthy of fullest consideration. Its effect will be to facilitate, as well as cheapen maintenance, to improve practical operation, and to a large degree add to the safety of our patrons.

I should consider myself derelict if I did not make a brief allusion to the excellent work performed by the committee appointed to prepare a standard code of rules. We all appreciate that this is a difficult proposition to handle to the entire satisfaction of all parties but I feel confident that the vast amount of time and thought devoted to the report that will undoubtedly be submitted at this meeting will be productive of beneficial results.

I am also gratified by the large number of supply men that are always in attendance at our annual meetings, as they not only add to the numbers but to the interest of the occasion, and the pleasant interchange of social intercourse between the street railway officials and the men with whom they deal cannot help but prove beneficial in many ways.

I take pleasure in stating that the predictions made in my last year's report regarding the street railway development of greater New York and the continued advance in reconstruction of horse lines in the older city of New York have been fully carried out and the general interests of the citizens thereof greatly subserved. That very noteworthy improvement, the construction of the subway in the city of New York, is progressing and has now reached a stage where 70 per cent of the construction work is completed, and upon reliable official information I am prepared to state that the work is progressing quite up to expectations and that the contract for equipment, buildings, etc., are all made predicated upon beginning operation of a portion of the road to at least 145th street on the West Side and to 145th street and Lenox avenue on the East Side by January 1st, 1904. The rapid transit proposition seems still to be in an embryonic state, as far as furnishing a complete system of transportation is concerned, for the chief engineer of the subway frankly concedes that the present construction will not be adequate to satisfy the requirements of the city.

The elevated roads in old New York still continue to carry on the work of improvement, and the introduction of a third rail system on its various lines is well advanced, while the facilities furnished the public by the improvement are plainly noticeable.

I have often called your attention to the unjust discriminations in the State Franchise Tax Law, whereby we are taxed one per cent of our gross earnings and other public serving corporations pay but

one-half of one per cent. This subject is one that merits your thoughtful consideration and action.

In this connection I desire also to mention the unjust burden imposed upon the street railways of the state by the enactment of the Ford Franchise Tax Law. I shall not attempt a detailed argument of the situation, which remains practically unchanged since the presentation of certain figures and statistics submitted by me as President of this Association at the hearing before the Governor of this State on May 11, 1899; suffice it to say that one hundred and one street surface railroads operated by mechanical traction submitted reports to the state for the year ending June 30, 1901; sixty-one showing a surplus for the year, forty showing a deficit. Of the total surplus 58 per cent is shown by the companies of greater New York; of the one hundred and one companies but sixteen declared dividends, three of which showed a deficit after so doing and which are included in the sixty-one roads mentioned as showing a surplus.

An enormous amount of money is invested in the street railways of this state, a large percentage of which was sunk in the depreciation of values and in demonstrating the practicability of electrical traction, the benefit of which the public at large has inherited and for which the state under the Ford Franchise Law now assesses as real estate. That public corporations should pay their full and just measure of taxation none will deny, but that any discrimination should be made against them simply because they are public corporations is unjust and unfair.

The most serious annoyance and handicap the street railroads of the state have suffered since the introduction of mechanical traction is the burdensome and perplexing question of pavements. The general state law regarding the proportion of expense to be borne by street railway companies is one of the old methods of horse street railroading handed down of which we are unable to rid ourselves. The exorbitant demands made upon us in this respect are a constant menace not only to the financial interest of the smaller roads of the state but the larger ones as well. Fortunately the legislature of the state recently modified the law slightly whereby the smaller municipalities and street railroad companies can now fix by contract the amount to be paid by the company. This is only a step in the right direction and the modification should apply to all cities. That we are entitled to still further legislative consideration in the pavement matter no street railroad company which has suffered the burdensome taxation under the law as it now exists will gainsay.

In closing I esteem it a pleasure to briefly allude to the general usefulness of our association, which has been so clearly and frequently demonstrated in the past, especially from an operating standpoint. The annual meetings have proved fruitful and profitable and I firmly believe that the properties we represent and public interest as well, have been greatly subserved by the presentation and discussion of the many subjects of practical interest. Notwithstanding the past enviable record of the association there is a still broader field of usefulness to be developed which can only be completely accomplished by every street railway company of this state becoming identified with the association and its work.

CAR DISPATCHING ON INTERURBAN LINES.*

BY THOMAS E. MITTEN, GENERAL MANAGER INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

Since the introduction of high speed electric service between cities, there has been a great demand for a satisfactory method of car dispatching on interurban lines. So many lines of this description have been constructed within the past few years, either independently or in connection with existing city systems, that the subject has become one of common interest; there has, however, up to the present time, been apparently little, if any, concerted action, the management of each road having adopted some method designed with a view of meeting the particular requirements of the line to which applied. Theoretically, the ideal system would be that controlled by an automatic block, operated independent of trolley circuit and absolute in its action, which would permit of but a single car or train upon a section of track at one time. Up to the present time, such a system has not, to my knowledge, been satisfactorily worked out as applied to electric lines. Experiments with electric signals, operated in con-

*Read at the annual convention of the New York State Street Railway Association, Sept. 9-10, 1902.

nection with the trolley circuit, have been made from time to time, and some lines are now being operated relying almost entirely upon the protection afforded by such signals. This practice, however, seems to be confined to the shorter lines where but few cars are operated, the results obtained not seeming to have been such as to warrant its general adoption.

In the operation of the longer and more important lines, where high speeds are attained and cars run with greater frequency, the disposition is rather in the direction of following steam railway practice, and it would seem that much might be gained by a careful study of the system in general use by steam railways representing, as it does, the result of much thought and many years' experience. The accidents occurring on interurban lines have shown that as we more nearly approach the speed of steam railway trains, we become correspondingly subject to the same class of accidents. It would, therefore, appear that we should make our rules looking to their prevention conform as nearly as may be practicable to those which the steam roads, by long use, have found most effective.

Believing that the solution lies in this direction, the writer has, for some years past, been endeavoring to perfect a system which, while closely patterned after steam railway practice, has greater flexibility and can be simplified to conform to the requirements of the line and service to which applied. Under the system referred to, a printed time table, containing the running schedule, meeting points, and all rules necessary to a proper understanding, is provided, a copy being supplied to each motorman, conductor and such other employes as are interested therein.

Trains are of two classes: regular and extras.

Regular trains are given a number and shown on time table, and are designated by a corresponding red figure displayed, in a conspicuous place, on front and rear of train by day, and, in addition, a red light at either end of train at night.

Extra trains can occupy main track only upon written order from the dispatcher, and are designated by a green letter "X" by day and green light at night.

Regular trains, having a second section following, carry in addition to their red number or red light signal, a white sign worded "Car following" by day and a white light at night.

Trains, running in sections, are required to keep 3,000 ft. apart by day or 5,000 ft. at night or during foggy weather when running at speed, distance and speed being correspondingly reduced when approaching meeting points.

Extra trains are required to be in on siding to clear at least five minutes before a regular train is due.

A red flag and a red lantern are carried on front platform at all times, lanterns to be kept lighted at night and during foggy weather, ready for immediate use.

Trains which are disabled in the vicinity of curves where vision is obstructed, are required to be immediately protected by conductor (using red flag by day and red lantern at night) proceeding at least 1,000 ft. in the direction from which danger may be expected.

Under ordinary conditions, where no unusual delays are encountered, this time table is found to be all that is necessary.

A dispatcher is located at a central point, who by telegraph or telephone issues the necessary orders under prescribed form, when, owing to the operation of extra cars, or unusual delay, such are found to be necessary.

Operators, or receiving agents, are maintained at certain stations on the line for the purpose of copying and delivering train orders to passing cars.

When receiving an order, the operator or receiving agent, makes three copies on manifold paper, the original is retained by him, the duplicate and triplicate being passed to the motorman and conductor to whom addressed.

As soon as the operator or receiving agent receives an order, by telephone or telegraph, he at once repeats it back to the dispatcher, who, at that time, copies it into a book of permanent record, the orders being numbered by him consecutively, commencing with No. 1 at 12 a. m. each day.

The plan described affords protection to both the front and rear of trains, the complete time table representing, in a concrete form, the method which has been satisfactorily used for nearly two years upon a single track line over thirty miles in length, where at times, the patronage requires the operation of the largest number of cars possible at a maximum speed of 45 miles per hour.

ECONOMICAL METHODS FOR REMOVING SNOW AND ICE.*

BY R. E. DANFORTH, ASSISTANT GENERAL MANAGER ROCHESTER RAILWAY COMPANY.

Those of us who are connected with railways in northern and western New York, find our "great problem" in handling snow; that of removing it from our tracks to allow for the passage of cars, and often in keeping open cuts between small mountains of hard wind-packed snow, rather than that of caring for it after we have heaped it up along our lines. We congratulate our more fortunate brethren, who not only live where a milder winter climate prevails, but who are furnished with so ample an equipment of snow-handling machinery, and we regret our inability to adopt their methods and obtain their results.

On roads having an average passenger car headway of 7½ to 10 minutes, are not often found the number of plows or sweepers required to maintain over the system, a headway of even 60 minutes. This fact, together with climatic conditions, renders the problem of snow removal, in our smaller cities and towns, and also, in all cities and towns of northern and western New York one of serious importance.

With us, it is a question of ways and means; a question of number and types of plows, of capacity of rotaries, of strength of sweeper brooms, of means of throwing the snow over banks, from five to

this little better than our sweepers, we placed the board ahead and shoved it along. The board soon changed its form from a vertical plank, placed diagonally across the track, to a warped surface shear, tending to cut, lift and then roll a mass of snow along its length.

Finding this snow-plow ineffective in banks over five or six feet high, an ingenious friend produced an electrically-driven boring machine and called it a rotary track cleaner. With this machine we are able to cut our way slowly but surely through banks of snow of almost any depth and of any condition, short of hard ice.

We have, also, placed upon all our passenger cars, track-cleaners or scrapers, which will, without difficulty, remove snow from the rails to the depth of 4 in., unless the snow has been packed to this depth by the street traffic; and it may be well to say that scrapers, which will remove even hard packed snow, are in use in Toronto and elsewhere.

Each type of plow has its place and cannot economically be used in service for which it is not adapted. It is as improper to attempt to remove 6 in. of snow with a rotary, as to attempt to cut through 2 ft. of snow with a rattan sweeper. In either case the feat may be accomplished, but in neither case with greatest economy.

Considering, first, the removal of snow in cities, it may be said that experience in western New York has shown that, with the equipment at hand the work should be performed about as follows: On the appearance of a snow storm, when the streets are free from snow, light plows and sweepers should commence work, when about two inches have fallen. If the storm continues and the snow falls



WINTER SCENES ON THE ROCHESTER & SODUS BAY RY.

fifteen feet high, and of providing electric power to operate both plows and cars.

In our towns, we cannot haul all the snow off the streets, because there is too much to possibly handle; we therefore confine our efforts in this respect to the business centers, cross-walks and junction points. Along the remainder of the lines the snow is piled up between curb and walk, or spread between track and curb, as the locations warrant. The snow we do remove is hauled away in sleighs, and sometimes on flat cars. In considering our snow fighting equipment, we find that all types of machines for removing snow are useful. We even require horse plows or walkaways for leveling back banks of snow, thrown out by the plows, and for cutting down drifts and opening gutter work which cannot always be readily done by a track plow.

In localities where winter commences early in December and lasts until April, and where storm follows storm, and where a "thaw" means a rise in temperature slightly above 32 degrees, and closely followed by more snow storms, severe cold and unusually high winds, the accumulation of snow from one storm almost never disappears before it is buried beneath another. In the outskirts of the cities, and on the suburban line, the high winds, continuing for days, are the cause of most of the trouble, as huge drifts of hard sandy snow are formed as rapidly as removed, which defy ordinary snow-plow apparatus successfully.

To combat our local conditions we have drifted away from rattan broom and followed, more or less intelligently, modern steam road practice. First we dragged a board along the track; and, finding

so rapidly that there is a probability that the accumulation between trips of the plows and sweepers, will exceed three inches, the heavy shear-plows are sent out. When the ridge formed by the plows and levellers approaches 24 in. in depth, walkaways are used to level off the same, and shovelers sent out to clean all cross-walks.

At the commencement of a storm a force of trackmen are sent out to clean switches.

In storms of recent years, when snow has fallen to depths of over thirty inches it has been found impossible to depend upon the light plows and sweepers to do more than follow after the heavy plows, to clean the street to the pavement. The work of the rotary commences when the banks of snow on either side of the tracks become so high that the plows can no longer shove them back.

The rotary is a slow moving machine, because of the power limitations of the ordinary street car motor, but its work is positive and effective. As our storms are usually accompanied, or followed by high winds, the new fallen snow is soon piled in drifts in the thinly settled portions of the city. The snow thrown out by the rotary is spread over a large surface and does not materially add to the height of the bank, until the snow has become wind packed and sandy, and then, for the reason stated, the height of the bank is only slightly increased. Teams and shovelers commence the removal of snow at junction points, as soon as it accumulates. When the storm is over, the work of removing the banks of snow in the business section, thrown up by the plows, and from the sidewalks, is undertaken by the railway and city forces jointly.

When the storm ceases our work has just fairly begun, while there remains little to be done in the centers of the city, drifts are being rapidly formed in the outskirts, and plows and rotaries must remain in constant operation for days to keep the lines open.

*Read at the annual convention of the New York State Street Railway Association, Sept. 9-10, 1902.

Suburban lines which cross the line of prevailing winds and those which are run along the highways, require constant, and at times, heroic effort to keep them open. When snow fences are liberally used and properly placed along the exposed portions of the line, the saving in snow expense is marked.

The Rochester snow plow equipment consists of eight antiquated sprocket driven mold-board plows, equipped with Westinghouse No. 3 motors, three combined rattan sweepers, one double truck four-motor Wason nose plow, one double-end tin fan rotary, two single truck heavy shear plows and six walkaway or horse plows. With this equipment, was kept open, throughout the severe storms of last winter, 100 miles of track, including 25 miles of side or boulevard track, placed between rows of trees on one side and hydrants, stepping stones and hitching posts on the other, with less than ten feet between the two. This peculiar location of tracks renders the use of wings or levelers impossible, and the snow is therefore, soon piled up close to the tracks and the cars are operated in a cut, the width of the car body. Under these conditions the removal of snow is made difficult and expensive, and, because of the narrow space between rails and sidewalk, the number of shovelers and the expense of snow removal is greatly increased. The cost of removal of snow and ice for the winter of 1901-2 in Rochester was \$90 per mile, a large percentage of which may be attributed to the 25 miles of boulevard tracks. A double track line 5½ miles long between Ontario Beach, Charlotte and Rochester City line, and running north and south, lies on the west side of the highway, between the curb and fence lines. The hedges and line fences form a snow fence, which stops the drifting snow and heaps it up to great depths on the tracks. This line has been kept in continuous operation for eight years by two to four men, with a rotary plow. During the most severe weather cars are obliged to closely follow the rotary over the line, but are never stalled. Although this plow is equipped with small motors (four G. E. 800) it has been operated for three seasons without a burnout. A section gang of four men has been used to clean switches and crossings on the 11 miles of track.

The Rochester & Sodus Bay Ry., operating about 40 miles of line, mostly along a highway, is kept open by two rotaries and ten shovelers, but with considerable difficulty. The location of this line is peculiarly favorable for its obstruction by snow drifts, which form along almost the entire line, often higher than the roofs of the cars. The plows on this line are overtaxed and require a considerable expenditure for their maintenance. Under the conditions existing on this line, each car should be provided with a pilot plow—a heavy nose-plow with long side wings or levelers, should be provided, for use through the villages—and the rotaries should be the single, instead of the double blade pattern, so as to be able to lift the snow higher.

The cost of removal of snow and ice during the winter 1901-2, along this line, was \$2,300 or \$57.50 per mile.

When the average life of a rattan-filled broom is considered, as with its extreme flexibility, the additional cost of a steel broom, properly re-enforced by steel plates, is more than made up. Those who have operated steel brooms driven by 50 h. p. motors, know that they will cut through drifts of moderate depth, and sweep the track clean, with no apparent injury to the brooms. For comparison, it may be well to state, that the steel brushes cost \$42 per set and last from two to five years with ordinary care. A sweeper thus equipped will readily go through two feet of loose snow and at good speed, and will cut all packed snow to the pavement when properly operated.

IMPROVEMENTS BY THE UNION TRACTION CO., OF INDIANA.

The Union Traction Co. of Indiana is contemplating some improvements in its line which will eliminate several dangerous points and enable it to shorten the schedule time between Marion and Indianapolis. All the short curves on the line between Marion, Jonesboro and Fairmount will be done away with and a double track will be laid over part of this route. It is believed that after the changes the company will be able to run cars from Marion to Indianapolis in 2 hours and 45 minutes, which is the running time of the steam railroad. On the fast trains chair cars are to take the place of those now in use.

DISCIPLINE.*

BY C. B. FAIRCILD.

Some time since, the writer was riding on the front seat of an open car, on a country road, where it was not against the rules to talk to the motorman, and in conversation with a thoughtful man, he remarked: "The repair men give, and are required to give, special attention to the controller and motor equipment of our cars, but they frequently neglect, or only give a passing thought, to the brakes." "Now," said he, "if I cannot make a car go I certainly can do no harm or have an accident, but if I can make my car go, and am not able to stop or control it, I can do untold damage." Now, the subject of this paper is not brakes, but discipline, and I quote the foregoing only for the philosophy that is in it.

Managers and others, in operating street railway systems, strain every nerve, advertise, and make their cars attractive, to induce patronage, or to get nickels into the hands of their conductors, but what are they doing to insure that all these nickels get into the treasury, or, after getting them into the treasury, what are they doing to prevent their escaping or being paid out to meet excessive accident and repair claims, due to the ignorance and carelessness of the conductors and motormen? In other words, managers select their motors and other appliances with great care and then watch, shield, nurse, protect and repair them assiduously, to prevent their burning out, bucking or kicking, but what are they doing to improve, protect, shield and enlighten the two human machines that operate on the two platforms of the cars? Do they never buck or kick? And those others, who have charge of the track and car house repairs, as well as the clerical force?

What if a motor or controller does go wrong? You do not usually discharge it or lay it off without pay, nor take a crow bar and jam it into it and tell it what a — fool it is, that it ought to know better, had been told often enough. Isn't it in your book of rules? You are not a profitable machine for this company. You do none of these things, but you put an expert on it and have it repaired.

It is to the human machines that our subject, "Discipline," relates.

The word "discipline" is from the Latin *disco*, meaning to learn. The word "disciple" is from the same root, and has reference to a learner, or one who receives instruction from another. "Discipline" used as a noun means education, instruction, and usually comprehends instruction in arts, sciences, manners and due subordination to authority. "Discipline" as a verb means to instruct or educate, to inform the mind, or to prepare one by instruction in correct principles for a profession or any useful work.

Originally these words applied only to instruction, but in ecclesiastical affairs, in the early church, when heresy hunting began, the word had reference as well to the execution of the laws by which the church was governed, and the inflicting of penalties enjoined against offenders. So in later times the word means not only to instruct, but to correct, to chastise, to punish, with a view to bringing the offender to repentance and reformation, and more attention is usually given to the latter meaning than to instruction, whereas the reverse should be the rule. For our present purpose, the word "discipline" will mean the rules and regulations by which a body of men are kept in a state of efficiency and order, and under complete command.

At once, it appears, that there are two related parties—the instructor and the learner, or the disciplinarian and the disciples, both human beings and of the same common stock, involving the principle of brotherhood with a common object in view, viz: The efficiency of the service. The first recognition is this relation. The second, how best to impart the instruction, and enforce its observance.

It was well remarked by a member of this association at the last annual meeting, to the effect "that inasmuch as the machinery for propelling cars is decidedly in advance over the old type of machine (meaning horses), so the men who stand on the platforms of your cars must also be a decided improvement over the old street car men." This is true, and it is also true that applicants for such positions, and, in fact, nearly all working men, are a different kind of men from those employed a decade ago, and they will not submit

*Read at the annual convention of the New York State Street Railway Association, Sept. 9-10, 1902.

to the bossy and abusive treatment that was formerly supposed to be necessary, in order to make men know their places, or to get work out of them, which was probably the outcome of the spirit of slavery then existing. For this reason a manager or superintendent must know the basic principles upon which the relation of man to man exists, and must base his action on these principles in order to insure satisfactory results.

Among these principles are the following: The brotherhood of man is fundamental from the very nature and constitution of man, hence one cannot do a wrong to another or speak unkindly, without doing a greater wrong to himself. For the thought of wrong is first generated in one's own mind, where it will do its corrosive work before reaching its intended victim. Again, mankind are indissolubly related by ties of common nature and origin too deep for anything to put asunder; and, being so related, self-preservation demands that one should act kindly and do justice to all, including the meanest and weakest and most defenseless of his fellow men. Again, since man's constitution is based on the principles of charity and good will to all, slavery of any kind is not the natural birthright of any one, and when a master puts a chain about the neck of a slave, the other end must of necessity fasten itself around his own neck.

These principles were recognized and well illustrated by one of the speakers at your Rochester convention. He said: "I do not believe that any workman was ever made a better man by harsh or cross rebuke administered to him by his superior in the presence of his fellows. He feels that he is an inferior, if he is subject to such treatment, and whenever I have occasion to speak to a man, for any infraction of duty or violation of rules, or the neglect of his duty, I take occasion to take him alone and appeal to the better side of his nature. My experience has been that more than ninety-nine per cent of mankind are subject to the better influence. There is a great deal of man in every man, and all that you have to do is to develop it, give him a chance, bring him close to you, for there is scarcely a man so dense but what he is open to an appeal to the better side of his nature."

Employees in whatever situation reflect the color of the mind which directs them, so courtesy will be found to be one of the greatest factors in success. The writer is aware that most of the managers and superintendents who are members of this association recognize and practice these principles, but the duties of a manager or superintendent in this matter of treatment of men does not end in his personal treatment of his associates and employees, but should be followed up by careful inspection to learn if the heads of departments and foremen are co-operating with him. He should know that every man down to the lowest grade receives fair and just treatment from his immediate superiors. It is a patent fact that a gang of workmen will not be better than their foreman, and if he is overbearing, cross and profane, the men and their work will partake of the same low character. If a foreman gets angry and quarrels with his men, he puts himself on their lowest level and loses his power of discipline, and by getting angry wastes his own physical strength that might better be spent in the service of the company. Let your men all understand that they are free to complain, or report any ill treatment on the part of subordinates without fear of being persecuted. Let your men understand that they are not to be serfs, and are not expected to submit to petty tyranny, but that they are to be independent and have the right to resent, in a proper manner, any unjust or ungentlemanly treatment. Let your foreman and subordinates understand that each man sets an estimate upon himself, and if he uses the language of a blackguard he must expect his men to do the same. Let him understand that one must first learn to govern himself, and that anger is a confession of weakness.

In the enforcing of discipline one should remember that no matter how stupid, ignorant or vicious a man may appear, he still knows some thing that the superintendent would be the better or wiser for knowing. Even though you have decided to discharge a man, by keeping cool and winning his confidence you may, by adroit questioning, be able to get from him admissions or confessions that will prove exceedingly valuable in rooting out discordant elements among the men or draw out some hint that will be of value to the service. In reproving or cautioning men keep on their good side and regard all your men as so many feeders or avenues for seeking and transmitting to headquarters knowledge that will add

to the efficiency of the service, and all your men should be encouraged to plan and suggest.

In the matter of shielding employees, special attention should be given to the night men, whether car men or night repair men. The late night men are apt to be influenced unfavorably or debauched by the people who patronize the late night cars, and unless carefully watched will pick up careless habits or shady practices that will in time spread to the entire force. Men should never be required to remain too long on late night runs, or at night work of any kind. In the business of street railway management there are three classes of parties to which a superintendent finds himself related; first, the employees; second, the public, and, third, the stockholders, and in proportion to the attention given to the first class does he benefit the other two classes. When the employees please the public the public becomes liberal patrons and the stockholders get the benefit of the extra nickels.

So much for the relation; now for the instruction and its enforcing.

We often hear it remarked by the heads of departments in street railway matters: "If you knew the calibre of the men we employ you would know they would never think of using such or such an appliance if we should adopt it; or, our men can never be brought to such a state of efficiency." One who says such things only confesses his own inefficiency as an instructor, for men will do, and all men will do well, whatever they are properly instructed to do. It is in them as a possibility; the question is how to bring it out, and make it actual. It is not enough to dismiss the subject and say that it has been tried and failed, for so far as the writer is informed men working in the street railway field are not generally fully instructed, or rightly informed. Note the difference between instructed and informed. They may be well instructed in mechanical details, and as to their particular duties in particular situations, but have never received instruction along the higher lines, as how to develop and employ their own native powers, their own power to think, and act promptly and correctly, under any and all circumstances that may arise. A man may be familiar with all the rules, and yet not know them, and it is a mark of a good instructor to so teach that his pupils know the subject, can digest it and make it a part of their own immediate knowledge, always ready for use without taking time to fish about in their minds to recall the rule that applies to any particular case. Every mind is so constituted that it can acquire, if properly taught, and instruction is the only thing that will, or can, do away with the limitations that hamper street railway practice. Mere instruction, however, is only half, and the smaller half, of the requirements. Every teacher knows that no matter how lucidly a subject is presented to a class of pupils, the learning is solely a mental act on the part of the individual pupil. The object of the teacher and pupil is the same, but the relation to the work to be done is different, and as said above, the object can only be attained by the mental act of the learner, by his observing, remembering, etc. It is clear, then, that what he does, and not what the teacher does, is the essential part of the process, that is, the appropriation and assimilation of knowledge, by the mind, and can be performed by no one but the learner. The teacher can no more think for his men than he can walk, sleep, or digest for them. The process of thinking, then, by which a pupil learns being essentially his own, the teacher's part is that of a guide director, or superintendent of the operation by which the pupil teaches himself. The instructor can stimulate and direct, but he cannot do the thinking necessary to give the desired results for his pupil. The teacher's problem is how to get his pupils to learn, how to get all his pupils to learn, the so-called stupid ones, as well as the bright ones, and how to adapt his teaching to the calibre of the individuals and see that they make the mental effort to learn. And he should remember that there is no need for haste, the only thing needful is accurate knowledge, to have something thoroughly, perfectly, immovably known, the same as is required of a machine, that it will work perfectly under all conditions. Even then the teacher's work is only just begun, instruction must be followed up by continuous, persistent and careful inspection of the men when on or off duty, not with the view, merely, of finding if rules are being violated, or for the purpose of administering reproofs and reprimands, but for the purpose of keeping acquainted, of watching their general conduct, and for the purpose of impressing upon the man the rightness and advantage of honesty, sobriety,

and politeness. Let the reprimands and reproofs, if necessary, come afterwards, when the individual offender can be called aside and warned or instructed by himself. Indiscriminate censure when anything has gone wrong, or is going wrong, only defeats good discipline. In the matter of inspection remember that if everything is found working smoothly one day it is not an evidence or guarantee that it will be so running the next day, unless you make it so by your presence. Never take it for granted that your men, or assistants, are doing what you have told them, but watch and see—come upon them at odd spells day and night. Let them feel that you are omnipresent. In preparing a code of rules for the government of street railway employes it will be more expedient to so word them that they will all be constructive rather than prohibitive laws and penalties. It is much pleasanter and more effective to have laws that will tell men what they ought to do, rather than what they must not do. For instance, rules that read "It shall be lawful and proper, etc.," rather than it shall be "unlawful, etc." "Said crime or misdemeanor or infraction of rules shall be punished by fine, suspension or discharge." Rules that read "thou shalt not" often serve as a challenge or suggestion, to certain minds, to do the forbidden thing, for the purpose of showing their independence, and that they can do it without being detected. It weakens the force of a rule to state it arbitrarily with must or forbid when its violation cannot be enforced. For instance, "Indulgence to excess in intoxicating liquors when off duty is positively prohibited." "Spitting in this car is positively forbidden." A man might be discharged for intoxication, but there is no way that the company can prohibit a man from becoming intoxicated. The rule about spitting cannot be enforced, for the passenger might spit out of the window or the door, or might use the coal box, or, if he should spit on the floor, the chances are that the conductor would not see him. A better notice would be, "Gentlemen, please do not spit on the floor of this car." Or, "The Board of Health has made it a misdemeanor to spit on the floor of a car."

A book of rules should have no reference to specific rewards or punishment. These matters should be left to the individual judgment of the one who is responsible for their enforcement. Incentives are better than penalties, in the matter of securing obedience to the rules, but as there are always employes with whom incentives have no weight, penalties are sometimes necessary. They need not be severe, however, but reproof or punishment must be certain, following any offense, whether injury has resulted or not, and must tend to instruct or train the offender so that he will want to obey the rule. In no case should a disciplinarian threaten a man, or impose a penalty, and then let him beg off. Investigate carefully, and be sure of your ground before imposing a penalty. The offender should be made to realize that reproof or penalty is imposed for neglect or disobedience, not simply because the manager is displeased and seeks revenge. Penalties except in rare cases should not affect the man's pay, for if it does his family or friends may be made to suffer, and the women of his household, not knowing the circumstances, are apt to blame the manager and gossip and circulate reports injurious to the interests of the company, and the man himself, thinking he is unjustly fined, will be apt to seek, or try some means by which he may get even with the company. It is gratifying to know that this matter of affecting a man's pay has already been settled by a number of companies in this state, as shown by the reports and discussions of your previous meetings. Merit and demerit marks may be used, but a record of these necessitates an endless amount of bookkeeping, and often leads to no end of misunderstanding and jealousy among the men, and is often attended by annoyances that defeat the end sought to be gained. (The bookkeeping mentioned does not refer to the man's record.) It is better to leave it to the manager or superintendent to devise some original method of reward to suit meritorious cases, without any previous promise made in the matter. In the whole matter, however, it is better to remember that formation is better than reformation, and that more attention being paid to instruction, and drill, will save time and worry in the matter of punishment. It is conceded by prison authorities and others that punishment as ordinarily administered is not reformatory. In enforcing discipline let not authority be the impelling motive. Temper your attitude by imagining yourself in his place. Think that if you had had his hereditary, his conditions and environment you would be just like him, and this will furnish a good lesson in toleration. Interpret the

man from his own point of view, and remember, that until he sees the justice and truth of your action, it is not truth to him. To convince him, find other points of agreement, and he will be led towards recognition and at length exclaim "I see it." If you seek common ground you can always find it, and when found its area naturally increases. Hold the other man's view in respect, and that will bring him towards yours. Your toleration will outlaw his law.

In the matter of correction a distinction should be made between offences from ignorance, indifference, recklessness, carelessness and those where willfulness or guilt are involved. So far as the company is concerned, a loss from carelessness or forgetfulness is just as bad as a loss where guilt is a factor, but the penalties cannot be the same. The fact, however, should be impressed on the minds of all the men that loss from any cause is a serious matter, especially when it is accompanied with injury to life or limb, and that accidents are not measured by the money value only, but have an important influence on the general reputation and patronage of the road. Accidents do not happen, nothing happens; there is a cause for every effect. There are no unavoidable accidents. According to psychological laws the cause can usually be found, in the mental make-up of the man responsible for the accident. The mental attitude of some men invites accidents and all sorts of so-called ill luck. The man who has one accident will have another and another and will continue to have them unless his mentality is changed. The best men never have any accidents, and all the accidents can usually be traced to a certain few men who, when known, had better be discharged or transferred to some situation where they cannot do much injury, either to themselves, to others, or to property. It is a mistake to suppose that men must necessarily have accidents, violate rules, or be a little reckless, or careless at times, in order to learn street railroading. People learn to walk by walking and not by falling down. Mistakes or accidents are not instructive or reformatory, and a man is never better for them. The writer was surprised to hear the statement made at your last convention by a superintendent, that he would have no objection to employing a man who had been discharged from another road for having an accident, upon the ground that such a man would realize the seriousness of his error and make a better man than before. Such reasoning is contrary to mental laws, and contrary to all the information the writer has been able to gather on the subject in his fifteen years' continuous association with street railway men.

All the triumphs of skill which we observe are merely the shaping of things by the subtle power of thought. The grander the achievement, the grander and more masterly the thought that has embodied itself. The scientific work which calls for the praise and admiration of men is the result of the scientific thought of the worker. Man then, being a master of thought, and of all things through it, any desired object or condition becomes possible of realization. Once master of the principles of thinking one can become a specialist in any particular line of invention or discovery that may be demanded by the necessities of the service. Once master of that kind of thinking, which builds men, bringing into expression the ideal qualities that are essential to profitable street railroading, a manager can advance his service to an earning capacity beyond anything he has ever imagined. The question is often asked, "What is your experience in such a matter?" or "In my experience I have found so and so to be of advantage." Now experience is merely what has been found out in practice, but it should be remembered that there is much beyond what has yet been so found out. A turn may come in street railway affairs and sometime a wiser method of discipline may be suggested, productive of unheard of results. So it is never safe to reason on the basis of experience, or on a basis that one knows all that is to be known on any subject and so declare a new idea impossible or silly. It is not always experience, custom or practice that is to be followed, but some higher, advanced or better way. Those who are the great masters of commercial matters today are those who have dared to try something new that has come to their thought. An example is found in the matter of welding the joints of street railway rails. Engineers who were skilled in all such knowledge when told of the idea pronounced it impossible and silly, declaring that in the summer's heat the rails would hump up, pull the spikes and ruin the road, or in winter time, the rails would pull apart by contraction.

Their reasoning was conclusive, according to experience up to that time, but when the actual trial was made the results were surprising. There was little or no trouble from expansion or contraction, and it has become an almost universal practice. Those who declared such ideas absurd have in this day their companions but prompt action is the secret of success in the line of new suggestions, but it should be action, that is right in line with one's regular work.

We must not limit the possibilities of today by the attainments of yesterday: if we should do so, we would bring to an end all progress, and in the matter of discipline no advancement could be made towards the time when there shall be fewer accidents, less expense for repairs and when employes shall be more considerate of the rights and comfort of passengers.

In the matter of instruction, it is a commendable practice to provide schools or lectures for instruction and practice as has already been done by some of the largest systems in our state. In these schools, oral instruction should be given in addition to printed rules, and when rules are provided, it is best not to put them into the hands of green men to study, at first. Not until they have had some opportunity to become familiar with the names of the parts of a car, and road equipment. Even then it is better that the rules be first read and explained to the men, as some men, although they can read, find it difficult to comprehend written instructions. It was well remarked at the last convention that, "So far as the question of training is concerned it should continue so long as the man is in the employ of the company. The training of every employe should be continuous, as new questions and conditions are constantly coming up." This training can best be given by having schools for this purpose, as is already the practice with some companies, and through the business and social meetings, in connection with the benefit associations or other organizations. Schools of some kind are especially desirable for small companies, as it is usually found to be more difficult to give thorough instruction to employes on a small system than on large roads, for the reason that the superintendent is so burdened with details that he finds little time to devote to instruction. Thus it frequently happens that a motorman, for instance, receives his entire teaching from another motorman, who receives all his instructions from a previous motorman. So that the rules that the last man receives are only copies of copies of copies, and are likely to be very much distorted from the original. Again, when frequent changes are made among the men, a new man may be put on to learn from a man who himself was new only a short time before.

It should be borne in mind that in the present state of society it is of advantage to a company to provide instruction in schools or by lectures for their men, along lines, other than those relating to their mechanical duty. In other words some means to counteract the philosophy of the "bar rooms" and make the men conscious of their own mental and moral powers. Not only the philosophy of the "bar rooms" is to be counteracted, but that given at public halls where the men listen to bitter harangues on society in general, attacks on property, on the church and the institutions of our social fabric, when men blame everybody and everything except themselves and fire the souls of their hearers, as bad whiskey fires the body, and for the same reason. Labor troubles arise from ignorance, and can only be avoided by bringing all the men to the same general knowledge of all the local conditions, that the chiefs in the service themselves enjoy. Men can be taught to feel that their interests and those of the company are identical. Individual opinions are founded upon, and colored by, an innumerable variety of factors which have preceded, and if you expect men to think as you do and be actuated by high and lofty motives and loyalty to the company, they must be taught the same things which have made you what you are. As was said last year, there are bound to be seeds of passion, seeds of discontent and disloyalty planted in the minds of the employes somehow, hence a matter of self-defence, from a selfish or commercial standpoint, without any reference to ethics, morals or religion, street railway companies should undertake to fill the minds of their employes with seeds of truth for truth's own sake. Men are tired of make-shift, they do not wish to be bribed by gifts or abused by penalties, but they do want food for their minds, and when teachers are provided, who will proclaim the brotherhood of man, and the law of mind, as founded on the very nature and constitution of man, men will crowd and throng the classes. Men must be shown

that they have a higher nature which is ever leading them on. That this nature has a tendency to evolve until they outwardly manifest, in full, their relations and possibilities, being filled with the hope and expectation of bettering their condition in life. When men are taught how to think, how to recognize and use their power to think, they will have the key to all problems, for thought is creative and all creation and all progress of the race, as manifest in means for transportation, in printing, etc., has been through thought.

The principles enumerated are not one-sided, are not for one class only, but are to be observed by the employes as well as the employer, but it must be remembered that these principles cannot be forced upon any class of people, nor upon the public, for this reason, these truths cannot be put into practice until your employes are educated up to them, but the responsibility of teaching principles to what are known as the laboring classes rest with the higher or more advanced and enlightened, usually the employer. From the fact that street railways are closely allied to most every other industry they have the opportunity, and it will be for their credit to take the initiative in this matter. It is often said by street railway men that they are not in the missionary business, but it is now known that any enterprise or industry is prosperous in proportion to its missionary work.

Some of the larger companies have formed schools for instruction. It would be doubtless to the advantage of the smaller companies if they would club together and organize schools in different parts of the state, or subsidize and encourage private schools where instructions can be given in all matters relating to street railway affairs, to which young men can go and fit themselves for the business or profession of street railroading. We have numerous commercial colleges, schools of dramatic art, of music, etc., why not have schools for the science and art of street railroading and street railway management—schools equipped with cars, motors, trucks and all the mechanical appliances, with a course of instruction in all the duties required of a street railway employe, embracing his relation to the public which he is expected to serve?

ACCIDENTS ON ELECTRIC ROADS.*

BY C. R. BARNES, ELECTRICAL ENGINEER FOR THE NEW YORK RAILROAD COMMISSION.

As a representative of the Railroad Commission I have officially come in contact with nearly every manager of electric railroads in the state. My relations with them, I think, without exception, are cordial and friendly, and I hope that condition to continue.

The subject of this paper is at the present time a very important one. The author has had eight years' experience in the investigation of accidents in this state, and this experience has taught him the importance of the subject, and also how incompetent he is to present a paper on it before a convention of representative railroad men such as this. But to treat the subject in even my humble way, facts must be stated, and in doing this it is desired that every member of the association should know that there is no criticism on the management of any one particular road intended; but the general information in reference to the operation of all roads which has been obtained in my official position will be used in the hope that it may in a small measure aid in what you are all interested in accomplishing, namely, reducing the number of accidents to those which are incidental to the operation of an electric railroad and which experience shows to be practically unpreventable, even with reasonable care and foresight.

In the year 1898 there were 1,174.38 miles of electric railroads in this state; 4,002 box, 3,498 open, 10 mail and 208 freight, express and service cars operated. In that year there were 74 persons killed and 541 injured. In 1899 there were 1,225.16 miles of road; 4,743 box, 3,681 open, 139 mail and 631 freight, express and service cars operated. There were 126 persons killed and 580 injured. In 1900 there were 1,413.26 miles of road; 5,098 box, 3,666 open, 22 mail and 666 freight, express and service cars operated. There were 148 persons killed and 650 injured. In 1901 there were 1,548.66 miles of road; 5,199 box, 3,945 open, 10 mail and 558 freight, express and service cars operated, and 160 persons were killed and 807 injured. The complete reports of mileage and the number of

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cars operated for the year ending June 30, 1902, have not yet been received in the railroad commission office. In this year to June 30th there were 127 people killed and 823 injured. You are all familiar with the serious accidents which have occurred since June 30th, one of which resulted in 14 deaths and the injury of 60 persons, another in 4 deaths and 20 or 30 injured; one where three were killed and several injured; two where one was killed, and several others where a number were injured.

These figures show that the death rate caused by accidents in reference to miles of road operated was .003 in 1898, .102 in 1899, .104 in 1900 and .103 in 1901. As stated above, these figures cannot be given for 1902. But with the exception of the year 1901, in which year the death rate in proportion to miles of road was less than the year previous, there has been a continuous increase in the death rate as compared to the mileage. This increase between the years 1898 and 1901 was .040, an increase of about 63 per cent. The percentage of passengers injured in reference to miles of road operated in 1898 was .462; in 1899, .480; in 1900, .450, and in 1901, .559. This shows a steady increase in the percentage of passengers injured in reference to mileage of road except in the year 1900, when the percentage was less than in the year previous. There has been an increase between the years 1898 and 1901 of .097, an increase of about 21 per cent.

These figures include the accidents on all of the electric railroads in the state, including city and other roads, and are compiled from the annual reports of the companies made to the railroad commission. It was the intention to have classified these accidents, and also to have made a percentage comparison based on car mileage, but the investigation of the number of serious accidents which have occurred recently has occupied so much time that I was unable to make as detailed a statement of accidents and as clear a comparison of them with the growth of the electric railroads as would be desirable in a paper of this kind.

While these figures include the killed and injured resulting from all classes of accidents, a large majority of them are the result of head-on collisions, tail-end collisions, collisions at grade crossings of steam railroads, collisions at grade crossings of electric railroads, derailments and failures of bridges and trestles. The future consideration of this subject will be confined to this class of accidents. The accidents incidental to city operation, such as striking persons and vehicles on the street, passengers injured boarding and leaving cars, passengers thrown from cars, etc., will not be discussed in the following portions of this paper.

The greatest loss of life and injury to passengers on electric railroads in the last five years has been caused by rear-end collisions; the next largest loss of life and injury to passengers has been caused by head-on collisions, and in this comparative line of the causes of death and injury to passengers are the collisions at grade crossings of steam and electric railroads, the derailment of cars and the collapse of bridges and trestles. The causes for the above class of accidents are numerous, and to state only a small portion of them would be beyond the limits of a paper of this character. The more important ones will be briefly mentioned.

Head-on and rear-end collisions can be dealt with under one head, as the causes which produce them are in most cases similar. In the investigation of this class of accidents, it is found that motormen have two stereotyped excuses for their occurrence: First, "When I saw the car ahead of me I applied the brake, but it would not work;" second, "I then put on the reverse, but it would not take." The testimony of all persons directly interested in the operation of the cars in collision is taken in the investigation of accidents, and in nine cases out of ten this evidence goes to show that the motorman's statement was not true. When a motorman has been running a car the larger part of the day, making his usual stops without trouble, and in such a manner that the conductor's attention has not been attracted to them, this being the case on the run on which the accident occurred, it is safe to infer that the motorman is mistaken when he says the brakes would not work. Of course, there is always the possibility of the brake giving out on the stop just before the accident; but in the investigation of this class of accidents, the inquiry must extend further than the crew of the car; it must be carried to a thorough examination of the methods of operation, the physical conditions of the road, the kind of brakes used on the cars, and the equipment of cars, including sand boxes. In the investigation of the methods of operation of rail-

roads in reference to accidents, the statement can safely be made that in a large majority of them the primary cause of the accident can be traced to inefficient management of the road, and while the motorman may be the immediate cause of the accident, it in all probability would have been prevented had the management been more systematic.

There has been a large number of tail-end and head-on collisions. The larger portion of these have been caused by motormen running past switches where they were due to meet a car. Several have been caused by misunderstanding of train orders, transmitted over a telephone system; several by conflicting orders being given by different officers of the company; some by crews attempting to "steal" a switch; several by crews taking it for granted that a car which was due at a junction of two lines had passed that point; others by the failure of block signal systems; a few by cars getting beyond the control of the motorman on heavy grades and not stopping at a switch where they should have stopped; a number by facing-point switches on cross-overs on double tracks, and there have been two cases where motormen have seen cars approaching them on the same track, and have continued at full speed, with the intention of making the other car back up to the switch, the speed continued on both cars for the same purpose until it was impossible to stop either; two were caused by the running of special and work cars over a road without proper notice being given to the regular cars; one head-on collision was caused by an ordinary passenger car being used as a work car and not being placarded as such; a regular car met it on a switch where another car was due, supposing it was the regular car the crew ran out on to the main track, and the two regulars met in head-on collision. Among the causes of tail-end collisions may be mentioned the 500-foot distance rule in use on a large number of the suburban and interurban railroads; cars coming to a stop at points on the road where the view of an approaching car is limited; cars "running away" on grades and on wet and slippery tracks; regular cars running into work cars, standing upon the main track without protection; broken trolley wheels leaving a car standing on the track without lights; trains being run in sections without the rear end of the first section being properly protected, and a number of other causes.

The accidents at grade crossings of steam and electric railroads and at grade crossings of electric railroads, are invariably caused by violation of the running rules of the company, for I do not know of a crossing of steam and electric tracks in this state, where there is any considerable volume of traffic on the steam road, but what the company's rules require the electric car to come to a stop and the conductor to go ahead and flag his car over the crossing. But some collisions have been caused by the power giving out while the electric car was going over the steam tracks, or by the trolley leaving the wire while this was being done, in this manner stalling the electric car in front of the steam train or engine. At nearly every crossing of two electric tracks the cars on one of them are required by the rules to come to a full stop before proceeding over the crossing.

The causes of derailment of cars are so varied that it would be almost impossible in the limited space of this paper to enumerate them. The principal causes, however, are: Cars going around sharp curves at too high a rate of speed; the spreading of tracks on curves; the irregularity and poor alignment of curves and lack of proper elevation on them; where the grooved rail is used, the groove being filled with stone, sand or other substances; frogs and switches not being properly placed; open switches; poor alignment and surface of track; broken flanges on wheels; axles out of line; loose wheels; wheels not properly gaged, etc.

There have been several accidents resulting from bridge and trestle failures. These in most cases have been caused by leaving old structures in the road and increasing the weight of cars operated over them without increasing the strength of the structure. There have been two derailments on bridges, resulting in serious injury to passengers, brought about by the custom of planking highway and street bridges flush with the top of the rail, without proper guards to prevent a car from going off the rails and over the side of the bridge. This planking flush-with-the-top-of-the-rail is almost the universal custom and is a very dangerous one.

These are the most frequent accidents occurring on suburban and interurban railroads and the principal causes of them. The question now to be considered is how to prevent their occurrence.

The solution of this problem, to some minds, appears to be an easy one. Read any of the papers of the daily press after an accident has occurred, and the editor volunteers a ready solution of the question of preventing accidents on electric railroads. In some of these papers you will see that double tracking a road would prevent all accidents on it in the future; in others equipping the cars with John Smith's automatic brake would prevent accidents of all characters; in another, the adoption by the company of Bill Smith's block signal device would be a guarantee against accidents, and so on through a long list of suggestions, the writers being confident of their ability to judge of the merits of the different devices mentioned and their positive knowledge that the adoption of that device or plan would be the solution of the question under consideration. But you, gentlemen, who are more experienced and far more interested than the editors in preventing accidents, know that accidents on electric railroads have multiplied in variety and number with the advances made in electric railroading. It is not a case of a sick child where a dose of paregoric can be administered and the disease will disappear. The present conditions result largely from the tireless efforts of manufacturers and inventors of electrical machinery to increase the efficiency, power and speed of their apparatus, and from the failure of electric railroad managers to keep pace with them in track construction, safety devices and methods of operation. This condition has been a growth of years, and the remedy for it must be found in the free use of safety appliances, in more perfect and complete construction and equipment, and more careful and systematized methods of operation.

It is taken for granted that every member of this association realizes that the electric railroad business is face to face with grave problems; that the numerous serious accidents, not only in this state, but throughout the country, are injuring the standing of the electric railroad before the public, and that if they continue, the revenues must be impaired for the reason that people will lose confidence in electric railroads and will prefer to patronize steam roads. Up to this time the electric car has met with favor by the public, preference being given to it for suburban and interurban rides, even when a destination could be reached quicker by the steam roads. The comforts of the electric service, including fresh air, free from smoke and cinders, the unobstructed view which can be had from the open car, and especially the combined pleasures of a ride on them through a country district have caused the public to patronize them liberally; but these frequent accidents are creating alarm and distrust. The confidence of the public must be restored, or you will not only drive people from the electric cars, but you will drive capital from investment in electric railways. These statements are intended to apply only to roads other than the distinctively city roads in the state. The city railroads are operated in a manner which reflects credit upon the management of them as well as upon the electric railroad business generally.

This condition of safe operation does not exist on all of the suburban and interurban roads, and upon most of them the railroad commission have had to investigate serious accidents. Still, there are several of these roads which are operated under rules and regulations which compare favorably with steam railroad methods. On one of them there is a complete telegraph train dispatching system in use; on another, a tram dispatching system, in which the orders are transmitted by telegraph and telephone; on several others there are tram dispatching systems, the orders being transmitted by telephone only.

Of course, it is expected in a paper of this nature, after describing the character of accidents occurring on electric railroads, that suggestions should be made to prevent their occurrence, and this is the point where I realize my inability to fully meet the requirements of the situation. However, I will mention a few points in which my experience and observation have led me to believe that improvement could be made. As stated above, the investigation of accidents in a large majority of the cases shows a defect in the organization of the operating force and in the methods of operation. A well organized operating force on an electric railroad can be compared to the motor, pinion and gear wheel of an electric car, the president being the motive force of the organization compared to the motor, the superintendent or general manager, through whom the president's policies are carried out, compared to the pinion, and the heads of the different departments, including motormen and conductors, to whom the superintendent issues his orders,

represented by the different cogs on the gear wheel. The whole forms an unbroken line in the case of the organization from the president down to the motormen, conductors and other employes, as in the combination the pinion and gear transmit the power of the motor to the traction wheel. In the latter case each member must be in perfect working order, each one must be fully equipped and efficient in itself; any defect in one shows a defect in the whole. This is also true of the organization. If the president lacks in ability, sound judgment and common sense, he will interfere with the operation of the organization, and above all he must not reach over beyond the pinion, the superintendent, in carrying out his ideas and policies as illustrated in the case of the motor, pinion and gear; if the leads of the motor extend beyond the pinion and come in contact with the gear wheel, a damage is caused which results in the breaking down of the whole combination. It is not meant by this statement that the president must not come in contact with the employes of the road, but that he must not interfere with the operation of the road when it is in operation except through the proper channel, the general manager or superintendent. When the machinery is at rest after the day's work is done, or when employes are off duty, the more he comes in contact with them, the better it is for everyone interested in the welfare of the road; but in the regular routine of business the president's duties consist in outlining policies and plans for the benefit of the road; the details of the execution of these plans and policies devolve upon the superintendent. The superintendent of a railroad should be a man of ample experience and capacity, qualified to take charge of the operation of the road in all its branches, carrying out the views and ideas of the president, but to all intents and purposes he should be the czar of everything pertaining to the direct operation of the system. The heads of the different departments, motormen and conductors, as represented by the gear of the combination, must mesh into the different apertures between the cogs of the pinion, and if one of the cogs of the gear becomes rusted and will not readily absorb the lubrication, which in the case of organization is represented by the book of rules and special instructions, it weakens the whole structure, and if not removed will cause a break-down. When a cog becomes worn out it must be removed from the system. In the case of the organization, when a motorman becomes too old for service, he must be removed from that position, and usually there are places on an electric road into which an old, faithful motorman can be put, where he will not be a detriment to the service. If a motorman becomes too large for his position, as in the case of the cog, he will not mesh into the aperture assigned to him, but interferes with the smooth running, and must also be removed. This illustration might be carried further, showing that perfect organization is an essential thing to the welfare of an electric railroad. But the illustration clearly sets forth one point which to my mind is essential to the safe operation of any road, that is: the duties of the superintendent or general manager should be confined to carrying out the instructions received from the president in reference to the operation—and nothing but the operation—of the railroad. He should not be burdened with any additional duties, such as the supervision of construction of extensions, nor the negotiation of extensions, nor the negotiation of stock or bonds; his whole duty should be trying to earn dividends, not to negotiate the securities of the road.

From personal observation it is known that every one of the managers of railroads in this state is interested in reducing accidents to a minimum. The Board of Railroad Commissioners is doing all in its power to bring about this condition. Their expert has inspected nearly every foot of track in the state of New York; also the equipment of cars; examined into the methods of operation, and the board has investigated nearly every serious accident that has occurred in the past five years, and on all of these inspections and investigations recommendations have been made with a view of preventing accidents. These recommendations have in most cases been received by the companies in a proper spirit. A large number of them have been complied with, but there are some instances where the managers have thought that, while the recommendation if carried out would be a benefit to the road, the possibility of accident involved was so remote that they have delayed compliance with the recommendation from time to time in order to keep down the operating expenses for this year and intending to comply next year or in the near future. A large number of these recommenda-

tions apply to the protection of crossings of steam and electric railroads at grade. It has often been said to me when a suggestion for protection at a crossing of this character is made: "We have operated that crossing for ten years and never had an accident on it. Our men are all instructed to flag their cars over it, and it is impossible for an accident to occur at that point. These are all old men, all live here in the town, and most of them own their homes; they are a good steady, industrious lot of men, and I know each of them personally." Now that manager was sincere and honest in the statement. He could not be led to believe that there was any danger at that crossing for the reasons which he stated. The fact is, no matter what class of motormen are employed or what wages paid, an accident is likely to occur at a crossing of that kind unless it is so protected that the car crew is obliged to come to a stop, the conductor going ahead on to the steam track before the motorman can proceed over the crossing. As an illustration of what motormen and conductors may do: On an inspection tour I visited a certain town in this state, arriving there about noon. I called up the road superintendent by telephone, told him my business and arranged to call on him at his office after lunch. At that time I boarded a car, and on the way to his office we met another car on a switch. The conductor of that car entered the one in which I was the only passenger, and looking at me and seeing no other person in the car, called out to the crew of the car: "Boys, be sure and flag the crossing, as there is a railroad commissioner in town this afternoon." From that remark I drew two conclusions; one, that it was not customary to flag the crossing; the other, that I did not look like a railroad commissioner. No matter how long motormen and conductors have been in the employ of the company, or how reliable they may be, accidents will occur at crossings which are not properly protected. The commission's efforts to prevent accidents on electric railroads cannot be effective without the willing and ready co-operation of every person interested in the operation of these roads, and while a large majority of the managers of roads are in hearty co-operation with them we find that there is not a proper realization of the danger connected with the operation on the part of some of the officials.

In stating the number of accidents which have occurred on electric roads in the past five years, a partial classification of them was made. In suggesting means of preventing their occurrences it is not necessary to consider each class of accidents by itself. The remedy which will prevent the occurrence of a head-on collision would be a remedy for almost all of the other kinds of accidents; this remedy is, a proper organization of the operating force of the road, proper discipline of employes, proper track construction, proper equipment of cars and proper methods of operation, and this statement is applicable to all roads, no matter what the extent of them. For proper organization and discipline of the operating force, so as to prevent head-on collisions, only competent and properly qualified men should be motormen and conductors. It is not meant by this statement that none but experienced motormen and conductors should be employed, but it is intended that a better class of men would be secured if more care was taken in investigating their past records and physical condition before employment. In order to do this, proper printed blanks, furnished by the company, should be filled out by the applicant, these giving all of the necessary information in regard to their previous employment, reasons for leaving it, references as to character, etc., and in addition a thorough physical examination, especially as to eyesight and hearing, by a doctor employed for that purpose by the company; more care should be exercised, and a more thorough system of "breaking in" or instructing motormen than is the custom at present on most roads. It is found that the general custom on a majority of the interurban roads is to take a man, no matter what his previous occupation was, put him on a car with an old motorman and let him run ten days, then make one or two trips with the superintendent, inspector or master mechanic, after which he is reported qualified and is given charge of the front end of a car. This easy method of making motormen was all right in the early days of electric railroading, with the 16-foot, 6-ton car, but is all wrong with the heavy equipment of interurban roads of the present time. It is inviting accident to place such a man in charge of an 18 or 20 ton car, loaded with fifty or sixty passengers, descending 5 per cent grades with sharp curves, such as exist on almost all of this class of railroads. The motormen should not be compelled to serve the apprenticeship which is

required of the steam railroad engineer, but should receive a training by which he would have some general knowledge of the construction and operation of the apparatus under his control.

Another matter of importance which devolves upon the management of a railroad is the matter of discipline. The first step in this direction is the compiling and furnishing to employes of a complete set of rules. It is the usual custom to require motormen and conductors to learn the rules before they are given permanent employment, but very few companies require these men to remember them. In investigations of accidents, the question is asked a motorman: "Are you familiar with the rules contained in the company's book of rules?" The usual answer is: "I knew them when I went to work for the company, but don't know as I could repeat them now." The discipline and efficiency of employes in the United States mail service is as near perfection as possible. In that service employes are required to pass an examination at stated intervals, based on their knowledge of the business and the rules governing it. Motormen and conductors should be obliged to do likewise. These rules should be made as explicit and clear as possible, covering every emergency which can arise, leaving as little to the judgment of the motorman or conductor as possible. The importance of proper rules cannot be overestimated in behalf of safe operation of a railroad. As an illustration of this: An accident recently occurred on one of the roads in this state where fourteen persons were killed and sixty injured. This accident might have been prevented had the conductor of the car used proper judgment and set the rear brake after the front one had become disabled by the breaking of a brake rod. When asked why he did not do this, he answered, "Because I did not receive four bells from the motorman," and he considered it would be a violation of the rules for him to do it without that signal even in an emergency. The rules, among other things, should especially provide for the safety of trains when operated in more than one section. Usually the book of rules prescribes a 500 or 1,000-foot spacing distance. Experience has shown that this rule alone is not sufficient to insure safety of operation where one car is following another, as the construction of country roads is such that in many cases the view is limited to less than this distance. There should be a rule compelling the conductor of the head car to protect the rear end by means of fuseses or in some other way while in motion and by a flag or lantern while standing still.

Next in importance to rules and discipline is the question of train dispatching, block signal or telephone system. The ideal method of operation on any suburban or interurban railroad is the running of cars under a telegraphic train dispatching system. On most of the roads in this state this is impracticable, and the telephone is in a number of cases substituted for the telegraph, the motormen or conductors acting as operators. A reliable block signal system, the cost of which would place it within reach of electric railroads, is something which is much needed, and it would be an important factor in reducing accidents. There is no such system in extensive use on any of the railroads in this state. Improvements have been made within a short time on several of the roads in the method of handling train orders by telephone. Formerly either the motorman or conductor would call up a train dispatcher, receive from him an order to run to a certain point, he would repeat this back, and receive "O. K." from the dispatcher. Several serious accidents occurred through a misunderstanding of orders, and this system has been changed on some of these roads. Now a motorman receives the order from the dispatcher and writes the body of the order on a printed blank; this is manifolded, a copy given to the conductor, who then repeats it back to the train dispatcher, giving the name of the motorman and conductor, he receiving "complete" and time from the dispatcher. Another important matter in connection with the safe operation of an electric road is a proper time table. The management of every road, no matter how many cars are operated on it, should prepare and have printed a proper time table, showing the time of each car at the termini and at every turnout switch or station on the line of the road, the meeting points shown in prominent type, with rules governing the movement of cars, based on steam railroad time tables, shown on it. This matter of telephone equipment and time tables is one to which the managers of some of the smaller roads object. In replying to a suggestion of this kind, some have said: "I consider that unnecessary, as in our regular operation we only run two cars." This is not a valid excuse for not equipping a road with a telephone system and running

cars under the authority of a time table, for it takes only two cars to cause a collision, and the results of a collision on a road of this character may be as serious as on a road where a larger number of cars are operated. This is illustrated in a collision which recently occurred on a road four miles in length, where in regular service only three cars were operated. This collision resulted in the death of fourteen persons and the injury of sixty.

The question of derailment of cars is one on which it is not necessary to occupy a great deal of the time of the convention. Derailments are caused by defects in track or equipment, or by carelessness in the operation of cars. Defects in track are so apparent that the manager of a road is aware of their existence and knows the poor spots in his road better than anyone else. These are often not repaired, not because he does not know that they add to the possibility of derailment, but in a number of cases on account of the financial condition of the company. It has been stated to the representative of the railroad commission after an inspection of a railroad:

"I know that that, derailing switch should be put in; I know that that track should be raised up; I know that this section should be ballasted, and I know that that curve is in bad condition, and I have asked our folks for the money to do this work. I am glad you have made the recommendation for it, as they think that we can get along without it for another year." This is poor policy, as the putting in of a derail switch at the foot of a grade might prevent a runaway car from going around the curve below it and tipping over. The raising and ballasting of the track, the alignment of a curve; any one of these might prevent a derailment which would place the road in the hands of a receiver.

On the question of failure of bridges and trestles, the board of railroad commissioners have made an examination of nearly every bridge and trestle in the state over which electric cars pass, and in case of apparent weakness, have made recommendations for the strengthening of the structure, or its replacement by a modern one. In cases where there was any question as to the strength of the structure, it has recommended that it be examined by a bridge expert. These recommendations have been generally complied with.

Another important matter relating to accidents on electric railroads is the brake equipment of cars. This matter has been so thoroughly discussed and everyone is so familiar with the subject that it is not necessary to do more than to say that, on country roads, and by country roads I mean the suburban and interurban roads in this state, it is almost criminal carelessness on the part of the management to operate the class of cars which are usually operated on these roads with only a single chain hand-brake on them. There are very few of these roads on which there are no heavy grades; most of them have grades running from two to ten per cent, and in some cases more than that, and there are sharp curves on nearly all of them, these frequently occurring at the foot of the grades. Cars on these roads should be equipped with the best braking appliance obtainable in addition to the ordinary hand-brake, and in cases of extreme heavy grades and sharp curves, they should be equipped with additional emergency brakes, and all cars both open and closed should be equipped with a sand box on each end.

Accidents are less likely to occur on a double-track road than on a single-track one. The number of accidents would be reduced if all suburban and interurban roads in this state were double track. The financial condition of the majority of these roads will not permit the construction of a second track, but where physical and financial conditions are such that this can be accomplished it should be done. All extensions of old roads and the construction of new ones over which cars are to be operated at high speeds should, as far as possible, be on private right of way. The reduction in the accident account will more than pay the interest on the investment required for this purpose.

In addition to the above suggestion in reference to improvements in method of operation, discipline of employes and equipment of track and cars, to reduce the number of accidents occurring it is necessary that managers of railroads make a study of the business in which they are engaged. There are some roads in this state on which the railroad commission is seldom or ever called upon to investigate an accident. When we visit the manager's office of these roads we invariably find a business office, everything indicating that the man in charge is attending to his business and is thoroughly

posted in it. One of the indications of this is that, somewhere in the office, you will see on file one or more of the different periodicals devoted to electric railway interests. On the other hand, the manager's office of railways on which a large portion of the time of the Railroad Commission is spent in the investigation of accidents is devoid of anything in the shape of literature pertaining to electric railway operation. The successful managers of electric railroads have been found in attendance at the street railway conventions for a number of years past; the managers of the roads on which most of the accidents are occurring are rarely or ever met at these conventions unless the convention happens to be held in a city near which they are located. This is justification for the advice to managers to be in touch with the business in which they are engaged, by keeping posted through the electric railway publications and by attending the conventions of this association and entering into the discussion of the different subjects presented. And on this line, this association owes a duty to the public, which as the representative of the railroad interests of the state of New York it should fulfill.

First—The Railroad Commission recommends to every railroad company the adoption of a book of rules based on the standard rules. When the companies ask the commission for a copy of the standard rules they are unable to furnish them, as there are no official standard rules. There should be a standard set of rules adopted by this convention immediately.

Second—In nearly every head-on or rear-end collision which occurs, one of the cars telescopes the other. This is caused by difference in heights of buffer and difference in construction of cars. This association should adopt a standard set of specifications for the construction of the various sizes of cars, all to be of uniform height of buffer and uniform construction for each size of car.

The recommendation has been made to railroad managers to keep posted on the current literature affecting their interests. One word to the editors of journals devoted to the interests of electric railroads; they have a duty to perform as well as others interested in the safe operation of roads and to some extent are responsible for the conditions which exist today that make possible the number of serious accidents occurring. While they have been the means of educating a large number of the managers of our railroads, and are today keeping them posted on the improvements in appliances and methods of operation which are being introduced in different sections not only of this, but of the old countries, once in awhile they allow an article to creep in which adds to the fancied security of electric railroad managers whose roads are operated without sufficient safety devices or proper precautions in methods. As an illustration of this, a short time ago there appeared in one of the most influential electric railroad publications of the day, an article describing a train dispatching system for interurban work. This was a telephone system. The article set out by discarding the telegraph system as being too cumbersome to meet the requirements of an electric road, and, continuing, the writer said: "It has been urged against the use of the telephone in train dispatching that there is more chance for error in receipt of messages than by telegraph. It is hard to see that this objection has much weight. If desired, messages can be written down and repeated back for approval to guard against errors as in telegraph messages. However, these points are hardly worth arguing, because the telephone has now become generally used and recognized as the proper instrument for dispatching on electric interurban roads. This article, therefore, resolves itself into a review of the methods of using the telephone in train dispatching." Then follows a description of the system, occupying three columns of the paper, all of which demonstrate the merit of the system, which is summed up in the fact that a train order can be handled in ten seconds. Articles of this kind appearing in a publication of the standing of the one in which it was printed are likely to result in the adoption, by electric railroad managers, of a system of train dispatching such as is described. This would be a step in increasing, rather than diminishing, the number of accidents. The ideal method of train dispatching for electric railroads is that which after years of experience has been adopted by the steam railroads of this country. The expense of maintenance of operators at different points along the road prevents its general adoption by electric railroads. The closer this principle of train dispatching is followed the smaller the number of accidents which will be caused by errors in handling train orders, and

any method of handling such orders where only ten seconds is consumed in transmission is a dangerous one, and should not be employed by any railroad in this state.

The disagreeable portion of this paper has been written. Let us now turn with satisfaction and pride to the operation of the city roads of this state. These are managed and operated in a manner to challenge the operation of steam railroads. During the year 1907 there were 1,162,139,614 passengers carried on electric railroads in this state, and 81,000,000 on steam roads. The record of fatalities and injuries shows that passengers are relatively safer on these electric roads than on the steam railroads. The everyday transactions of the Metropolitan Street Railway Co., carrying the immense number of people which it daily does, with the small number killed and injured, is one illustration of the safety of operation of electric railroads. The comfort, convenience and safety with which the large crowds at the Pan-American Exposition were handled by the Buffalo Traction Co. last year is another illustration of the careful operation of an electric railroad. That the managements of city roads realize the importance of reducing accidents to a minimum is shown in the case of the Brooklyn Heights railroad. For some years past a large portion of the time of the railroad commission was occupied in investigating accidents on this system. At present the large crowds going to and from the summer re-

ELECTRIC FREIGHT LOCOMOTIVE.

An interesting electric locomotive has recently been built for the Inter Urban Railway Co., of Des Moines, Ia., by the Des Moines Street Railway Co., after the design of Mr. James Weleh, its master mechanic. We are indebted to Mr. H. H. Polk, president of the Inter-Urban Railway Co., for the accompanying illustration.

This locomotive is used for hauling standard cars to and from points on the Inter-Urban company's Colfax line running from Des Moines to Colfax, Ia., a distance of 25 miles. The line passes through a large coal field and a rich farming district. The dimensions of the locomotive are as follows: Height from rail to top of body, 12 ft. 10 in., height over trolley stand 13 ft. 5 in., length over end sills 26 ft., extreme width 8 ft. 3 in. The frame is constructed entirely of steel, the sills consisting of two 8-in., 25-lb. channels. The bolsters are made of two 10 in., 35-lb. I beams bolted together with pieces of hard pine between them well fitted to the beams. The ends of the bolster are planed to fit the channels and are held in place by strong angle plates of $\frac{1}{2}$ in. x 6 in. steel. All the corners of the frame are fastened by similar angle plates. The posts are all 6 x 6 in. oak fitted between the channels and the space between the posts is filled with hard pine, to which the floor is nailed. This filling also protects the posts from any



ELECTRIC LOCOMOTIVE FOR INTER-URBAN CO., DES MOINES, IA.

sorts on Long Island are handled in comparative safety and very few persons are killed or injured, as compared with the number riding. There are summer resorts located near all of the smaller cities in the state, such as Rochester, Syracuse, Utica, Albany, Binghamton, Elmira, Jamestown and Auburn, to and from which there is unusually heavy traffic during the summer season. These crowds are carried and managed in such a manner that it is very seldom that a person is killed through any defect in the method of operation or the equipment on these railroads.

In conclusion, I may express the hope that, through the combined efforts of all interested, next year's convention will find your lines throughout this state equipped and operated in such a manner that the confidence of the public will be restored in the safest and most comfortable of all methods of transportation, the electric railroad.

The Seattle Electric Co., owing to the growth of the city and the increasing patronage of its cars, has recently ordered 25 new cars, which will be added to its equipment at an early date.

The Sunday traffic on the Amhurst & Sunderland Street Ry. has recently increased to such an extent that the company has been obliged to run trains of two cars from ten o'clock in the morning throughout the remainder of the day.

sheering tendency to which they may be liable. The body is mounted on Taylor trucks and the total weight of the locomotive on the rails is 44,550 lb. At each end of the locomotive there are two boxes each capable of holding one cubic yard of sand and between the two sand boxes are other boxes for carrying jacks, camel backs and blocks. The locomotive is equipped with four 50-h. p. General Electric motors, Westinghouse air brakes and Janney standard couplers. It also contains a device for sanding the track on curves which consists of a hopper fastened on the truck frame. The sand is dropped into this hopper by means of which it is distributed on the shortest curves in the city; the latter device was also designed by Mr. Weleh.

ELECTRICITY ON THE EVANSVILLE & TERRE HAUTE.

It is reported that the Evansville & Terre Haute Railroad will adopt electric car service on its line between Indianapolis and Princeton in order to meet the competition that is expected with the completion of the Evansville & Princeton Traction Co., which is now under course of construction. The new trolley road almost parallels the Evansville & Terre Haute R. R., and passes through one of the richest stretches of country in Indiana, and is the first electric line to be built in that part of the state.

THE GROWTH OF A WELL-KNOWN SUPPLY HOUSE.

From a single room to an eight-story building in less than a dozen years is the story, in a few words, of the growth in the street railway supply business of the Mayer & Englund Co., of Philadelphia. In 1893 Mr. C. J. Mayer started in business as commission agent for several makers of street railway supplies. On Dec. 1, 1895, Mr. A. H. Englund was taken into the concern and the firm name became Mayer & Englund. At that time the business was all transacted in one office in the Betz building, Philadelphia, and the firm employed one stenographer who was also bookkeeper, and one clerk who looked after the orders and shipments. Mr. Mayer and Mr. Englund constituted the sole selling force. Jan. 1, 1897, the business was moved to the building at 10 South 10th St., and occupied the first floor and basement which was also the storeroom. March 1, 1899, the business was incorporated as The Mayer & Englund Co., and the second floor of the same building was engaged in order to meet the demands for more room. In 1900 the demand for greater space was still growing and in that year the company engaged the

the W. T. C. Macallen Co., of Boston. To this line have been added from time to time various specialties and street railway material, and at the present time the company is furnishing a complete line of electrical and mechanical supplies required for street railway construction, maintenance and operation, as well as supplies required by large industrial plants, as steel plants, foundries, etc.

One of the most important additions to the firm's assets during the past two or three years has been the acquisition of a large number of patents, covering "Protected" rail bonds, and tools and machines for installing bonds in railway tracks. Many of these patents were handled by the Protected Rail Bond Co., which is controlled by Mr. C. J. Mayer, and for which the Mayer & Englund Co. acts as general selling agent. The growth of the company's bond business has been phenomenal. "Protected" bonds have been installed on 515 electric railways or a total of 10,000 miles of track, which is more than one-half of all the street railway mileage in the United States.

The overhead material handled by the firm is known as one of the best in the markets, on account of the heavy, substantial nature of all the designs, the company considering this a very essential requirement in modern overhead work. Nearly all the designs are



Office of C. J. Mayer.
Storeroom.

Mayer & Englund Building.
General Office.

Office of A. H. Englund.
Basement Storeroom.

building at 10 South 10th St., including five floors and basement. The building had gradually become almost a landmark to many whose names are prominently identified with the street railway industry, including street railway men as well as supply representatives.

In the spring of the present year, the company once more found itself cramped for room, by reason of the demand for its specialties, and in July, 1902, it moved into the new modern eight story fire-proof building occupying Nos. 1020, 1022, 1024 Filbert St., in the business heart of Philadelphia. Here the company has fitted up a suite of offices and storeroom as fine as any to be found in this country. The first, second and seventh floors, together with the entire basement, have been reserved to accommodate the several departments, i. e., the storeroom for heavy goods in the basement; the general shipping and storeroom on the first floor; the accounting, executive and general offices on the second floor; and an overflow storeroom on the seventh floor. Each of these floors is 60 ft. front by 80 ft. deep, giving a total of nearly 20,000 sq. ft. of floor space or nearly three times the room occupied by the company in the old building on South 10th St.

At first the line of goods handled by Mayer & Englund consisted almost entirely of the gear, and pinion and trolley made by the R. D. Nuttall Co.; the fare registers and fixture made by the International Register Co.; a complete line of overhead insulation by

original with the company and differ in many respects from other lines on the market.

The company carries a large stock of all its specialties and is thereby enabled to ship goods at short notice. The new headquarters are conveniently situated near all of the depots, and the shipping facilities are of the best.

The company's annual catalog is one of the largest and finest issued by any company in any trade. It contains 580 pages and over 500 separate and distinct articles are listed. The work contains a complete code formulated by the company for the purpose of saving its customers unnecessary expense when ordering goods by cable or telegram.

As before mentioned the new building on Filbert St. is modern and up-to-date in every respect, and the company's methods of doing business are also strictly modern and up-to-date. Its general and other office departments are provided with the latest labor-saving office devices and appliances.

All the company's correspondence is kept by the vertical file and index system, under which each particular subject is given an index number, and all papers relating to the same subject are filed under the same number. All letters are written in carbon, and the original is filed with the answer. The clerical department uses the loose leaf system in all bookkeeping with the exception of the general ledger. All orders, invoices, bills, etc., are written on book

typewriters. A system of columnated bookkeeping is used in which separate accounts are kept with each general line of specialties for the purpose of ascertaining the relative profit on different lines at the end of the year. The entire cost of conducting the business is charged pro rata to each of the different lines according to the volume of gross sales.

The company's employes now number 24, including 9 employes in the sales department, 11 in the selling, accounting, order and general office department, and 12 in the shipping and storeroom. The company maintains branch offices in charge of the following agents:

At 35 Liberty St., New York City, in charge of W. A. Cockey; Park Building, Pittsburg, in charge of George W. Provost; 135 Adams St., Chicago, in charge of J. M. Gallagher; Equitable Building, Atlanta, Ga., in charge of H. M. Loftin, who also maintains a branch office in the Heumen Building, New Orleans, La., which is under his direct care. The company is also planning to establish an office in Cleveland, O. No regular foreign agencies have been established, but the company has enjoyed an enormous foreign business, it being no unusual occurrence to ship goods in one day to all four points of the compass.

The following is a list of the principal manufacturers represented by The Mayer & England Co.; R. D. Nuttall Co., Pittsburg, Pa.; The International Register Co., Chicago, Ill.; The Protected Rail Bond Co., Philadelphia; W. T. C. Macallen Co., Boston; Speer Carbon Co., St. Mary's; American Electric Heating Corporation, Boston; Garton-Daniels Co., Keokuk, Ia.; Strieby & Foote Co., Newark; Sterling Varnish Co., Pittsburg; Pittsburg Insulating Co., Pittsburg; Universal Safety Tread Co., Providence, R. I.; Trolley Vestibule Shade Co., Bridgeport, Conn.; William Hall & Co., Boston, Mass.

AMERICAN STEEL & WIRE CO. IN THE SPRING BUSINESS.

The American Steel & Wire Co. has just issued a new catalog on springs in which it calls attention to many new features. As makers of all grades of steel, from the raw material, this company is in an excellent position to meet all requirements and to insure satisfactory results. The company has enlarged the equipment of its factories in Worcester, Mass., Waukegan, Ill., and San Francisco, Cal., and can supply its patrons promptly. Its products in the line of springs covers the entire range of extension, compression, torsion and flat springs. In addition to the descriptions and illustrations of all kinds of springs the catalog contains a number of useful wire tables with comparisons of different gages, etc., and it also includes a list of products of the American Steel & Wire Co.

THE STERLING NO. 5 REGISTER.

The Sterling-Meaker Co. is receiving many flattering reports from its new Sterling No. 5 register; several master mechanics have expressed themselves with considerable freedom, and one says that "this register will last as long as the car." Such strong approval was, of course, not without foundation. Fare registers get a good deal of hard usage, and if so complex a machine will keep a true record for a reasonable period, no one can complain of it, even if it has not life everlasting. Increased durability is, however, equivalent to a lower first cost, and the Sterling No. 5 machines have been highly commended for this feature. The register involves a number of new ideas in construction that would appear to make a falsification of the record utterly impossible. The back, or ringing device, also contains some new features of importance. The company is much gratified to learn from the companies using the machine that it has been doing perfect work for all.

ONTARIO TRACTION CO'S. EXTENSION.

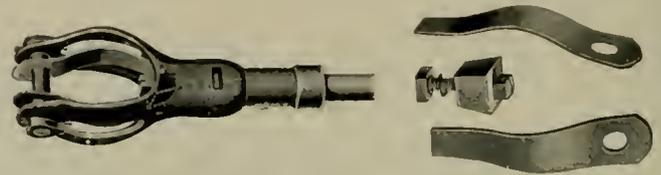
The Ontario (N. Y.) Light & Traction Co. is projecting an extension of its lines east from Canandaigua to Geneva and west to Rochester. Certificates of extension have been filed in Ontario County and preparation for the surveys are being made. The eastern extension will run through the towns of Hopewell and Seneca and the western extension through Victor and Fairport to

Rochester. The new line will parallel both the Auburn branch of the New York Central Ry. and the line of the Geneva and Western Rapid Ry.

IMPROVED TROLLEY HARP.

Mr. A. Johnson, electrician for the Quincy (Ill.) Horse Railway & Carrying Co., has recently designed an improvement in trolley harps with the idea of providing a simple structure in which the contact springs can be conveniently replaced when worn out and which at the same time will hold sufficiently rigid to insure good electrical contact. The device has been named the "Reliable."

The harp has a tapering recess in the base for holding the contact springs, and for clamping them a tapered plug is used. In forcing the plug down, to clamp the contact springs firmly a 5-16-in. bolt is provided, the bolt passing down through the plug and an opening in the body of the harp where a nut is located. The head of the bolt is slotted for the reception of a screw driver by means of which a few turns will either tighten or loosen the plug as may



THE "RELIABLE" TROLLEY HARP.

be desired. For forcing the plug back to release the contacts a small coil spring is placed around the bolt between the plug and body of the harp.

The contact springs can be renewed in a very few minutes and the change does not necessitate the removal of the pole from the car, an important saving in time and labor.

As is well known the contact springs are the life of the bushings, and the bushings of the pins, hence with a reliable harp a good bushing with proper contact springs will outwear the wheel. The contact springs are easily made and have but one hole.

The body of the harp is made of malleable iron with a 3/4-in. cold rolled shaft to connect with the pole. The wheel pins are case hardened and the contact springs made of heavy copper bronze. The completed harp is made strong and in a first-class manner, and will receive the standard make of wheels. It has been in use on the Quincy street railway for a number of months and has proved entirely satisfactory in all particulars, especially for heavy travel and large motors.

LOUISVILLE-CINCINNATI INTERURBAN.

A new interurban road is being promoted in Kentucky which will run from Sanfordtown through Florence, Carrollton, Milton and Louisville. The line will enter Covington via Latonia, and cross the Chesapeake & Ohio bridge to Cincinnati. The estimated cost is \$500,000, and Mr. C. T. Tennis, of the Tennis Construction Co., in company with other promoters, recently made a trip over the proposed route. It is believed that some difficulty will be experienced by the new road in entering Louisville for the reason that the new road will be built to standard gage, while the roads in and about Louisville are broad gage.

INDIANAPOLIS, LEBANON & FRANKFORT ROAD.

Townsend, Reed & Co., 1208 Stephenson Building, Indianapolis, Ind., advise us that they have closed a contract with the General Electric Co. for three 800-kw. generators, four sub-station equipments and 24 motor car equipments which are intended for the Indianapolis, Lebanon & Frankfort Traction Co. Three 1,500-h. p. cross-compound engines for the main station have been ordered of the Hamilton-Corliss Engine Works, Hamilton, O., and the contract for 10,000 tons of 70-lb. T rails has been let to the Carnegie Steel Co. The grading between Lebanon and Indianapolis is approaching completion and rail laying commenced last week.

PENNSYLVANIA STREET RAILWAY ASSOCIATION ANNUAL CONVENTION.

The tenth annual convention of the Pennsylvania Street Railway Association was held at the Country Club, York, Pa., September 10th, and was one of the most interesting in the history of the association.

The success of the meeting was largely due to Capt. W. H. Lanus, president of the York County Traction Co., who lent every effort to make the convention a memorable one.

The convention was called to order by Captain Lanus, treasurer of the association, who announced that John A. Rigg, of Reading, the president, was unable to attend, and that Henry C. Moore, of the United Traction Company, of Trenton, N. J., would act as chairman of the convention. Upon taking the chair Mr. Moore introduced Mayor M. B. Gibson, of York, who welcomed the delegates to the city. The address of Mayor Gibson was responded to by Mr. Moore, after which a call of the roll was taken, showing the following companies represented:

Harrisburg Traction Co., B. F. Meyers, F. B. Musser; Lebanon Valley Street Railway Co., C. H. Smith; Conestoga Traction Co., O. M. Hoffman, J. H. Cramer, Charles W. Witmer, Frank S. Given; Schuylkill Valley Traction Co., George Hoeger; United Traction Co. (Reading), Henry C. Moore, Samuel A. Rigg, S. S. Hoff, Charles S. Banghart; Wilkesbarre & Wyoming Valley Traction Co., John Clifford; Williamsport Passenger Street Railway Co., C. T. Herrick, S. W. Rhen; York Street Railway Co., W. H. Lanus, Grier Hersh, George S. Schmidt, Charles H. Mayer, J. H. Mellinger; Chester Traction Co., John MacFayden; Philadelphia & Delaware Electric Street Railway Co., A. G. Jack; Holmesburg, Tacony & Frankford Electric Railway Co., H. Glazier; Wilmington City Electric Co., C. E. Vantrump; Trenton Street Railway Co., P. E. Hurley; Continuous Rail Joint Co. of America, Mr. Barr; Heil Railjoint Welding Co., C. J. Harrington; J. G. Brill Co., W. H. Huehlings, J. Elwood Brill; General Electric Co., R. E. Moore; John A. Roebling's Sons Co., Charles Cushing, Foster Ivins; Lobdell Car Wheel Co., F. A. Lex; Westinghouse Electric & Manufacturing Co., T. Cooper, C. A. Bragg; Street Railway Journal, W. K. Beard; Lehigh Car Wheel & Axle Co., B. F. Swartz; Columbia Machine Works, W. R. Kerschner; C. J. Harrington, C. J. Harrington; H. C. Roberts Electric Supply Co., C. M. Maxwell, John Mustard; Western Electric Co., Fred C. Jeeger; The Electric Storage Battery Co., Edward L. Reynolds; Street Railway Review, E. H. Bowen; The Mayer & Englund Co., J. F. McCarthy, W. A. Armstrong; Sawyer-Mann Electric Co., Geo. W. Simpson.

Following the roll call a committee on nomination of officers was appointed, after which papers were read on "The Most Economical Management of the Repair Shop," by C. S. Banghart, and "Track Construction of Suburban and Interurban Railways," by S. S. Hoff.

Captain W. H. Lanus, treasurer of the association, made his report, which showed a balance in the treasury of \$1,873.93. The nominating committee then presented its report which was ratified by the convention. The officers for the ensuing year are as follows: President, E. H. Davis, general manager of the Williamsport Traction Co., Williamsport; first vice-president, Edward C. Bailey, Harrisburg Traction Co., Harrisburg; second vice-president, W. W. Griest, Conestoga Traction Co., Lancaster; secretary, Charles H. Smith, Lebanon Valley Street Railway Co., Lebanon; treasurer, W. H. Lanus, York County Traction Co., York; executive committee, B. F. Myers, Harrisburg; John A. Rigg, Reading; W. H. Lanus, York; E. H. Davis, Williamsport; C. H. Smith, Lebanon.

After the adjournment of the convention the members were taken for a ride over the York County Traction lines. A visit was made to the Lafayette Club and on the next morning a trip to Gettysburg was made, where the management of the Gettysburg Street Railway Co. extended the use of its cars to the visitors. At the Lafayette Club one of York's popular orchestras furnished the music for the occasion and the Hon. W. F. Bay Stewart gave an interesting address on the York Haven Water & Power Co., which is now constructing the largest electric plant on the Susquehanna River.

August 23d a new street railway line, running from St. Louis, a northern suburb of Montreal, Canada, to the latter city, was opened for traffic.

THE MOST ECONOMICAL MANAGEMENT OF THE REPAIR SHOP.*

BY CHARLES S. BANGHART, SUPERINTENDENT OF REPAIR SHOP UNITED TRACTION CO., READING, PA.

The repair work of an electric road operating twelve or fifteen cars, is, generally speaking, as varied in character as that of a much larger road. But, since it would be impossible for small roads to maintain a repair equipment equal to that of a larger road, much of their repair work must be done outside. Therefore, I will speak of the large road, one which operates from 75 to several hundred cars.

In the list of machinery and tools which I have prepared, I have aimed to give those which are most generally useful in a repair shop. Many small conveniences for the quick and easy handling of work will suggest themselves and can be added to the equipment. The machine shop, with its auxiliaries, the blacksmith shop, truck shop and armature and coil room, naturally take first place in repair work.

The value of a convenient arrangement of these departments and the proper location of work benches and machinery to give ample working space cannot be overestimated. In a repair shop you never know "what a day may bring forth." A good rule to observe in this connection is to take as much room as you think you may need and double it.

A lathe equipment, consisting of one 24-inch, one 20-inch and one 10-inch speed lathe, will meet ordinary requirements for that class of work. The large lathe should be provided with crane fitted with chain blocks, for the safe handling of heavy work. One large drill press, 26 inch, and one speed drill press will answer for that class of work. The other machinery necessary may be listed about as follows:

- A good milling machine.
- A shaper.
- Hydraulic wheel press.
- Vertical wheel boring machine.
- Power shearing machine.
- Power hack saw.
- Power thread cutter (right and left.)

The grinding work can be done with an emery wheel and ordinary grind stone. There should also be a set of buffing wheels for finishing car and electric fittings and a good habbiting outfit. The latter is essential.

A good arrangement regarding tools is to have a special tool room in charge of a competent man, and a check system for the purpose of holding workmen responsible for tools drawn.

In the armature room, besides the necessary work benches and armature stands, a binding machine, field winding machine and bake oven, are required. At this point I would state that it is an unnecessary precaution to bake armatures after rewinding, as in motors of modern type the cells are wound and painted with insulating compound and then dried before being inserted in the core. But the oven is essential for baking armature and field coils.

An overhead trolley with chain blocks is necessary for the proper handling of armatures. Also a full outfit for testing work; such as instruments for testing open circuits and for short circuited coils on completed armatures. Armatures when completed should be given an insulation brake down test of not more than 2,000 or less than 1,500 volts, alternating current. All armatures should, after being completed, be given the generator test. The system is very simple, and the entire process can be carried on by one man and a helper.

The coil department, besides having work benches and form holders, should be fitted with taping machine, pair of rollers for flattening leads, a press for pressing completed coils, and tanks for insulating compound for dipping armature and field coils.

The truck shop, besides assembling tools, should have an overhead hand power crane with sufficient capacity for the safe handling of motors and truck frames.

The following outfit will do for all ordinary carpenter work: One planer, one resurfacing machine, one jointer, one mortiser, one boring machine, one shaper, one wood turning machine, one hand saw, one circular saw, one emery wheel, one grind stone.

*Read at the annual meeting of the Pennsylvania Street Railway Association Sept. 10, 1902.

In the space devoted to work on car bodies see that there is plenty of room for necessary trestle benches and convenient handling of work. Pit room in this department for half a dozen cars is a necessity.

The paint shop should be constructed so that it will have good roof light, and the space between the tracks should be such as to allow the work to be done on cars standing parallel and not to crowd the workmen. The floor should be concrete, with smooth surface, so as to be easily kept free from dirt, and graded to be readily drained.

In the maintenance of motor equipments to-day, where almost continuous service is demanded and high mileage made, only those equipments fitted with both oil and grease boxes will safely run over thirty to forty days without a thorough overhauling. With a large road it is necessary to do this work at several different points, but a smaller road can concentrate it.

To overhaul a motor car thoroughly, it is advisable to have, at each overhauling shop, trucks with motors mounted, and in first-class order, ready to run under a car body whose trucks and motors need overhauling. For the purpose of lifting the body from the trucks, four chain hoists, conveniently located, together with two cross-timbers and four stirrup irons, form a good combination, and will do the work with the least possible injury to the car body.

When the car is lifted the truck to be overhauled is run out, the good truck substituted, car lowered, connected up and turned over to the operating department; the whole operation taking just about one hour, and for that length of time only is the use of the car lost. A suitable crane equipped with a carriage and chain block will be found a great convenience in overhauling. This department should be fitted with a wheel pit, with necessary jacks, to be able quickly to renew broken and worn-out wheels without removing car from the trucks.

Motor shells should be thoroughly cleaned out, either by compressed air or kerosene. The grease in grease boxes should be taken out and put in the gear case, and grease box thoroughly cleaned. Brush holders should be taken out, thoroughly inspected and cleaned. At this time you have the best opportunity for truck inspection. To prolong the life of an equipment and to reduce the number of crippled cars, new fields and newly wound armatures should be put in motors by themselves.

I have found that overhauling done with a car standing over the pits, with the bottom half of motor dropped, does not allow as thorough an overhauling as is necessary to keep the motor equipment in perfect shape, besides tying up the car body while the work is being done.

In the matter of general inspection, a car started out in perfect order can run safely for several days without it being necessary to inspect it, with the exception of cars run at high speed on suburban and interurban lines. These should be thoroughly inspected after each day's run.

In this connection, to inspect from twenty-five to thirty cars per day, one man can be responsible for the proper inspection of all trolleys, including the taking out and replacing of any defective poles, wheels or springs, and the straightening of all bent poles.

Another man should be responsible for the proper inspection of all circuits, together with hood switches, fuse boxes, circuit breakers and lightning arresters.

Another should give his whole attention to controllers; while the brakeman and his assistant should be able to keep all brakes in good shape and replace all worn out shoes.

This arrangement of inspection and overhauling should keep the truck and motor equipment in good shape if the night inspection of carbons, grease and oil boxes be done after an equally thorough system.

At a car house operating seventy-five to one hundred cars, three or four men should be able to grease motors, inspect brushes and make small trolley repairs. I recommend doing as little work as possible at night. The night car cleaning should be limited to sweeping and dusting cars and cleaning windows, while all washing should be done during the day. If cars are of the closed type, with drop sash, the space under the seat should be cleaned once a week.

My experience has been that the "Car Report" system, by which the conductor on housing his car reports it in good shape or designates some portion of the equipment in bad order, is a great as-

sistance to both day and night inspection and to the shop work in general. All cars should be taken to the general repair shop once a year and the body thoroughly repaired, and the car varnished or burnt off and painted anew, as the case may demand.

While the car body is in the carpenter's hands, the truck should be run out and gone over thoroughly. In case it is a built up truck, all rivets and bolts should be carefully inspected and renewed where necessary. The brake rigging at this time should be taken apart and if it is a truck with brake beams working in slides, the beams should have what we call "Dutchmen" jumped into the ends, to bring the wearing parts back to their original thickness, as the beams will probably have worn wedge shaped.

If the brake beams are hung by links, these should be renewed if they show any sign of wear.

At this shop should be concentrated all classes of repair work. It pays all railway companies operating fifty or more cars to make their own repairs on electrical apparatus, including the making of armature coils and renewing of commutators. Regarding the latter, we find that the dropped forged bars make the best commutators. Most roads will find it cheaper to buy the ordinary repair parts to controllers, hood switches, etc., and assemble them themselves.

I would advise that car body repairs,—painting, rewinding armatures, making commutators, armature and field coils,—be made by piece work. If good inspection is provided and the prices honestly matched, both the company and its employes are gainers by this method.

There are two more things which I think very essential to the economical maintenance of car equipment; first, that all material of any consequence be bought by specification subjected to a rigid chemical and physical test; second, that the employe who operates the equipments be properly instructed and schooled in handling them.

Managers, do not be afraid to keep in touch with the repair shop, for though it works in dirt, it performs the vital work of renovating that which is a clog to the entire system.

TRACK CONSTRUCTION OF SUBURBAN AND INTERURBAN ELECTRIC RAILWAYS.*

BY S. S. HOFF.

The above subject, which I presume also includes the construction of a roadbed upon which to put the track, is one of deep interest to the investor, the manager, the manufacturer, the local civic authority, and the urban as well as the sub-urban populace, and in this opening decade of the twentieth century will most likely tend to develop more territory and civilize, in the higher sense, more people than any three decades of the past life of the steam railway; hence, the importance of the development of the electric railway on true and correct lines cannot be overestimated.

As this is a state organization, the laws and practices of our own commonwealth bearing upon this subject must be used and conditions as we find them must be accepted in our discussion; experience alone can suggest wherein such laws, practices and conditions are wrong in principle and tend to retard rather than to promote true progress.

We have two systems of suburban and interurban electric railways now in operation, by virtue of our street railway laws, the one constructed upon the public highway and the other, generally under a steam railway charter, through private property; each has its advantages and disadvantages, the adoption of either depending largely upon local conditions.

In locating and building a railroad, be it steam or electric, it is not only the engineer's province to give the investor the best for the least money, but he must also think of the manager and consider fully the safety and economy of operation and maintenance.

In the public highway system, the engineer starts out to build a railway under the supervision of not only his own employer and the local civic authorities, but also of every resident along its route, and in a short time he runs up against a mass of grievances in number almost as great as the number of residents.

Under the beneficent rights vouchsafed us by the charity of the

*Read at the annual meeting of the Pennsylvania Street Railway Association, Sept. 10, 1902.

steam railway managers, if your engineer is not a successful diplomat he finds himself trying to build a sectional railway, differing radically in many parts from his original well thought out plans, or else he encounters the broken link in his system with exasperating delays in the courts or in attempts to effect a compromise before he secures a completed roadway; but we had better start to build our road and leave these generalities to the manager.

A preliminary survey of the highway is necessary to get a proper conception of the grades and alignment, and in projecting a location on this information it is frequently advisable to make many minor changes in the original roadway in order to avoid many small "kinks" in surface and line and by judicious management with the local authorities this can be frequently accomplished; these changes may slightly increase the first cost of construction but are justifiable.

In the construction of a railway through private property much more judgment is required of an engineer than is necessary in building one upon the fixed line of a public highway, and more time should be accorded him in making a location than is generally given, principally for the reason that after the rights of way have been secured it is very difficult to make such revisions as subsequent developments may require or make desirable.

In securing rights of way, care should be taken that a width is adopted which will not only protect your roadbed but also afford sufficient material for future repairs.

In the selection of a general route by the projectors of a road is where the engineer often encounters his greatest drawback to making a good location. The practice of the investor, as a rule, is to seek the poorest land on a farm for his railroad, at the sacrifice of his roadbed, under the impression that it cheapens the cost of the right-of-way, whereas my experience has been that the land occupied by a railroad is, in the eyes of the average farmer, "the best on the farm," his price being fixed on this basis, and very often where money may be saved on land damages it entails much additional cost in the construction and future operation and maintenance of the road.

In making a location, it is advisable to keep away from bottom lands in the vicinity of long tortuous water-courses and territory of rapid water sheds, as in such localities you find that it is necessary to erect many bridges, that material for embankments is very scarce, and that the roadbed, especially light embankments, will be in constant danger of wash from high water and sudden downpours of rain forming rapid and uncontrollable floods.

Another thing to be avoided, wherever practicable, is a sharp curve in or at the foot of a heavy descending grade. This combination is the fruitful source of many accidents, as is so frequently attested by newspaper accounts of accidents caused by runaway cars.

Long straight lines or tangents are with many the great desideratum and frequently to gain this end sharp curves are resorted to whereas by the introduction of some additional lighter ones those with very short radii might often be avoided, and when the factor of safety together with the wear and tear of roadbed and rolling stock are considered relative economy results. The same rule applies to heavy grades which should be avoided wherever practicable. It is much better to spend a little more money once to make the cuts a few feet deeper and the banks a few feet higher, than to be constantly spending it for additional power to climb excessive grades. Simply because electric cars can be operated around sharper curves and over heavier grades than steam cars can does not imply that these are desirable things to have in an electric railway.

In constructing the roadbed, the cuts should be made wide enough—a minimum of 15 ft.—to admit of a ditch along either side of the track to keep water from the ends of the ties.

The embankments should be of sufficient width to support the full load under the ties and leave room beyond, on either side, for "cutting" or "jacking up" a car, should the running gear or machinery become disabled while running on the same; a minimum width of 13 ft. should be maintained upon all embankments. The slope of both cut and embankment should be made sufficiently flat to resist the erosive effects of the elements.

Should it be necessary to construct an embankment through marshy ground that cannot be drained it will pay to make it of stone, if available, but, if this cannot be had, the next best plan is to cover the ground to the full width of the embankment, including the slope, with a thick mattress of brush and build the embankment

upon it; this will force the water out of the ground and secure a firm foundation.

In bridge work the masonry should be put up in a substantial manner, not necessarily of expensive cut work but with an eye to solidity. Especial care should be taken to make the foundations broad enough to sustain the load to be carried, and deep enough to resist the action of frost and of abrasion or undermining by the periodical visitations of continuous high water and sudden floods. Should quicksand be encountered in foundations, it is best to bridge the same with a cement concrete floor, in fact I prefer making all foundations of concrete, giving ample time for the cement to set and harden before building upon it. In the point of durability stone or concrete arches, steel or iron superstructure, and wooden construction rank in the order named, the use of either depending largely upon local conditions and the amount of available funds.

Cast iron pipe drains can often be used to advantage and with economy, but when you have decided upon the size of pipe to use at any point, don't fail to put one in of double its capacity, and under no circumstances use any of less than 12 in. diameter.

A thorough system of drainage should be adopted for all roadbeds, not one which will concentrate the water upon your right of way and carry it along for an indefinite distance, as is often done in borrowing material for embankments out of ditches along and against its sides, but such a system as will provide ample openings at frequent intervals to carry across, if necessary, and away from the roadbed, all water wherever intercepted before it accumulates into large destructive volumes. All roadbeds should be so constructed as to admit of placing 6 in. of clean gravel or broken stone ballast under the ties for the promotion of sub-drainage and for tamping the ties to a firm and elastic bearing, from the ends to about 10 or 12 in. inside the rail bearings, the middle of the tie remaining untamped.

The ties should be placed two ft. apart between centers; they should have a top and bottom face of eight in., a depth or thickness of six in., and be not less than seven, preferably eight ft. long. They should be made of sound white or rock oak timber, if it is available, on account of its wearing qualities and its tenacity in holding spikes, but other woods such as white chestnut or spruce pine, if seasoned, must be substituted when the white oak cannot be obtained.

The rails should be of a weight corresponding to the weight of rolling stock and service required, but no mistake has ever been made in using a too heavy rail. The weight of new rolling stock, according to present practice, never lessens after a road has been put in operation and it is very difficult to keep a track in even fair surface or line when the rails begin to depress between the tie bearings.

The joints of rails should be made as strong as possible, the splice called the "Continuous Rail Joint," giving the most rigid construction. The joints proper, or the ends of the rails, should come between ties with good tie bearings under the ends of the splice plates.

The rails should be laid with broken and not even or opposite joints to prevent the double hammer on the joint ties which the latter method produces and which, in time, gives a slight downward bend to the end of each rail that can never be removed; hence, rough riding.

I know engineers and managers frequently disagree upon the policy of even or broken joints, but I am willing to take my own experience with steam road work and that of old track repairmen to back up my position on this point whether a T or girder rail is used. Special work should be the best obtainable, long radii being always used on the switch ends in preference to the quick, jerky, short leads and points one often sees, and the best efforts should be put forth in securing dry and uniformly firm beds throughout the full length of the frog and switch pieces to eliminate as much as possible the tendency to wear out in spots.

In order to maintain the proper gage with girder rail construction, the rails should be braced at about every fourth tie with outside pressed steel braces, the reason for my preferring this kind being that the weight of the car on the rail assists the brace in doing its work, there is no obstruction in the track to interfere with paving and there are no screw threads to rust out or nuts to become loosened as with the tie-rod.

Concealed joint bonding I consider the best for a track and the least liable to be loosened by vibration or careless interference by trackmen at their ordinary repair work as well as affording protection against robbery, yet the utmost care should be exercised to

secure a clean and full contact in the barrel of the hole in the rail and such bond should be selected as would best produce this result. Riveting or bolting against the face of the web will retain contact about as long as it takes to attach the bond, for vibration will very soon cause the harder metal to compress the softer and thereby destroy the contact. Cross bonding and bonding around special work should be as carefully done as the joint bonding, using well tinned copper for the purpose, and the lines of wire should be carried down and buried in the sub-grade to protect them against the midnight prowler and careless repairmen; but this work belongs rather to the electrical than the civil engineer.

At road crossings, excepting those with long skewers, I would dispense with the use of wood or plank, substituting a length of rail on the inside of each running rail to form a groove for the wheel flange and packing the space inside and outside the track with broken stone covered with screenings or, if this cannot be obtained, with gravel and sand.

On all curves of less than 500 ft. radius, I would recommend for safety the use in T-rail work of a guard rail along the inner running rail and bolted to it in like manner to the guard rail of a spring frog; this will give the assistance of the weight of the car on the running rail to hold the guard in place instead of depending entirely on spikes for that purpose; grooved rails should be used in girder work under similar conditions.

The outer rail of curves should be given sufficient elevation to overcome the centrifugal force generated by the highest rate of speed which the cars are capable of developing in order to protect the passengers as well as the company against the careless or indifferent motorman who tries to make up lost time without consideration for possible consequences, yet there may be unavoidable parts of the roadbed where "slowing-up" is essential to good running and managers should never be lenient in dealing with a motorman who disregards instructions covering such points.

After the track is laid, tamped and surfaced, the space between the ties, to the top of the same, should be filled with broken stone, gravel or sand, materials which retain the least moisture, to hold the track in rigid position and prevent the shifting about which always results when this space is left open.

For safety, all private rights of way through pasture lands should be fenced, and cattle guards should be placed at all road crossings, even though they are not absolutely effective, in order to reduce to a minimum the danger from roving cattle, particularly on high speed roads.

The proper section of rail to use where no paving is to be done is unquestionably the T, but in cities and towns where much wagon travel parallel to the track is encountered and where special work is necessary in a wagon road, it is essential to use the girder, and this should be deep enough to dispense with the use of chairs wherever possible.

All tracks in cities should be paved inside and outside the rails to the limits of the ties, and this paving should consist of a material and be so shaped as to shed water as rapidly as possible to prevent it seeping through to the ties.

To insure this result it is best to cover the bed and ties with a cement concrete base, tamped in well against the web of the rails, which will not only keep moisture from the ties but also, by giving a uniform and firm foundation to the paving surface, materially prolong the life of the whole roadway. If good material and workmanship have been put into the track and it has been properly ballasted, the most improved and lasting pavement is, with time consideration, the most economical to lay.

With the right of eminent domain accorded the steam road charter, which should also be extended at least to the interurban electric road, it is possible to build an electric road capable of being operated safely and successfully at any rate of speed to which the electric system of the future may be developed.

ELECTRIC WIRE CONDUITS IN CINCINNATI.

The contractor who installed the wire conduits for the Cincinnati Gas & Electric Co. has been highly complimented on the manner in which this work, involving 1,250,000 ft. of conduits in 40 miles of streets, has been carried out. General Hickenlooper, of the Cincinnati Gas & Electric Co., said of the work: "G. M. Gest, the

contractor, has handled the business very well, and he has done the work with the minimum of inconvenience to the public. His arrangements for covering the excavations at most frequented crossings, and his use of bridges over the trenches at street crossings, have been productive of the best results, and Mr. Gest deserves a great deal of credit for the way in which he has carried out the enterprise, which is one of the largest undertakings in the way of making conduits that has been done in any of the large cities." The undertaking was more than usually exacting because of the short time allowed by the city in which to complete it.

PROPOSED AUSTRALIAN RAILROAD.

The North Australian League of Melbourne, Australia, which has for one of its principal objects the promotion of the Trans-Australian railway, running north and south between Adelaide and Port Darwin, has issued a prospectus in regard to the proposed road. This league was formed for the purpose of centering public opinion on this matter, and in pursuance of this object offers to bona fide capitalists in any part of the world its services free of charge in investigating local technical conditions and in preparing statistics. No pecuniary benefit is sought by the members of the league, but it will do everything possible to accomplish the realization of the railway to Port Darwin and will assist in formulating and carrying out the preliminary measures. The prospectus is issued to induce the financial railway interests of all countries to investigate the opportunities offered for such a road, and to write for further information on the subject. The premier of South Australia has agreed to submit to Parliament, during the present session, a motion confirming the desirability of this road. Capitalists and railway directors interested in the project are invited to watch the progress of the measure through the South Australian Parliament.

INFORMATION ABOUT EMPLOYEES.

The Brooklyn Rapid Transit Co. has decided to keep a more complete record of information relative to employes, and has called for answers to the following questions:

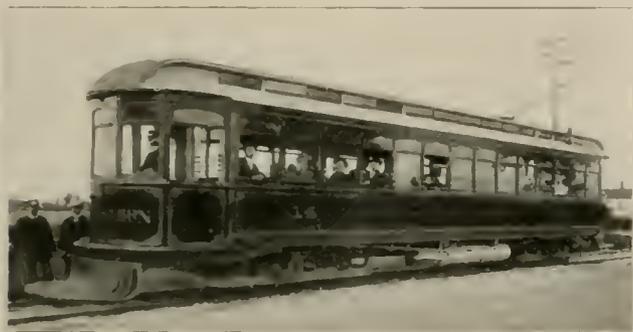
1. (a) In what department are you employed? (b) In what capacity. (c) Under what foreman or head of the department?
- (d) What weekly (monthly) salary are you paid?
2. (a) How long have you been in this company's service? (b) In what positions, and where located? (c) How long have you held your present position?
3. What is your age (year of birth)?
4. Where were you born?
5. Are you married or single, or widower?
6. (a) What family have you dependent upon you for support? (b) Are others than your family dependent upon you for support; if so, state particulars?
7. Name of father? Name of mother?
8. Nearest living relative? Residing at? Relation?
9. In case of serious accident, please notify _____, Address _____.
10. Are you healthy and able-bodied?
11. Do you use any kind of liquors (either wines, spirits or malt) as a beverage?
12. Are there any unsatisfied judgments against you?
13. Are you in the habit of engaging in games of chance or in speculating in any way?
14. Have you ever been arrested or accused in a civil or criminal court of any infraction of the law?
15. Are you engaged in outside business, producing income other than your salary; if so, state particulars as to time devoted to such business, and income derived?
16. Have you ever been discharged or suspended from the service of this company, or of any of the companies which now form a part of the Brooklyn Heights Railroad system; if so, state particulars?
17. Do you belong to any fraternal or labor organizations; if so, give name?

August 1st the Dallas & Oak Cliff Electric Railway Co. was absorbed by the Northern Texas Traction Co., and will hereafter be known as the Dallas division of the system.

G. P. MAGANN STORAGE AIR BRAKE.

The G. P. Magann Air-Brake Co., Ltd., which has its principal offices at Detroit, advises us that its brakes are used on all inter-urban lines out of Detroit, except one, and is also used on the city cars of the Detroit United Ry. The company has just closed a large order for brakes to go on the new Toledo & Monroe Ry. As is well known the Magann air brake is a storage system and as such received a very gratifying endorsement from the New York Railroad Commissioners.

In its storage air brake system the company claims to have met every condition of street railway operation. Stored air is used, confined in reservoirs fixed to the car and filled in a few seconds by



KUHLMAN CAR EQUIPPED WITH MAGANN STORAGE AIR BRAKE.

charging from a stationary air compressor, at the power station, or at any convenient point on the line, and at sufficient pressure to allow a car to make an average of 300 stops or more, according to the requirements. The care and expense incident to air-brake machinery is reduced to a minimum, for there is very little mechanism on the car. In fact, it is stated, that during five years' operation of this brake system not one dollar was spent on maintenance, this being due, it is claimed, to there being no machinery upon the car for compressing the air. The equipment is not subject to the occurrence of "jammed" brakes.

NEW PIPE THREADING AND CUTTING-OFF MACHINES.

The accompanying illustration shows a No. 0 pipe-threading and cutting-off machine which is a fair type of the machines made for this purpose by the Armstrong Manufacturing Co., of Bridgeport, Conn. The Armstrong machines thread pipe from 1/4 in. to 6 in. in

size; with a competent workman in charge the time required is from two and one-half to four minutes according to the size of the pipe. They are so arranged that when cutting off pipe the dies are opened for the pipe to pass through without being removed from the machine, this being effected by a simple motion of the hand-wheel or lever. All gearings and bearings are enclosed in an oil chamber, so that lubrication is perfect and working parts are protected from dust and

chip. The die head has no gear teeth where it comes into contact with the bell; the head has a large wearing surface and does not wear loose, and the vice may be fastened to a post or bench, or to the side of a house.

On the No. 0 machine the operator can cut pipe from 1/4 in. to 1 in. very quickly, and by changing the handle from one spindle to another he can cut from 1 1/4 to 2 in. more slowly but still easily. There is no need of a large number of turns on small pipes, an advantage which it is claimed is found in no hand machine except the Armstrong. Nos. 0 and 00 may be quickly changed from hand to power.

The company also manufacture the "Genuine Armstrong's" ratchets and dies, nipple holders, vices, pipe cutters, wrenches, etc.,

and will send complete catalogue No. 22 on request. The company's New York office is at 139 Center St.

NEW ENGLAND STREET RAILWAY CLUB OUTING.

The New England Street Railway Club held its annual outing on Thursday, Sept. 4, 1902. About 150 members and guests left Boston by special train for Hampton, Mass., arriving there about 11 o'clock in the morning. At this place electric cars were taken to Hampton Beach, where a ball game and various athletic events were indulged in until dinner time. After an excellent fish dinner, the guests congregated at the athletic grounds, where a 100-yard dash, high jumping and potato racing and various other athletic events were hotly contested. Entry was open to all, and four silver cups were offered as prizes to those scoring the most points in the games. The 100-yard dash was won by F. W. Whittemore; the high jump, by R. W. Conant; the potato race by Mr. White, and F. O. Nourse, who was third in high jumping and potato race, also received a cup.

E. D. Miller, of Boston, had charge of the events, assisted by F. S. B. Sias, with J. E. Johnston, recorder. The judges were D. L. Prendergast, of Boston; F. G. Henderson, of Newton, and E. W. Goss, of Milford. C. H. Hill, of Boston, was starter, and P. W. Davis, of Boston, was timekeeper.

SHARON-NEW CASTLE INTERURBAN OPENED.

On August 18th there was a formal opening of the new inter-urban railway between Sharon, O., and New Castle. The company entertained a number of newspaper men of the Youngstown Press Club, who made the trip over the road accompanied by Mr. R. Montgomery, president, Mr. Godfrey Morgan, general superintendent, and a number of Youngstown city officials. The roadbed was in excellent condition, and at times a high speed was attained, one mile being made in 59 seconds. A stop was made at the sub-station, where the guests inspected the machinery, and after completing the line to Sharon the return trip was made to Youngstown where the party, which had by this time reached considerable size, was given a dinner by the company.

THE NEW YORK CENTRAL AND PAN-AMERICAN STAMPS.

After mentioning a number of most ingenious methods of "American Railway Advertising" Mr. John T. Bramhall, advertising agent for the Monon Route, writing on that subject for Transport, of London, says:

"But these are all as nothing compared to the brilliant coup of Mr. George H. Daniels, of the New York Central, who is admitted to be the prince of railway advertisers, in suggesting, or causing it to be suggested (for Mr. Daniels modestly disclaims the personal honor) to the postmaster general the proposition of illustrating the idea of transportation in the new series of Pan-American stamps. The plan being adopted, what more natural than to picture the New York Central lake steamers on the one cent, and the Empire State express on the two cent stamps? I do not know how many millions of these stamps were sent out all over the world, but Mr. Daniels was shrewd enough at the close of the year to buy up all the remaining stock of the issue for the exclusive use of the New York Central road."

FRANCHISE EXTENSION VOID.

The Rogers law, which granted the Cincinnati Street Railway Co. an extension of its franchises for 50 years, expiring in 1946, was declared unconstitutional last month by the Superior Court. If the Supreme Court sustains the Superior Court a number of franchises granted elsewhere under the same law may be void. The law gave a 50-year extension of franchises only for such street railways as complied with various conditions on the date it went into operation. Attorneys for street railways state that they will file exception and new petitions at once.

DISCIPLINE FOR STREET RAILWAY EMPLOYEES.

BY W. F. HARRINGTON, VICE-PRESIDENT AND GENERAL MANAGER
CAMDEN & SUBURBAN RY. CO., CAMDEN, N. J.

There are various systems of discipline in practice, of which the Brown System is the best known. They all have for their purpose the advancement of those employes who by good work and steady service show their worth, to the most desirable positions.

In some systems employes are discharged for failing to comply with rules and regulations. The men remaining in employ being advanced to the position previously held by the discharged men. The disadvantage in such a system is that frequently employes who should be disciplined in some way or other do not lose their position on the seniority list. The result of this is that men who by faithful service should receive some consideration for such service remain for a long time in a position which does not properly reward them for their good service.

In other systems where the promotion plan is followed, men are frequently advanced for good service rendered in such a way that a feeling of bitterness is engendered in the breasts of other men who have not been advanced, as it is a well known fact that employes are very jealous of their position and standing. To follow the promotion plan, great care has to be observed in awarding promotions and it is very easy owing to the multitudinous cases that arise in street railway practice to unjustly advance men over the heads of their fellow employes.

In the system where merits and demerits are employed, the same objections apply as is shown in the promotion system, as it is exceedingly difficult to properly apply merits and whatever practice be followed for crediting a man with a given number of merits, difficulty is experienced in deciding the number of merits to be given for each case of good service. In the strict application of this system as long as a man's standing on the seniority list is not affected, he does not seem to care whether he has 60 or 200 merits or demerits. It has been noticed among street railway managers and, in fact, in all industrial operations where large numbers of men are employed, that great jealousy exists on the part of the men as to their standing.

It suggested itself to the writer, after trying various methods of discipline, to take advantage of this later feature, and on April 1, 1901, the "demotion" system was put into effect and after 18 months' operation, the following interesting results have been obtained: Prior to the adoption of the system great trouble was occasioned on the part of employes missing roll calls. Repeated cases where men would miss from 9 to 17 times during a month may be picked at random from our files. After the change the greatest number of times any one employe missed in a month has not exceeded 6.

It is proper here to describe the essential features of the demotion system. The general rules of the dispatching of conductors and motormen are outlined below in the appendix. Part first relates to regular men, and part second relates to extra men. In addition to that shown in the appendix, conductors and motormen are demoted by the general manager one or more points on the seniority list as may be deemed advisable. In cases of petty irregularities and violations of rules, for instance, a conductor may be demoted 5 points for permitting smoking on his car. The motorman may be demoted 5 points for starting car without receiving signal from conductor.

It has been noticed since the adoption of this system that men who have been in the employ of the company for years, who have been careless and negligent of their duties, have been demoted gradually until they have reached points well down on the seniority list. In looking over the files, in the 18 months there are men who have been demoted as high as 43 points and one 37 points and several respectively 27 points, 26 points, and 22 points. This as can be readily seen throws these men who have been rendering faithful services correspondingly by the inverse process advanced or promoted on the list.

It is an interesting fact to note in looking over the files, as an instance, a conductor who entered the employ of the company in 1891 is on the straight day runs and is below men on the seniority list who entered the employ of the company in 1896. This is the

best class of runs at the disposal of the company. In the straight from noon runs it is interesting to note that men entering the employ of the company in 1901 are ahead of men who had entered in 1900. In the evening runs, men who entered in 1902 are ahead of men entering in 1901. On the extra list, men who were employed in June, 1902, are ahead of men entering in May. This also applies to conductors.

The motorman list shows quite a fluctuation, but does not work as rapidly as the conductor list.

We find cases of men who are above other men who have been in the employ of the company for two or three years under the operation of this system.

It took the first year for the employes to realize the full significance of the demotion system. The last six months it has been found that the men exercise the greatest care in order not to come under the ruling of the demotion system and wherever they can, by explanation, they will endeavor to have the points removed.

It has been found that by posting on the bulletin board in the car house the names of those men who have been reported for irregularities that they will be demoted one or more points if the irregularity be not explained on or before a set date, that they take special pains to meet the general manager to clear their record, giving the general manager an opportunity to get in better touch with his men and enabling him to exercise judgment in enforcing the discipline.

The writer has noticed in many instances that men who have reached a point in their demotions where the exercise of discipline would throw them, for instance, from the straight from noon runs to the swing run, that even though the fault under which the discipline is acknowledged the employe would request that he be given one or more weeks' suspension or one or more weeks at the bottom of the extra list, rather than be demoted.

Under this system any employe by good conscientious service can advance to the better runs at the sacrifice of less capable men, and it has been found that the men approve the plan and appreciate the reward for faithful service.

This system permits the gradual weeding out of such men who are undesirable by a natural process of the "survival of the fittest."

The following facts are noticeable in the operation of this method of discipline:

Men have a general knowledge of how the list stands and when some one ahead of them misses they will look at the rack and see if their name has been advanced. They do not talk much about it, or seem glad that some one else has been set back, but regard it as a reward for good service. The man missing says very little about it, usually being a person who does not seem to care much for discipline. The majority of men missing roll calls seem to consist of young single men, who do not take the necessary rest when they should.

It is noteworthy that in many cases when an employe realizes that he is gradually going down on the list, he wakens up and from that time on becomes more efficient.

In conclusion, prior to the adoption of the demotion system the number of men missing roll calls to the total number of men employed averaged monthly 42 per cent. After the adoption of the demotion system and for the last six months the average has been 26 per cent.

RULES FOR THE GOVERNMENT OF CONDUCTORS AND MOTOR- MEN, CAMDEN & SUBURBAN RY.

REGULAR MEN.

1. In case a regular man wishes to be excused from duty he should ask the day before, and, if excused such runs will be marked up from top of extra list (as it stands on the next day) in the order of the reporting time of the runs to be filled.

2. A regular man must report ten minutes before it is time for his car to leave the car house. For failing to report, either in person or by message for car, the first time in a month he will be demoted one point and given one day for each hour or fraction of an hour missed and he will have to report at each succeeding roll call and in that time to receive work only after all men on extra list have been assigned.

Any employe having a clear record for the previous two months will be relieved from demotion for the first failure to report in a month.

The second time in a month a run is missed he will be demoted two points and given one day for each hour or fraction of an hour missed and he will have to report at each succeeding roll call and in that time to receive work only after all men on the extra list have been assigned.

The third time in a month a run is missed he will be demoted three points and given one day for each hour or fraction of hour missed and will have to report at each succeeding roll call and in that time to receive work only after all men on extra list have been assigned.

THE HOLLAND TROLLEY BASE.

The United States Electric Railway Supply Co., of 40 and 42 Larned St., Detroit, invites attention to its patented self-oiling trolley base, which is in general use throughout the country, and for which it is claimed that it prevents trolley trouble and saves the wheels, poles and overhead equipment. It is pointed out that the base requires but 1 qt. of oil per year and any stand can be mounted on this base in 15 minutes. Stands in which the base has worn an oval hole can be plugged, mounted on this base and used as long as there is any tension left in the springs. Another feature of this invention, and an admirable one, is that it keeps the trolley wheel on the wire and prevents injury to the overhead construction.

Among the many users of the device are the Detroit United Ry., Rapid Railway System, Detroit, Ypsilanti, Ann Arbor & Jackson Ry., Hamilton Electric Light & Cataract Power Co., Limited, Bay Cities Consolidated Railway Co., Brockton & Plymouth Street Railway Co., Boston & Worcester Street Railway Co., Dayton & Western Traction Co., Dayton & Troy Electric Railway Co., General Electric Co., Lorain Steel Co., Mahoning Valley Railroad Co., St. Louis Transit Co., and others.

IDEAL STEAMBOAT SERVICE.

Eastern visitors to the A. S. R. A. Convention will find it pleasant and profitable to utilize the new daily service of the Detroit & Buffalo Steamboat Co. Two new mammoth steel sidewheel passenger steamers have been constructed to be operated daily between Detroit and Buffalo and are christened the Eastern and Western States. They are the largest and fastest steamers ever built on the Great Lakes for passenger service and cost \$650,000 each. Each has 5,000 horse-power engines, with an average speed of 21 miles an hour, or 23 miles at their highest mark. The boats are licensed to carry 3,500 people; each has sleeping accommodations for 750 passengers, 242 state rooms and 12 parlors, with bath. The dining-room seats 150 people. The main cabin decorations are French renaissance, with velvet carpets and mahogany furniture.

The steamers leave Detroit and Buffalo almost simultaneously at an early hour every evening and reach their destination before breakfast. It is a most desirable change from the hot ride by rail and in addition there is a saving in the cost that is not to be despised. Connections are easily made with all points East and West and stop-over privileges are allowed with round trip tickets, which are good until October 31st. For comfort, speed, safety and service this line is recommended.

Tickets at excursion rates are for sale at all principal railway and steamship ticket offices. By the company's advanced system meals and berths are not included in the price of a ticket and patrons are at liberty to provide for themselves if they so desire. Berths between Detroit and Buffalo are \$1.00 and \$1.50, and state-rooms are \$2.50. Transportation one way is \$3.50; round trip, \$6.50.

BRIDGE REPAIRS ENJOINED AT DAYTON.

The Board of City Affairs of Dayton, O., has enjoined the Peoples Railway Co. from making repairs to its Washington St. bridge. The railroad company has built 48 bents under the bridge requiring a large amount of piling, and it is alleged that these piles dam up the river to such an extent that danger of flooding the city would follow in case of high water in the river. The board claims that no permission has been granted the company to repair the bridge in this manner. The request of the company to build a temporary trestle on one side of the bridge was refused, and it is claimed that the company does not intend to ultimately remove its bents which menace the city.

The assessment of the Metropolitan Street Railway, of Kansas City, has been raised about half a million dollars, under the agreement made between the company and the city, whereby the city received 8 per cent of the company's gross receipts in lieu of the old rate of taxation.

The fourth time in a month a run is missed he will have to report to general manager.

All these rulings are subject to appeal to the general manager.

3. No extras are carried to relieve men who may miss their second car, as at dinner, supper or swing time; in such cases the early men will be demoted to the bottom of late runs, the late man will be demoted to the bottom of swing runs, and the swing man to night car. The night car man will be demoted to tripper runs and the tripper man demoted to extra list. In case of an extra, he will be demoted from his position on the extra list, three points.

4. The slate will be put out daily at regular time suitable to the requirements of the depot, after which no one will be excused without reporting.

5. A regular man asking off sick must lose two days' work and must report at depot the day before he takes his car.

Telephonic or telegraphic messages or letters sent by mail or by employees will not be accepted, as requests for leave of absence due to sickness or other causes.

The only recognized forms of request will be by letter brought to car house by some person not an employe or made personally at the car house, not later than ten minutes before the allotted reporting time.

Requests will be accepted only at car house.

Employees not complying with the above will be placed at bottom of extra list one day for each hour or fraction thereof for failing to report as above provided.

6. No regular man is excused from work after taking his car, without he is sick or disabled. He must work run out.

7. Changes on account of vacancies will be made from first to tenth day of each month, unless in case of a run being vacant three (3) days or more. In that event it will be filled by the oldest extra not otherwise engaged, until such time as he may be called for regular position, or the man to whom it belongs returns.

8. Promotions on account of discharge, etc., are made from extra list to tripper runs, from tripper runs to night car, from night car to swing runs, from swing runs to straight from noon runs, from straight from noon runs to straight day runs.

EXTRA MEN.

On and after Monday, April 1, 1901, extra men will report as follows: (at car house for morning work).

1. After the noon roll call at the ferry the list is telephoned to the car house and dispatcher books off the regular men for the next day, the first extra men booked up for regular runs are those working the tripper runs, then come those who did not get work at noon. In event a man who did not get work at noon should get a six-hour run at night roll call he will be expected to take run he is booked up for the next morning. In event he is not booked up he will not have to report until 10:59 next day.

2. Instead of extra men reporting at 4:50 a. m. a limited number of men will be delegated to report at 4:30, 5, 5:20 and 5:35 a. m.

On arrival at car house each man will report to dispatcher, giving name and time of report.

3. For failing to report as scheduled, the following rules will be strictly enforced:

a. The first report missed in a month will be demoted one point on the extra list and must stand on bottom of extra list one day for each hour or fraction of an hour late.

b. The second report missed in a month will be demoted two points on the extra list and must stand on the bottom of extra list one day for each hour or fraction of an hour late.

c. The third report missed in a month will be demoted three points on the extra list and must stand on bottom of extra list for each hour or fraction of an hour late.

d. The fourth roll call missed in a month will have to report to general manager.

All these rulings are subject to appeal to the general manager.

Any employe having a clear record for the previous two months will be relieved from demotion for the first failure to report in a month.

4. Extra men not otherwise excused from morning work will report as above.

Extra men not reporting and sending note that they are sick must take two days on bottom of extra list and must report at car barn the day before taking place on list.

5. Extra men taking straight from noon runs are not required to report until 10:59 report next day. If extra man has a noon run for more than one day, he must report ten minutes before it is time for the car to go out. Subject to Rule 3, Sections a, b, c and d.

Telephonic or telegraphic messages or letters sent by mail or by employees will not be accepted, as requests for leave of absence due to sickness or other causes.

The only recognized forms of request will be by letter brought to car house by some person not an employe or made personally at the car house, not later than ten minutes before the allotted reporting time.

Requests will be accepted only at car house.

Employees not complying with the above will be placed at bottom of extra list one day for each hour or fraction thereof for failing to report as above provided.

6. Extra man taking six-hour run at night is not required to report at early report next day, except he is booked up for a run; then he must report ten minutes before car is due to leave car house, subject to Rule 3.

7. Extra men will take runs as booked and hold until regular man returns. Subject to provision, Rule 7, regular men.

8. Early morning roll call at car house, see Rule 2, Extra Men. Noon roll call is made at the ferry 10:59 a. m. daily; 10:50 a. m. Sunday.

Night roll call is made at the ferry 5 p. m. daily; 4:50 p. m. Sunday. 9. After the noon runs are given out all men not excused will report at car house, subject to Rule 2, Extra Men. Dispatcher will appoint five or more men, as may be required, on extra list not working to report at Federal St. ferry 5 o'clock p. m. roll call.

10. An extra man relieving a sick man for part of a run will be entitled to such run until regular man returns, subject to Rule 7, Regular Men.

11. Extra men who have been excused from work will be turned down on list same as if they had been called for a car.

12. Men appointed for roll calls or reports will not be excused for failing to report.

13. Extra men holding straight day runs, not scheduled for Sunday work must report at depot Sunday morning, (as per Rule 21, Extra Men).

The Hamilton, Glendale & Cincinnati Traction Co. has brought suit against Peter Schwab for \$1,000 damages. The action is based on two injunction suits brought by Mr. Schwab against the company, causing considerable delay in its work of construction.

POWER HOUSES AT DETROIT.

The direct current portion of station G of the Detroit United Railway, described in the article by Mr. Farmer, on page 522, was furnished and installed by J. G. White & Co., engineers and contractors, of New York. The extension of this power house, including the 500-kw. unit to be installed this fall, will be furnished and installed by J. J. Kennedy, contracting engineer, of New York. The Stanley rotary converters, transformers, switchboards, etc., were furnished by the Stanley Electric Manufacturing Co., Pittsfield, Mass. All of these contracts were given through Jos. E. Lockwood, president of the Michigan Electric Co., of Detroit, agent for all of these concerns.

AUTOMATIC LOW WATER ALARM.

The Jones Automatic Low Water Alarm Co., of Detroit, makes a low water alarm that can be easily adjusted to the water column of any boiler and is intended to give immediate warning when the feed water becomes low in the boiler. The device is simple and has been endorsed by the chief factory inspectors of Ohio and Michigan, as well as by many engineers.

The action of this unique alarm is based upon the expansion and contraction of metals. The alarm is put on a water column by removing the lower and upper gage cocks and placing a tee and close nipple and screw in where the water gage cocks were, and screwing the water gage cocks in the end of the tees, the side outlook of the tee being used to attach the alarm. If it is not desirable to remove cocks, holes may be tapped above the crown sheet or flues. When the water gets below the bottom connection (J), water flows out of the copper pipe (C) attached to the alarm back into the water column and steam rushes up and takes its place. The steam heating the copper pipe expands it and by an arrangement of connecting rod and lever the alarm whistle blows until the water in the boiler gets up to the original point. It also blows if the water column gets stopped up.



The low water alarm does away with the undesirable high water alarm that blows so frequently for high or low water as to become a nuisance. The low water alarm, too, tends to make engineers more careful, it is stated, because an engineer is apt to become indifferent when none but he knows that the water is low. This alarm has no floats to collapse and fill with water, there is no mechanism in the boiler to get out of order and it is not a fusible plug or electric contrivance for batteries to exhaust. It can be tested at any time without running the water low.

The Jones Alarm Co. also makes a smaller alarm intended for steam vehicles of all kinds, especially automobiles, which may be used on small boilers. It is entirely of brass and is made for 400 lb. pressure.

PETER SMITH HEATERS.

The Peter Smith Heating Co., of Detroit, has installed its system of hot water heating on practically all the interurban lines controlled by the Detroit United Ry. A statement of the number of heaters sold, by divisions, is as follows: Detroit Shore Line, 12; Rapid Ry., 40; Detroit, Rochester & Romeo, 14; Detroit & Flint, 10; Detroit & Pontiac, 14; Detroit & Northwestern, 12; Detroit & Wyandotte, 15; special car Yolande, 1. The Peter Smith company has met with unqualified success in introducing its system of heating long interurban cars and the list of companies now using it is a long one. The list includes the following: Grand Rapids, Holland & Lake Michigan Ry.; Toledo & Western; Toledo & Bowling Green; Toledo & Maumee Valley; Cleveland & Eastern; Cleveland & Chagrin Falls; Cleveland, Elvia & Western; Sandusky & Interurban; Mahoning Valley Ry.; Fort Wayne & Southwestern; Indianapolis Street Ry.; Cleveland & Painesville; Chicago & South Shore; Indianapolis & Shelbyville; Milwaukee Interurban Ry.; Fond du Lac & Oshkosh Ry.; Columbus & New Albany Ry.; Lansing Traction Co.; Saginaw Interurban Ry.; Kansas & Leavenworth Ry.; Louisville & Pewee Valley Ry.; Alliance Interurban Ry.; Cincinnati Traction Co., and others.

WILLANS ENGINE IN AMERICA.

The Bradley Manufacturing Co., of Pittsburg, Pa., has recently purchased the American rights for the Willans engine, and has erected a new plant at Pittsburg, Pa., where this engine will be built in sizes of from 25 to 3,000 h. p. The company has issued a preliminary catalog illustrating and describing its engines, and has a large and complete catalog now in course of preparation. The Willans engine, which is one of the most prominent English types, is a single acting engine, designed so that the upper brasses of its bearings are always in compression, which enables the engine to run at high speed without knocking. The piston speed, however, is comparatively low, and the wear in the cylinders and piston rings is consequently small. The valves are of the piston type, and work inside the piston rods. These engines are built according to size, with from one to six cranks. Each piston is connected to its corresponding crank by two exactly similar connecting rods, between which is an eccentric forged upon the crank pin. As the piston valves move inside the hollow piston rods the valve face is the inside surface of the hollow rod, and as the valve face moves with the piston the relative motion of the valve and the valve face is obtained by mounting the eccentrics on the crank pins. The eccentric rods, in the same way as the connecting rods, are designed to work always in compression. The Bradley Manufacturing Co. will maintain in the manufacture of these engines a quality of workmanship fully equal to that of the English standard, and special tools will be employed in making those parts which require extreme accuracy.

ROSS PARK, BINGHAMPTON, IN LITIGATION.

Erastus Ross, the donor of Ross Park, Binghamton, N. Y., has brought suit against the city seeking the reversion of the property on the ground that the conditions of the gift have been violated. He also sues G. Tracy Rogers and other officers of the Binghamton Railway Co., asking a judgment of ouster from the premises and \$50,000 damages for the use of the park. Mr. Ross alleges that the park was deeded to the city of Binghamton upon the express conditions that the premises be held by the city as a public park for the benefit and enjoyment of the inhabitants of that city and on the further condition that the property, nor any part of it, should not be sold, leased, or in any way disposed of by the city. Mr. Ross charges that the conditions have been violated in the case of a lease of certain parts of the park to the Levavan Switchback Co. made by the park commissioners in 1892 for the period of five years and for a consideration of \$200. He also alleges that the city has violated the conditions of the gift by entering into a lease for a period of three years with officers of the street railway company whereby special privileges were secured to it to the exclusion of all others for maintaining upon the park grounds cafes, merry-go-rounds, platforms, buildings, and other places of amusement. The city, it is claimed, has also granted the Binghamton Railroad Co. permission to occupy part of the park grounds to the exclusion of the public for its tracks, gates, platforms and other structures.

WORLD'S LARGEST SIDEWHEELERS.

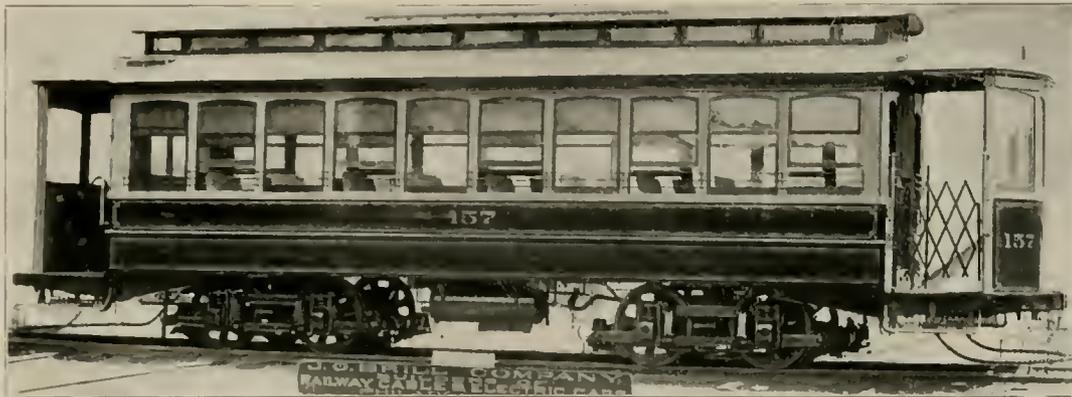
The Detroit & Cleveland Navigation Co. has contracted for two new steamers for the Cleveland route, which will be the largest sidewheel steamers in the world. They will be 25 per cent larger than the Eastern States and the Western States, owned by the same interests, and will have 30 per cent more power. The hulls will be built at the Wyandotte yards of the Detroit Shipbuilding Co. during next winter, although only one boat will be in commission by 1903.

General Manager McMillan of the Detroit & Cleveland company states that the new boats will be larger than the famed Fall River Line steamers. Each will cost about \$850,000. They will be four-deckers and each will have sleeping accommodations for between 1,100 and 1,200 passengers.

General Passenger Agent A. A. Schantz states that with one more boat on the line next season each will have one-third more time in port, and with two more boats an express service will be established between Detroit and Mackinac on an 18-hour schedule and 25 hours from Cleveland.

BRILL SEMI-CONVERTIBLE CARS FOR ATLANTA.

The Georgia Railway & Electric Company, of Atlanta, Ga., has recently received ten handsome semi-convertible cars from the J. G. Brill Co., of Philadelphia. The interior of these cars is wider than usual by reason of there being no wall pockets, which are also frequently objectionable because of their use as receptacles for rubbish. The windows become clogged and in attempting to raise them the glass is often broken. The floors of the cars are double and the inter-space filled with mineral wool. This excellent preventive against cold floors will doubtless be appreciated by the passengers. The interior finish is natural cherry with handsomely decorated birch ceilings. The length over the vestibules is 37 ft.



37-FT. SEMI-CONVERTIBLE CAR FOR ATLANTA J. G. BRILL CO.

5 m., width over sills, 7 ft. 10½ in., and over posts at belt, 8 ft. 2 in. Angle iron bumpers, "Dedenda" gongs and folding gates, are among the Brill patented specialties with which the cars are equipped. The trucks are Brill 27-F.

THE R. D. NUTTALL CO.

Doubtless few persons realize the magnitude of the gear, pinion and trolley business of the R. D. Nuttall Co. A dozen years ago, when this company first began the manufacture of gears and pinions for street railway service, the demand for this class of material required the use of but one gear-cutting machine; soon it was found necessary to add another machine, and later to increase the equipment by two additional machines. Since then new and improved machinery has been added from time to time, until now upwards of 70 gear-cutting machines (believed to be the largest gear-cutting equipment in the world) are taxed to their utmost to supply the demand for the well-known "Nuttall make" gears and pinions.

Within the past few years foreign agencies have been established in the larger European cities, and the number and size of orders received through this source has exceeded all expectations. The almost universal adoption of heavy cars and powerful motors for high speed and interurban service has made it necessary to correspondingly increase the weight and improve the design of motor gearing, and this company, fully alive to these requirements, has placed in the market a very complete line of heavy design gearing for this particular service. A complete motor bearing department has recently been added by the company, and a full line of all standard bearing will be carried in stock.

Last, but by no means least, is the trolley department of the plant, in which are manufactured trolleys and trolley repair parts for every conceivable trolley service.

Under the able management of Mr. F. A. Estep this company has attained an enviable position in the street railway supply business, and the reputable business methods to which past success may be accredited are sure to be adhered to in the future.

The traffic of the South Side Elevated for August is estimated to be about 10 per cent above that of the corresponding month last year.

INTERNATIONAL TRAMWAY AND LIGHT RAILWAY UNION.

At the Twelfth Annual Congress of the Union Internationale Permanente de Tramways, a change was made in the name of the association to include suburban and interurban railways, as well as tramways, as for a long time questions relating to interurban railways have been considered by the Union as well as matters strictly concerning tramways. The name International Tramway and Light Railway Union (Union internationale de tramways et de chemins de fer d'interet local) was adopted by the London Congress.

Accompanying the notice of this change of name the Union also calls attention to the new office of general secretary. As in every

important country of Europe close relations exist between the members of the national association and their standing committees, it is desired that the International Union shall become the center of information for its members of all nationalities, to which they may all have recourse in all cases for complete and precise information in regard to everything pertaining to the tramway industry. It is for this reason that the office of general secretary has been established, and it is desired that the members will furnish the union with data of all description in regard to technical matters, methods of operation, railway materials and devices, and mechanical questions.

The general secretary of the International Union has issued a circular letter to the various members in regard to the speed of street cars in different localities. This question is brought up by the fact that the English government is preparing some new legislation in regard to the tramways and light railways, and the question of regulating the speed of cars is under discussion. The questions are as follows:

"Does your franchise contain a special clause relating to the speed of cars on your road? If so, state by whom this regulation has been made, and enclose copy of same.

"It is desirable that you send a copy of the map of the route and state the speed usually employed as well as indicate the time used in making stops. This information should be given both in the case of city lines running from one extremity of the city to the other, and passing through the center of the city, and for short local roads.

"It is desired that the commercial speed be indicated, that is to say, the average speed used in running from one extremity of the route to the other, including the time taken for stops; also the average speed of the divisions of the line, the speed on the latter being presumed to vary with the density of the traffic and different local circumstances.

"Have you fixed stopping places? If so, indicate the average distance apart at which they are located.

"What is the maximum speed attained by cars on any point of your line?"

The Berkshire (Mass.) Street Railway Co. opened its new street railway park to the public on August 18th. The park is under the management of Mr. P. J. Casey, of Springfield.

ACCIDENTS OF THE MONTH.

A directors' car on the Lancaster, Mechanicsburg & New Holland Ry., which is operated by the Conestoga Traction Co., of Lancaster, Pa., collided with a regular passenger car near Mechanicsburg, at 8.40 a. m., August 11th. The conductor on the directors' car was injured.

A serious accident on the Jersey City, Hoboken & Paterson Street Ry., in Jersey City, August 18th, resulted in injuries to 20 persons. The car was going at a high rate of speed when the front wheels struck a locked switch, causing the car to jump the track and plunge for a considerable distance along a rough stone road until it collided with a stone wall and overturned. The wall at this place is protection from a precipice about 100 ft. deep.

A flat car, loaded with crossties, on the lines of the Charleston (S. C.) Consolidated Ry., was thrown from the track August 18th, and one of the five negro laborers in charge of the freight was killed. The crossties projected on either side of the platform. In rounding a curve the projecting edges struck a telephone pole, with the result that the car was thrown from the track.

An electric car on the Union Ry., New York, on its way to Yonkers, jumped the track and was overturned at 11:30 p. m., August 10th, causing injuries to 20 persons. The car was running at the rate of 35 miles an hour, when, for no cause that can be ascertained, it left the tracks and dashed into a pole beside the road, landing on its side with several of the 40 passengers pinned beneath it.

A collision between a construction car and a passenger car on the lines of the Toledo, Bowling Green & Southern Traction Co., at Bowling Green, O., August 21st, resulted in the death of one of the motormen and injuries to several passengers.

August 22d, at 6:10 p. m., the Independence Ave. cable train on the lines of the Metropolitan Street Railway Co., Kansas City, Mo., crashed into and telescoped a Ninth St. train at the foot of the incline from the elevated structure. Some 15 passengers on the cable train were reported more or less injured, and the gripman, W. D. Taylor, subsequently died from his injuries. Both trains were going down the incline at a high rate of speed when the one in the rear became unmanageable, and despite the efforts of the gripman to check its speed, began gaining on the other. The force of the collision was sufficient to lift the forward car, trucks and all, clear of the tracks. Had it not struck a heavy iron pillar it must inevitably have dropped into the street, several feet below.

A car on the lines of the Union Traction Co. of Indiana met with an uncommon accident August 22d, in making the last run for the night into North Marion. A pole but a short distance behind the car broke off near the ground and fell into the street, carrying with it all the overhead wires. The result rivaled the most ambitious fireworks display, and badly frightened the few passengers on board. No one was injured, however, and the damage was quickly repaired by the wrecking crew.

A head-on collision occurred August 24th on the lines of the Bay Shore Terminal Co., near Norfolk, Va., resulting in the death of three persons and injuries to several others.

A car loaded with passengers on the interurban lines between Carbondale and Scranton, Pa., jumped the track while crossing the bridge near the power house at Scranton, August 26th, and plunged into a creek eight ft. below. Only one of the passengers was seriously injured.

An excursion car on the electric interurban lines between Terre Haute, Ind., and Brazil, collided with a freight car on the Chicago & Eastern Illinois R. R., at 6:30 p. m., August 27th. There were 110 passengers aboard the electric car, but none was injured.

An accident on the Youngstown (O.)-Sharon Ry. occurred August 27th, near Youngstown, when two cars, bound in opposite directions, collided in a dense fog, with the result that several passengers were injured and one man killed. The motorman of one of the cars, it is stated, misunderstood his orders, and failed to wait at a switch, as he should have done, for the other car to pass. The fog was so dense that he could not see the approaching car until it was within six ft., when it was too late to avoid a collision.

Eight passengers were slightly injured in a rear-end collision on the Mahoning Valley Ry. at 11 p. m., August 30th, near Niles, O. A limited train from Youngstown was closely following a regular car, when the latter stopped unexpectedly. The limited was traveling at a high rate of speed, and the motorman was unable to

check it in time to prevent its crashing into the rear platform of the car ahead.

Twenty passengers were badly shaken up but not seriously injured in a collision which occurred on the Clayton division of the St. Louis Transit Co.'s lines, at midnight, August 31st. The motorman of one of the cars is blamed for not having waited at the proper switch for the passing of the other car.

On the morning of September 4th a car on the San Francisco & San Mateo Electric Ry. was struck by a train on the lines of the Southern Pacific Co. at the crossing near Sunnyside Ave., San Francisco, and seven passengers on the electric car were injured. The gateman in the tower at the crossing is believed to be responsible for the accident, since the gates were not closed to warn the motorman of the approach of the steam train. The train was invisible by reason of a fog, and it is claimed, neither bell nor whistle warned the crew of the motor car that the train was coming.

A cable train on the Milwaukee Ave. line, in Chicago, was partially wrecked in an accident which occurred on the morning of September 4th, resulting in injuries more or less serious to some 12 passengers. Near Evergreen Ave. the train, which was composed of a grip car and two trailers, struck either some impediment in the cable slot or a protruding man-hole cover with such force that the first trailer telescoped the grip car and the second trailer dashed into the two, hurling passengers from their seats and sending splinters of wood and shattered glass flying into the roadway. Several of the injured persons were removed to hospitals.

A rear-end collision occurred on the Snelling line of the Twin City Rapid Transit Co., in St. Paul, on the evening of September 7th, 10 passengers being seriously injured. The trolley of the forward car slipped from the wire, causing the car to come to a standstill and all its lights to go out. The motorman of the car following was unable to see what had happened on account of the darkness and therefore made no effort to slow up until it was too late to avoid a collision. It is feared that some of the injured will not recover.

BRILL COMPANY BUYS PLANT OF AMERICAN CAR CO.

Concerning the newspaper reports from St. Louis which have appeared recently regarding the J. G. Brill Co. having purchased the works of the American Car Co. in St. Louis, the following are the facts, as furnished by officials of the Brill company:

The Brill company has been considerably hampered in its output during the two months and more of strike among its employes and during all this time new work has been coming in rapidly so that its facilities for handling orders have proved inadequate at the present time. Finding a well-equipped car works in St. Louis, the owners of which have been endeavoring to make sale of it to the Brill Co., beginning with March of the present year, the Brill company decided after examination to purchase the works. The plant is, of course, very much smaller than that of the J. G. Brill Co., but it is capable of turning out about one-half of the number of cars annually that the Brill works can make. The facilities for providing for the additional amount of work could not have been made ready at the Brill works in less than six months' time. The property of the American Car Co. had been held by trustees for a St. Louis bank, who represented the creditors. The trustees were ordered to sell the property, which they did on September 12th, and it was bought for the J. G. Brill Co.

The Erie Rapid Transit Street Ry., of Erie, Pa., has fitted up a special car for express and baggage, and is calling for and delivering express from all points on its lines. The company calls for baggage on telephone calls, and the goods are carried at once to any part of the city on the company's lines, which insures a very quick delivery of merchandise.

The Aurora, Elgin & Chicago Ry. is attracting a great deal of attention and on September 7th there were 3,000 persons, who had gone out to the 52d Ave. terminus with the intention of taking a ride over the electric line, who were obliged to return because the equipment was not sufficient to take care of them. The receipts of the road on that day were stated to have been about \$400.00 per car. The curb quotations on the stock of this company are 98 to 102 for preferred and 39 to 42 for the common.

CONVERTIBLE BALLAST CARS.

In view of the rapid development of interurban electric railways which are being built in great numbers, upon a scale very much more extended than was usual a few years ago, and the fact that the importance of a well built and thoroughly ballasted track is now better realized than ever before, the ballast cars shown in section in the accompanying engravings will be of interest at this time. These are known as the Hart convertible type, as built by the Rodger Ballast Car Co., of Chicago. This company has had a great deal of experience in the design and construction of ballast cars, its earlier designs having been placed on the market some twelve years ago, and 15,000 or more of the Rodger ballast cars

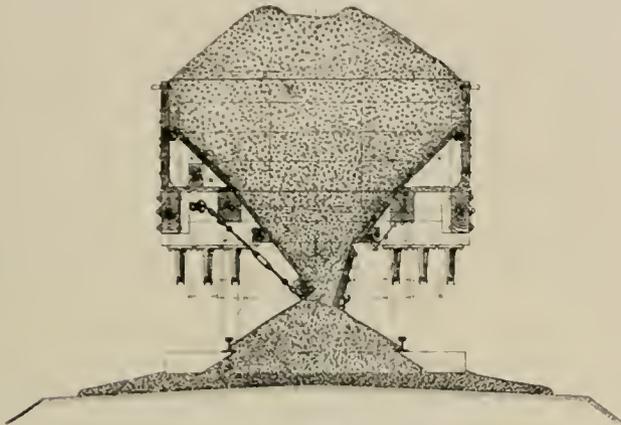


FIG. 1 CLASS CC AS HOPPER CAR.

are now in use by leading steam railroads. Since their introduction a few month ago, several thousand of the convertible cars have been purchased by such roads as the Wabash, the Michigan Central, the Rock Island and the Santa Fe. We are advised by the company that these cars are standard on 90 per cent of the roads and 60 per cent of the mileage of the country.

The convertible cars here shown are the class C C and the class C S. The class C C may be used as a hopper-bottom car when it appears as in Fig. 1, and may be converted into a flat bottom gondola for merchandise or other general freight service. The con-

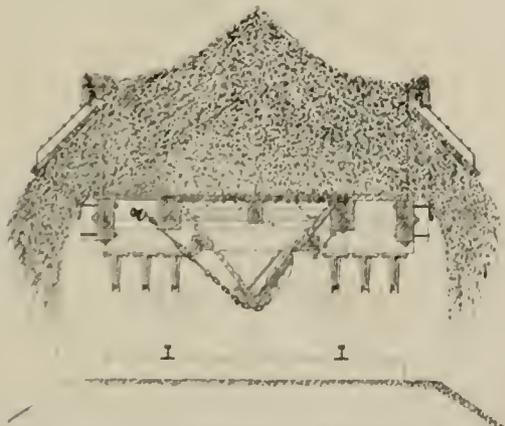


FIG. 3 CLASS CS AS SIDE DUMP CAR.

dition is effected by first putting in place at the center of the car the temporary center sill which in Fig. 1 is shown resting on the floor of the car under the movable section of the hopper bottom at the left hand side. Then the two upper sections of the hopper bottom are folded toward the center, the edges resting on the temporary sill mentioned, making the car in section as shown in Fig. 2. Used as a ballast car with 3-ft. sides, the class C C car holds 32 cu. yd., with 4 ft. sides, the capacity is 39 cu. yd.; converted for a gondola car the capacity is 32 cu. yd. with 3-ft. sides, and 52 cu. yd. with 4 ft. sides, the difference being due to the fact that when converted the piece forming the end of the hopper is moved from

its position over the truck back to the extreme end of the platform.

The class C S car is provided with side doors, so that if desired it may be operated as a side dump ballast car, as shown in Fig. 3, or as a hopper bottom center dump car, as shown in Fig. 4. This car also, it is apparent, may be converted to a flat bottom gondola for general freight service. The company also makes a hopper bottom ballast car which may be converted to a flat car for general service (this is known as the F. H. type), and a box car which may be converted to a hopper bottom dump car.

The general dimensions of the C C and C S cars mentioned are: length over end sills, 34 ft.; width over side sills, 8 ft. 9 in.; height inside, 4 ft. They are made with wooden outside stakes or steel inside stakes, the former being shown in Fig. 2 and the latter in Fig. 1. The hopper-flat cars, class F. H., are 40 ft. long. Each of

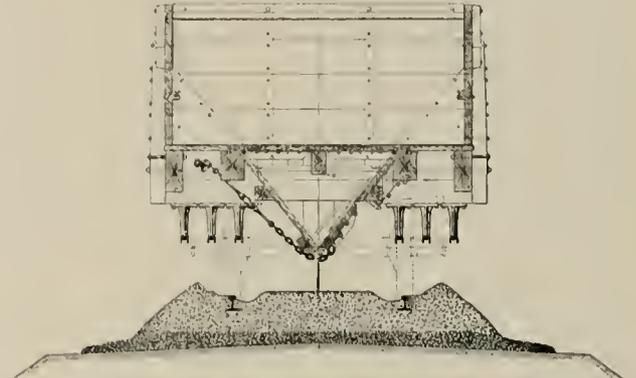


FIG. 2 CLASS CC AS GONDOLA CAR.

the classes are of 80,000-lb. capacity, though they are in service frequently considerably overloaded.

In designing these cars the company has made use of the most common of the standard sizes of rolled shapes, and all complexity in castings has been avoided, the idea being to use materials and parts that in event of accident can be replaced with the least loss of time. M. C. B. standards are generally used throughout.

The rapidity with which ballast can be unloaded and distributed by the use of cars of this type is surprising to one who has not had experience in such work; thus, with a train of 20 cars of the class C C from 600 to 700 cu. yd. can be unloaded and distributed in 20 minutes, and spread by means of the double-plow distributing car, so that the track is left flanged and clear for fast traffic, only three men being needed to operate the train. In converting one of

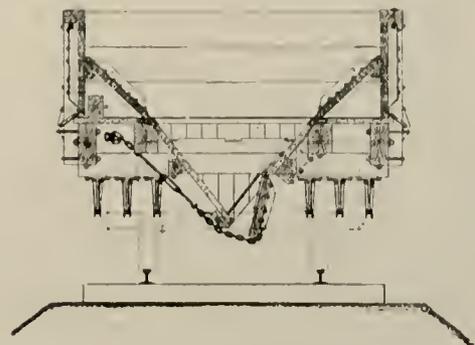


FIG. 4 CLASS CS AS HOPPER CAR.

these cars to the gondola type the work of four men for about 20 minutes is required, no tools except a monkey wrench being necessary.

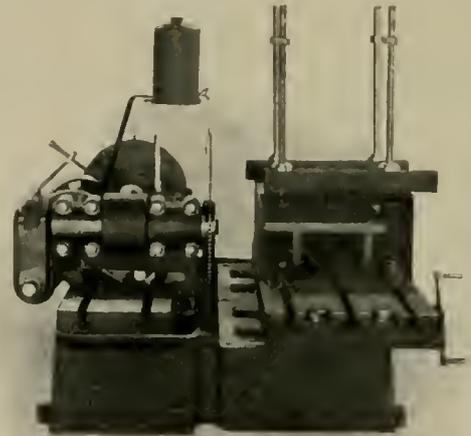
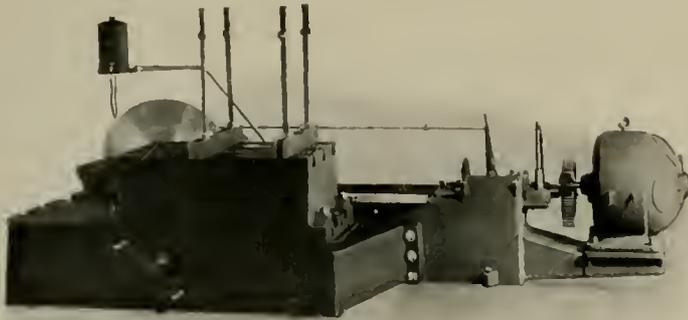
The Canonsburg Street Railway Co. and the borough council of Canonsburg have come to an understanding after considerable controversy in regard to the kind of rails to be used in the town. The company is to be allowed to use T rails, and the time for the completion of the road through the town has been extended to November, 1903. In consideration of the extension of time the company will pay the borough \$3,000.

ELECTRIC ROAD FOR CUBA.

The project to build an electric street railway in Havana and across the island of Cuba has been under consideration for some time and the plans have now been matured to a degree which makes the project appear certain. Demson, Prior & Co., of Cleveland, are the principal promoters of the new road and have had engineers investigating the route for some time. The engineers have reported favorably on the plans and at a meeting of the promoters held early this month it was decided to begin the work of construction at once. The projectors have formed a corporation capitalized at \$1,000,000 and will build, in addition to a trolley system in the city of Havana, a number of interurban lines. Grants of rights of way across the entire island of Cuba have been secured. The principal interurban line will be from Havana to Baraboa, an important seaport on the south coast. The length of this line is 36 miles and the road will pass through several intermediate towns. Another line will extend from Havana to Sand Beach, and the company claims that this line will be in operation by spring. The parties who investigated the situation report that conditions are ripe in Cuba for transportation facilities such as trolley roads will provide. The carrying of the products of that country from the interior to the coast is an important problem which it is believed would be solved more readily with electric traction than with steam roads, as the distances are comparatively short owing to the limitations of the island.

METAL SAWING MACHINES.

The accompanying illustrations show one of the latest type of metal sawing machines made by the Q & C Co., and are a part of



Q & C METAL SAWING MACHINE.

the new line of saws that have recently been brought out by the company. Machines of the type shown here have been installed in the new shops of the Lake Shore & Michigan Southern railroad at Collingwood, Ohio, and by the Chicago City Railway Co., Chicago, to be used principally for frog and switch work, but also when required are suitable for a wide range of work on structural shapes, plates, bars, etc.

The machine comprises a heavy bed saw carriage, feeding and driving mechanism, and two work tables that are fitted to the bed. The work is bolted to either of these tables and is cut off by the motion of the saw and carriage being fed into it. The saw blade is 27-in. in diameter, fine tooth, of the arbor-driven type, and has a longitudinal travel of 30 in., giving it a capacity for cutting I beams up to 15 in. in a vertical position, and 8-in. round sections. The arbor is of crucible steel, with the pinion formed solid with it, thus doing away with all possibility of weakness due to a construction where these parts are keyed together. The worm wheel shaft on which the driving pinion is also formed solid, is of hardened crucible steel; the worm is of hardened steel and the worm wheel of phosphor bronze.

The machine has the Q & C Co's. latest type of friction feed, giving an automatic feed variable from 3-16 to 13-16 in. per minute. Motion is given to the feed screw through a crown clutch, which in one position engages with the automatic feed and in another position by friction engages the feed screw with a train of gears giving

a quick return movement to the carriage by power. The lever shown in the engraving actuates this clutch, and by means of a rod passing through a lug on the carriage forms an automatic stop to the saw in both directions. When this clutch is out of gear the carriage can be moved in either direction.

A desirable feature, and one of considerable interest in this saw, is the manner by which the entire travel of the saw blade is made available for cutting off work on the top side table, while at the same time round or square pieces up to 8 in. can be cut off in a V-block, provided for this purpose, at the front end of the table. The side table is in two parts; the lower portion is movable longitudinally upon the base, and the upper portion is movable transversely upon the lower portion of it. This transverse movement is for the purpose of adjusting the work with relation to the saw blades after it has been clamped into position, so as to enable it to be cut off at exactly the desired point without undue time being taken in clamping it.

When the lower table is in its extreme forward position the saw blade can cut off work on the upper side table through the entire range of its travel. By moving this table backwards the V-block is brought within range of the saw blade so that by this method a greater capacity is obtained for a given length of saw travel than is possible in the ordinary construction.

There is 8½ in. of the blade available for cutting above the upper side table, and with its 30-in. travel the machine is very desirable for splitting rails or other material where it is desirable to make long cuts.

WAGES ADVANCED IN CANADA.

The British Columbia Electric Railway Co., which operates in Vancouver, B. C., Westminster and Victoria, made a general increase in the wages of its employes last month, in addition to which it is introducing a co-operative system, with the object of giving the men a better return for their work and to enlist their interest in the welfare of the company's business. Hereafter all the employes of this company will receive a share of the profits when the latter exceed the amount necessary to pay a 4 per cent dividend on the stock. The amount of profits available for dividends after the payment of the 4 per cent will be divided into three parts, two of which go to the share holders and the remaining third to the employes. The old rate of pay for conductors and motormen was 20 cents an hour for the first year, 21 cents for the second and third years, and 22 cents thereafter. The company now pays 20 cents for the first year, 23 cents for the second and third years, 24 cents for the fourth year and 25 cents for the fifth year and thereafter.

The Indianapolis Street Railway Co. has four pieces of property under consideration for its new terminal station, but unreasonable values have been placed on this property by its owners. None of this property will be purchased at the high prices demanded, and the company may begin condemnatory proceedings to secure a site.

News of the Month.

Barring unforeseen delays, work will be begun within 30 days on the tunnel extension of the rapid transit system to Brooklyn, N. Y., the bid of the Belmont-McDonald syndicate for this work having been accepted on July 24th. When completed, the tunnel will enable people to ride from the proposed terminal at Flatbush and Atlantic Aves. through to the end of the Belmont system in the Bronx for five cents. President Orr, of the Rapid Transit Commission, is quoted as declaring that the Brooklyn extension will be only the second link in a great tunnel system which will eventually connect all parts of the boroughs of Manhattan, Brooklyn, Queens and the Bronx, with perhaps, in the future, an extension to Richmond.

Residents along the route of the subway in New York are held largely responsible for the unsanitary condition of the excavation. There has been a general disposition on the part of the public to regard the big cut as a convenient dumping ground for rubbish, and the watchfulness of the contractors of each particular section has not sufficed to prevent such use being made of it. This is the statement made by Mr. William Barclay Parsons, engineer to the Rapid Transit Commission, in answer to the complaint of the president of the Board of Health that the conditions existing in the excavations are in some places a menace to the public health. Mr. Parsons, in an interview, contends that "in such an undertaking as the construction of the underground the disturbance of sewers and gas-pipes is bound in a measure to be detrimental to health, yet not more so than the work of repairing mains which is constantly being done by the city authorities. The absence of an epidemic as a result of torn up streets indicates the exercise of uniform care by those having the work in charge."

Two cars for use in the rapid transit subway have been delivered in Long Island City and experimental runs will be made on the Long Island R. R. These cars are appropriately named, No. 1 being the "August Belmont" and No. 2 the "John B. McDonald." No. 1 is painted white, with gold trimmings, and No. 2 is a bright yellow. The cars are 42 ft. long, and have a novel feature in their sloping sides which are designed to conform to the walls of the subway. The sides are vertical to a height of 30 inches, and then slant inward to the roof. The seating arrangements are similar to those on elevated trains, and each is equipped with double folding doors and a device for shutting all the doors of the car simultaneously. The interior is resplendent with polished wood, mirrors and brass work, and illuminated with incandescent lamps. The cars may be run either separately or as trailers. Each is equipped with a searchlight. Both have the word "Interborough" painted at the top. These cars were built by the Wason Manufacturing Co., Springfield, Mass.

The stockholders of the Interborough Rapid Transit Co., at a special meeting in the offices of August Belmont, 23 Nassau St., August 26th, voted to increase the company's capital stock from \$25,000,000 to \$35,000,000, for the purpose of providing funds to defray the expense of building the proposed tunnel from Manhattan to Brooklyn, connecting with the Manhattan underground system. One hundred thousand shares of stock will be issued at \$100 par value.

The Buffalo (N. Y.) Railway Co. has begun tracklaying for its extension to the steel manufactories. Other improvements will be effected which will give a quicker service through the downtown district.

The Rochester, Syracuse & Eastern Railroad Co. has received a certificate from the railroad commissioners authorizing the construction of its proposed line between Rochester and Syracuse over a private right of way except through cities and villages. Except for a few miles of grading and tracklaying which will be done this fall no construction work will be undertaken until all engineering work has been completed and right of way secured.

The Rochester Railway Co. gave its employes two picnics, on Wednesday and Friday, September 3d and 5th, at Windor Beach. A ball game between men chosen from the employes of the Sudus and Rochester lines was a feature of the entertainment. The picknickers were conveyed to the beach in a chartered car, and were accompanied by a regimental band disposing music.

The Mountain Lake Electric Railroad Co. of Glaver ville, N. Y.,

on whose lines 12 persons were killed and 20 injured in a collision on July 4th, contemplates settling claims for damages by paying the claimants in securities of the company, if these shall be considered acceptable. The company has an issue of 5 per cent bonds on which interest has been paid regularly. These it is proposed to turn over to the heirs of those persons who were killed in the collision of July 4th.

A miniature battle between two gangs of workmen resulted August 26th from the attempt of the Olean (N. Y.) Street Railway Co. to cross the tracks of the Shawmut R. R. in the construction of its extension from Portville to Ceres and Bolivar. After some controversy the Olean company had been granted an order to cross the steam tracks at Ceres, and Mr. T. W. Miller, superintendent, repaired to that place with 20 men to begin the work. The construction crew was met by an equal number of employes of the steam road, who chopped down trolley poles as fast as they were erected and in other ways interfered. A fight resulted in which pickaxes, pick-handles and stones were used, and a number of men, including Superintendent Miller, were injured. Local sentiment favors the street railway company and the desired crossing will undoubtedly be effected.

The suit brought by Abraham L. Graham to recover damages from the North Jersey Street Railway Co. for the death of his son, who was killed by the company's cars, was settled August 23d, after having been tried six times. This was the case in which Justice Gummere of the Supreme Court decided that \$1.00 was sufficient damages for the death of a child. Verdicts ranging from \$3,000 to \$5,000 had been awarded by the juries of the lower courts but were each time set aside by the Supreme Court as excessive. By the settlement the company will pay Mr. Graham \$1,000 and all the costs, amounting to about \$3,000.

The Elizabeth, Plainfield & Central Jersey Railway Co. ran its first car over the bridge at Pieton on its railway branch, August 25th. Three cars were run onto the bridge at once, and this test of its firmness resulted satisfactorily. When the connecting link shall be completed, alternate cars will run through to Plainfield without change, thus traversing a loop from Westfield Junction westward, including Plainfield, Bound Brook, New Brunswick, the Amboys, Rahway and Pieton.

The Jersey City, Hoboken & Paterson Railway Co., of Hoboken, N. J., has awarded the contract for the erection of a new car house in Paterson. The building will cost approximately \$100,000.

The Philadelphia & Lehigh Valley Traction Co., of Allentown, Pa., ran its first car under the "Trenton cut off" bridges on the Bethlehem pike, September 10th, the injunction obtained by the Pennsylvania R. R. restraining the company from running its cars under the bridges having been dissolved the preceding day. Passengers are now carried from North Wales to Flourtown without change of cars.

The new interurban between Meadville, Pa., and Saegertown was opened September 8th, and an extension to Cambridge Springs, 15 miles east of Meadville, will soon be completed. Connections will be made with the line running from Cambridge Springs to Erie, thus making a continuous route of 41 miles.

The Wilkesbarre (Pa.) & Hazleton Railway Co. proposes to establish a summer resort at Triangular Lake, which is a hard some sheet of water on the new electric line between Wilkesbarre and Hazleton. The site is an exceptionally good one, and is accessible by half-an-hour's ride from either city. In addition to a hotel and the usual resort attractions, cottages may be erected and every means will be availed of to draw a summer population.

The annual outing of the Pittsburg Railways Co. was notable this year for several novel amusement features. As it was impossible to care for the 4,000 employes on one occasion, two picnics were arranged, each of two days' duration. The first, on August 28th and 29th, was especially for the employes of the Consolidated and Monongahela systems; the second, on September 10th and 11th, for the United Southern and Birmingham employes. These rules, however, were not stringent, and the employes of any division might, if desiring, share in either event. Many sports and amusements were arranged, perhaps the principal of them being

a ball game which was umpired by President James D. Callery who personally gave a prize of \$50 in gold to the winning team. Prizes awarded the winners of other contests amounted to \$300 in cash. One share of stock was offered to the employe having the largest family at the picnic, certificates of birth or other proof being required to authenticate the statements of the contestants, and this plan not only proved a fortunate one as affording entertainment, but served the purpose of the entertainers in greatly increasing the attendance. On the days devoted to picnicing car schedules were shortened on all the company's lines so that no employe might lack an opportunity to spend a few hours at least at Calhoun Park, which was the scene of the festivities.

The Pittsburg Express Co., which was organized some years ago under the direction of the late C. L. Magee to operate trolley express cars over the railways in Pittsburg, has decided to discontinue business and shipments will not be received for transportation after September 30th. The company was originally organized with a capital of \$100,000, and several of the larger express concerns of Pittsburg were absorbed by it. For the first year the business did not meet the expectations of the promoters, but after Mr. C. V. Wood, of Beaver, was made general manager of the system, several innovations in the service were introduced and the street railway express became a profitable business. Stations were established in East Liberty, Homestead, Braddock, Turtle Creek, McKeesport and Carnegie in addition to the central office in Seventh St., Pittsburg. Ten cars and 10 wagons have been operated, but owing to the discrimination of some of the boroughs in favor of less expensive service the business has lately resulted unprofitably and will be abolished at the end of the month.

The Philadelphia Rapid Transit Co. has completed plans for two emergency houses and a motormen and conductors' building. The emergency houses will be two and a half stories high and will be located one on the southeast corner of 41st and Walnut Sts. and the other at 915-17 Walnut St. It is the intention of the company to convert the old car house at Allegheny Ave. and Richmond St. into comfortable quarters for its conductors and motormen. It will contain a library and other facilities of the club-house. The Philadelphia Rapid Transit Co. has frustrated another extraordinary attempt on the part of professional swindlers to mulct it for damages. One William Doran, reported to be an accomplished acrobat and contortionist, has been arrested in New York on the charge of instituting bogus damage suits against Philadelphia street railways. Doran is alleged to have made a practice of permitting himself to be struck by street cars going at the rate of 30 miles an hour, his proficiency as an acrobat preventing his being run over or seriously injured.

It is stated that the Philadelphia Rapid Transit Co. contemplates taking over the property of the Fairmount Park Transportation Co. The officials of the former however are quoted as denying the report.

The West Chester (Pa.) Street Railway Co. has recently increased its capital stock from \$300,000 to \$1,000,000, and has franchises for proposed lines to cross Chester County in several directions. This company opened its new extension of the West Chester & Lenape branch, which was recently purchased from the Wilmington & Northern R. R., August 31st. The extension runs from Lenape to Downingtown, a distance of 14 miles. The road was built by the Tennis Construction Co., which has all the contracts for the West Chester company's contemplated construction work. A franchise has been secured in Parkersburg for the proposed line of the West Chester company from Downingtown to Coatesville and Parkersburg, which is to be opened for traffic early in October. The line to Kennett Square will probably be in operation by October 15th.

Surveys are being made for the York County Traction Co.'s proposed extension from York, Pa., to Wrightsville, a distance of 11 miles, and from York to Hanover along the York and Gettysburg pike, passing through Spring Grove and Thomasville. The extensions when completed, one in an easterly and the other in a westerly direction, will be the connecting link in the two traction systems which will eventually reach Washington by way of Gettysburg and Philadelphia by way of Columbia. Construction work will be under way in the early spring and will be pushed to completion as rapidly as possible. An auxiliary of the York County Traction Co. was recently organized and has been incorporated

with a capital stock of \$25,000 under the title of the Wellsville Street Railway Co. to build an electric line from Dover to Wellsville.

The perpetual charter recently granted to the Princess Anne (Md.) & Deal's Island Light, Power & Railroad Co. gives the company the right to use the county roads in Somerset County and the streets of Princess Anne and intermediate towns for the construction of a 25-mile electric line to Deal's Island, with lateral lines, and to furnish electricity for lighting, heating and industrial purposes. The proposed road runs over a level country through a prosperous farming and village section. It should receive a large business at Deal's Island from all the products of the country bordering on Chesapeake Bay. Connections will be made by steamers to points north and west. Local interests have largely subscribed to the stock of the Princess Anne & Deal's Island company, and outsiders will be invited to do so. The company has an authorized capital stock of \$200,000, and an authorized bond issue of \$150,000. The officers of the company are: Hampden P. Dashfield, president, and William F. Lankford, secretary; and H. P. Dashfield, O. T. Beauchamp, Roger Woodward and S. F. Dashfield, executive committee.

The Natchez (Miss.) Electric Street Railway & Power Co. has purchased the entire property of the Natchez Electric Light & Transit Co., proposing to enlarge that company's old power house to handle both the street railway traffic and the electric lighting business. A part of the present track system will be rebuilt, a new car house will be erected and additional equipment will be installed.

Natchez parties are believed to be interested in a proposed electric railway from Biloxi to Pass Christian, about 25 miles in length, passing through Beauvoir, Mississippi City, Gulfport and Long Beach. Nothing definite has been done as yet toward advancing this project.

The Rapid Transit Company of Chattanooga has ordered six large passenger cars of the John Stephenson Company which will soon be delivered and put in commission on the city and suburban lines in Chattanooga. The track system is to be extended and improved and a large sum will be expended on the mountain line. It is announced that the company will soon begin issuing universal transfers. Formerly, transfers were issued only to purchasers of books of tickets.

The Birmingham (Ala.) Railway, Light & Power Co. will, after September 20th, issue transfers to any point on its system within the five-cent fare limit.

Mr. Percival Moore, vice-president and general manager of the Louisville (Ky.), Anchorage & Pewee Valley Railway Co., recently invited the municipal officers and leading business men of Louisville to make a trip of inspection over that company's completed lines to Lyndon and Beard. The power house and offices of the road are located at Lyndon, and these were made the subject of special attention. Seven cars have been ordered for the Louisville, Anchorage & Pewee Valley Ry. They will be 47 ft. long, with a capacity of running 45 miles an hour. The trucks will be equipped with four motors of 57-h. p. each. The fenders will be of the regulation locomotive "cow-catcher" pattern, a novelty in this part of the South; the interior will be finished in mahogany and illuminated with 15 incandescent lights. Rattan seats, water coolers, chemical fire extinguishers, lavatories and parcel-racks will complete the appointments of the cars, which will cost approximately \$8,500 each.

The electric interurban between Hagerstown, Md., and Boonsboro has been opened for traffic, and nine cars are run in each direction daily. Though the passenger traffic has been all that might be expected since the opening of the line, the transportation of freight has been the chief feature of the business, especially the transportation of peaches. A fare of 50 cents is charged for the round trip between Hagerstown and Boonsboro.

Press reports state that the passenger business of the Kentucky & Indiana Bridge & Railroad Co., of Louisville, will be taken over by the New Albany (Ind.) Railway Co. if pending negotiations are consummated. The New Albany company is building a line to Jeffersonville, and preparing to extend its facilities in New Albany. The Kentucky & Indiana Bridge & Railroad Co., operating what is popularly known as the Daisy Line between New Albany and Louisville, contemplates making the freight traffic on

this road its exclusive business, and may turn the passenger traffic over to the New Albany company under lease.

Rumors are still in circulation concerning a merger of the interurban interests at Columbus, O. The plans under advisement contemplate practically a consolidation of the Appleyard, Webb-Fisher and Mandelbaum-Pomeroy syndicates, and the completion of direct systems from Columbus to Cincinnati, Cleveland and Indianapolis. At present, the Columbus, Buckeye Lake & Newark Traction Co. has not been included in the negotiations. The Central Market line at Columbus, which is to control the loop, will soon be opened for traffic. It is expected that the universal transfer system will be established with the opening of this route.

Eight new passenger cars for the Central Market line have arrived in Columbus and will be used on the loop until the Central market is put in operation.

The Columbus, Delaware & Marion Railroad Co. recently inaugurated its service from Delaware to the Franklin County line, a distance of 14 miles, and a two-hour schedule has since been maintained. The company fired the boilers at the Stratford power house for the first preliminary trial September 11th. Rapid progress is being made on the line between Delaware and Columbus which is soon to be open for traffic, and the company has just completed stringing its private telephone line from Columbus to Stratford.

The Columbus, London & Springfield Railway Co. will within two months put several 60-ft. freight and express cars in commission of its lines, the freight traffic having increased to such an extent that special equipment for the accommodation of the service is considered indispensable. This company ran its first through cars on a regular schedule, August 24th, accommodating an especially heavy passenger traffic without accident or delay. The running time is at present two hours and fifty minutes, but this will be reduced so soon as arrangements can be perfected for increasing power-house facilities at the Columbus end of the route.

The Columbus, New Albany & Johnstown Traction Co. is rapidly completing its street improvements in Columbus. The company did a heavy business in carrying crowds to the New Albany camp meeting during the last week of August.

It is now proposed to erect at Columbus a union freight and passenger depot for the interurbans entering that city. Options have been secured on a desirable site on the north side of West Broad St. at the corner of Park St.

The municipal code affecting electric railways prepared under the direction of Governor Nash to be presented to the special session of the Ohio Legislature contains provisions limiting franchises to a term of 25 years, and making them subject to revision every 10 years by the councils of municipalities, which are given the right, in changing franchises, to regulate the price, the rate of fare or other conditions of travel. Senator Hanna, in consultation with members of the Legislature August 27th, is alleged to have favored perpetual franchises but to have endorsed the provision reserving to municipal councils the right to revise grants every 10 years. He is further quoted as opposing the constitutional amendment proposed by Senator Foraker allowing the enactment of special laws for municipalities, and the provision of the Nash code which propose a tax of 5 per cent on the gross earnings of public service corporations.

The Miami & Erie Canal Transportation Co. on August 17th opened its new route, propelling four canal boats from Hamilton to Lockland by electricity. The run was made in three hours, which is much longer than will be required ultimately, and as an experimental trip it was entirely a success. It is locally rumored that the company will add a passenger service to the freight service over this route, between Dayton and Cincinnati and eventually between Cincinnati and Toledo, but no announcements to this effect have as yet been authorized. The Miami & Erie company is making rapid progress in construction work between Lockland and Cincinnati. Tracklaying and ballasting have been completed for a greater part of the distance to be covered.

The Cleveland, Elyria & Western Railway Co. has completed its bridge over the Vermillion River at Birmingham and is now competing with the Lake Shore Electric Ry. for the traffic between Cleveland and Norwalk. The Cleveland, Elyria & Western and the Lake Shore have effected a traffic agreement whereby the

former enters Norwalk over the Lake Shore tracks. The distance between Cleveland and Norwalk is 57 miles, and is made by the Cleveland, Elyria & Western in three hours.

The Toledo, Bowling Green & Southern Traction Co. has nearly completed its new power house at Cygnet, which will be put in operation so soon as the dynamos shall be installed and the stack erected.

The Jackson (Mich.) & Suburban Traction Co. opened its new casino at Wolf Lake, August 20th, conveying some 2,000 passengers to and from the lake on the opening day, and operating seven of the large summer cars for their accommodation. The casino is a spacious and modern building. The ground floor is used as a restaurant; the second is furnished for dancing, and on the roof is an attractive summer garden. Heating facilities have been installed and the casino will be kept open until November 1st.

The Detroit United Ry. has issued the second edition of its recent publication entitled "Detroit, 1902." The book, which contains cuts of the principal buildings and parks of the city, and full information concerning street railway routes to points of interest, is designed as a souvenir, and a guide to excursionists. The photographic views include the island and the many summer resorts along the Detroit River, and a "bird's-eye" view of the city and its environs.

The electric line between Oshkosh, Wis., and Omro, 10 miles distant, was put in operation September 10th.

Two interurban railways, from Manitowac, Wis., to Green Bay, 39 miles, and from Green Bay to Kaukauna, 10 miles, are projected by the Construction & Equipment Co., which also has under consideration several other routes in Wisconsin. Cleveland, Pittsburg and New York parties are interested, and the entire charge of the proposed construction work will be given to Mr. J. H. Martin, whose headquarters will be in Green Bay.

The Indianapolis, Shelbyville & Southeastern Traction Co. has opened its new line between Shelbyville and Indianapolis, a distance of 28 miles, and cars are operated at intervals of 30 minutes. The run between the termini is made in an hour and 18 minutes, 18 minutes being required for the run within the corporate limits of Indianapolis. The contract for the construction of this road was awarded to Townsend, Reed & Co. on September 26, 1901, and actual work was begun on the grading on October 21st. The road is thoroughly ballasted, and there are 28 bridges en route, 11 of which are of steel construction, one a stone arch bridge and one a concrete arch. The longest bridge is at Shelbyville and is 200 ft. in length. The steepest grade is only 4 per cent. The officers of the company are: E. K. Adams, president; Albert de Prez, vice president; T. E. Goodrich, secretary, and John R. Messick, treasurer. The general offices and power house are located at Shelbyville.

The Union Traction Company of Indiana is eliminating curves and otherwise improving its system between Marion and Indianapolis with a view to making the run between these cities in the same time as the steam roads, which is two hours and 45 minutes.

The Indianapolis & Martinsville Traction Co. began running cars through to Brooklyn, August 31st. The line between Brooklyn and Martinsville is to be opened for traffic by November 1st.

The Fort Wayne & Southwestern Traction Co. has applied to the postal authorities for permission to carry mails between Fort Wayne and Wabash, Ind.

The County Attorney of Cook County, Illinois, in an opinion given August 20th, declares the board of assessors and the board of review to have no jurisdiction to assess the franchises granted to street railway, telephone, electric light and gas companies, the jurisdiction to make such assessment, according to the county attorney's opinion, being vested in the state board of equalization. The opinion further states: "It is clear from the express provision of the statute that the state board of equalization has exclusive jurisdiction to value the capital stock of these corporations and to assess the same, including the franchise, over and above the assessment of the tangible property as made and returned by the local assessors. The term 'capital stock' means all the property and rights of the corporation of every kind and nature. The general assembly has, however, by particular description, placed certain properties of these corporations within the jurisdiction of the local assessing tribunals for valuation and assessment. The properties under discussion, consisting of the rights of user and

occupancy of the public streets, have not been so placed, but have by the terms and express provisions of our revenue law been placed within the jurisdiction of the state board of equalization."

An uncommon accident happened to the Lake St. bridge of the Lake Street Elevated Railroad Co., Chicago, September 7th. The electric wires beneath the flooring of the bridge became crossed, causing a fire which damaged the motors employed to raise and turn the bridge. The only remedy of the difficulty was to lower the bridge for two inches, an action which the company was reluctant to take as it would throw the track proportionately out of alignment and it was feared that an accident to passing trains might result. Pending a decision, tugs and steamboats bound up the river were blockaded, and an appeal was made to the harbor authorities to require the mending of the bridge at once in order that it might be opened for the boats to pass. After six hours' delay the bridge was lowered and repairs begun. It was found that by running slowly and with caution the cars could cross with entire safety.

The Gage Hotel Co. has brought suit for \$300,000 damages in the Circuit Court against the Union Elevated Railroad Co., of Chicago, alleging that its property, the Wellington Hotel, at Jackson Boulevard and Wabash Ave., has diminished in value owing to the contiguity of the elevated loop, and that the patronage of the hotel has decreased because of the noise of the trains.

The Aurora, Elgin & Chicago Ry., a complete description of which recently completed system was given in the Street Railway Review last month, pages 441-459, began its passenger service August 25th. The first train carried no passengers or guests except the officers of the company, but subsequent trains were crowded and the service has been eminently satisfactory from the beginning. For the present trains are run at intervals of half an hour, the running time from the Garfield Park terminus of the Metropolitan elevated to Aurora being an hour and a quarter. Trains will be composed of four cars and will be run more frequently so soon as the road is in full running order, and the time will be reduced to one hour for local trains and 45 minutes for express trains.

The Chicago City Railway Co. will soon put in service 80 additional cars of the same type as the 125 double truck cars built for it by the St. Louis Car Co.; the order for the 80 new cars was given to the same company.

The Rockford (Ill.) Railway, Light & Power Co. during the recent Chautauqua assembly, adopted the plan of employing small boys on its cars, whose duties were to keep the trolley on the wire in rounding curves, to ring the bell for the motorman to stop or start, to tighten brakes when stops were made and otherwise to relieve the busy conductors. The boys gave satisfactory service and were paid 10 cents an hour. One 13-year-old boy made a record by working 16 consecutive hours in a day.

Two new companies have been organized to build electric inter-urban railways in Illinois. The Springfield & Central Illinois Railway Co., capitalized at \$200,000, projects a system connecting Springfield and Bloomington, and Bloomington, Decatur and Jacksonville. Its principal promoters are St. John Boyle, vice-president of the Louisville (Ky.) Railway Co., and C. K. Minary, treasurer and manager of the Springfield Consolidated Ry. The Danville, Paxton & Wilmington Electric Railway Co., of which J. P. Middlecoff, of Paxton, Ill., is president, has been incorporated to build a line between the cities named in the title.

The Chicago & Milwaukee Electric Railway Co. expects to complete its extension from Lake Bluff to Libertyville this month. Six miles of double track have been completed, as well as a brick power house and depot at Libertyville. The road will later be extended to Fox Lake.

The Alton (Ill.) & East Alton Railway & Power Co. has begun the construction of a four-mile line from the terminus of the Alton Railway, Gas & Electric Co.'s lines in Alton to East Alton. The extension, when completed, will be leased by the Alton Railway, Gas & Electric Co.

The Kansas City & Olathe Electric Railway Co. has nearly completed the grading of its line from Kansas City, Mo., to Olathe, Kan., and will receive bids on 50,000 ties, 1,824 tons of 60-lb. steel rails, and relays, new or in good repair. Fred C. Goodwin, of Kansas City, Mo., is president of the company.

Rumors are in circulation to the effect that all the street railway

systems in Portland, Ore., may eventually be consolidated by the Baltimore interests which organized the United Railways & Electric Co. of Baltimore in 1899, and recently effected the consolidation of the lines in San Francisco. The plan, as reported, contemplates the merger of the Portland Railway Co., operating a 35-mile system; the City & Suburban Railway Co., a 70-mile system, and probably the Oregon Water Power & Railway Co., a 25-mile system, under the title of the United Railroad & Electric Co.

The City & Suburban Railway Co., of Portland, is now building 12 closed cars for fall traffic, which will be 36 ft. long and vestibuled at both ends. The Oregon Water Power & Railway Co. has awarded contracts for the construction of a 5½-mile electric line between Lentz and Gresham. Contracts for the construction of 25 miles additional will later be awarded.

The Everett (Wash.) Street Railway Co. has awarded contracts for the construction of extensions of its lines at an estimated cost of \$100,000. It is stated that the Everett company will purchase new rolling stock.

On August 26th the first car was run over the new lines of the Seattle-Tacoma Interurban Ry. The car carried the officers of the road and the mayor and other city officers of Tacoma to Seattle to attend the Elks' carnival in the latter city.

The Northwestern Development Syndicate of Nelson, B. C., will apply to the Provincial Parliament at its next session for a franchise to construct a 10-mile electric railway for the transportation of passengers and freight through the mining district near Nelson. Power for the operation of the proposed road will be supplied from the syndicate's present plant on Menhemick Creek, the capacity of which will be greatly increased for this purpose.

The United Railroads of San Francisco will soon place a new transfer system in operation which will give additional privileges to passengers. The company's new power house is nearing completion, and contracts for about half the steam and electrical machinery required have been awarded. This plant will have a capacity of 16,000 h. p.

A. J. Babcock, chief engineer of the North Shore Railroad Co., has returned from the East and is perfecting plans for the conversion of the narrow gage steam road formerly known as the North Pacific Coast R. R. into an electric line. The third-rail system is being favorably considered, and the change to electric traction is to be effected not later than March 1, 1903.

The Pacific Electric Railway Co., of Los Angeles, Cal., is erecting a new power house at Los Angeles in addition to the Pasadena plant. The new station will contain one 1,050-kw. direct current generator; two 1,500-kw. three-phase generators, and three 600-kw. and five 200-kw. motor generator sets. One 650-h. p. Ball & Wood cross-compound condensing engine; one 450-h. p., and one 250-h. p. machine of the same type as is now used in the Pasadena plant, and an additional equipment of one 200-h. p., and two 2,500-h. p. McIntosh & Seymour cross-compound condensing engines will be installed. Steam is to be furnished by four 250-h. p. Stirling boilers, and later an addition of eight 400-h. p. Babcock & Wilcox boilers will be made. The officers of the company are: H. E. Huntington, of San Francisco, president; Epes Randolph, of Los Angeles, vice president and general manager; E. E. Bacon, of Los Angeles, secretary, and I. W. Hellman, of San Francisco, treasurer. F. Van Vranken is superintendent of the Los Angeles plant and W. H. Smith of the Pasadena plant.

The proposed electric railway from Santa Cruz, Cal., to Capitola and other resorts and suburban towns will be completed in the early spring if the bonuses asked by the promoters shall be conceded. The road will border the Bay of Monterey for a distance of three miles, serving the city of Santa Cruz and the resorts and villages of East Santa Cruz, Seabright, Twin Lakes, Del Mar and Capitola. Santa Cruz has an average population of 7,000 except in the summer when it is twice as great, and the other places en route have at present an aggregate population of 6,000 and are growing rapidly. The promoters have purchased the Monterey & Pacific Grove Street R. R. and are converting it into an electric railway which will serve as a feeder to the Santa Cruz-Capitola resort line. Mr. F. W. Swanton, of Santa Cruz, has been principally identified with the work of building up the resorts on the Bay of Monterey and is largely interested in the present project for the construction of an electric line connecting them. The route lies through one of the most beautiful sections of California.

GEORGE W. KNOX.

George W. Knox, the president of the Knox Engineering Co., has had an extended and varied experience in electric railway practice, which in his present work cannot but prove to be of the greatest value to him. After graduation from the Northern Illinois College in 1885 he was with the Chicago, Burlington & Northern Railway Co., in the mechanical department for two years, and in 1887 went with the Pullman Palace Car Co., street car department, where he was engaged till he took up electrical work with the Thompson-



G. W. KNOX.

Houston Co., in equipping the first cars that went west of the Mississippi River, these cars being for Omaha. In 1886 he joined the old Sprague company with headquarters at Chicago. While with the Sprague company Mr. Knox was employed as assistant engineer on the installation of the West Side line at Milwaukee, and in 1890 he was sent to Minneapolis and St. Paul as assistant to the chief engineer, in charge of the equipment of these roads, which comprised over 200 miles of track, one of the largest contracts ever let for electrical equipment of a road; here he had charge of the

equipment of the interurban road between Minneapolis and St. Paul, with what was then considered high-speed motors, 25 miles per hour. In May, 1891, having finished the Minneapolis and St. Paul installation, Mr. Knox was sent by the Edison General Electric Co., which had purchased the interests of the Sprague company, to Milwaukee, as assistant to the chief engineer in charge, to equip the remaining horse railway lines of that city. He remained in Milwaukee until the fall of 1891, when he was put on special installations throughout the country, going to Cincinnati, Columbus, Newark, Lincoln and Springfield, Ill., St. Joseph, Mo., and other places. In the spring of 1892 he changed over the storage battery system of the Dubuque Street Railway to the overhead system, being still in the employ of the Edison General Electric Co. In the fall of the same year he was sent by the General Electric Co. to Kansas City, Mo., to install the motors and generators on the Kansas City Elevated Ry.

While at Kansas City Mr. Knox was offered a position, through the late M. K. Bowen, with the Chicago City Railway Co., and the 160 miles of this road was equipped throughout under his charge. He was later made, in addition to electrical engineer, engineer of the construction for the company, having charge of the construction of all track and special work for the company. Mr. Knox remained with the Chicago City Railway Co. until 1900, when he resigned to take up general railway construction and engaged with Kohler Bros., as manager of the railway department. Early in the spring of 1901 he severed his connection with Kohler Bros., and opened an office as electrical engineer and builder.

The class of work with which Mr. Knox has been identified during the last sixteen years would naturally insure the immediate success which has come with this venture and which is attested by the line of interurban roads under construction during the past eighteen months.

Mr. Knox has had associated with him, during the last year and a half, Mr. R. M. Heskett, a graduate from the Armour Institute of Technology, with a number of years' railway experience to his credit. Mr. Heskett will be closely identified with Mr. Knox in his future work.

TOLEDO RAILWAY MEN BANQUET.

September 11th the members of the operating department of the Toledo Railway & Light Co., assembled at the railway company's Casino, where a banquet was served. Those in attendance were John F. Collins, superintendent, J. S. Young, assistant superintendent, P. Boyle and Harro Harrsen, division superintendents; A. Sherman, Earl Coffin, James Hallett, Edward Hagerty, E. Mc Gangan, M. E. Johnson, dispatcher, J. Anglan, F. H. Sterns,

Thomas Eslinger, C. Caldwell and Ben Walker, inspectors. An ornamental desk clock was presented to Mr. Collins, the presentation speech being made by Mr. Harrsen. On the clock was engraved "To John F. Collins, Superintendent the Toledo Railway & Light Co., from his Helpmates of the Operating Department."

After the banquet the afternoon was spent in seeing the play at the Casino, riding on the scenic and miniature railways and a shooting contest in which Mr. Collins took first honors. The party returned to the city on a special car after being photographed in a group.

WASHINGTON (PA.) & CANNONSBURG INTERURBAN.

An electric railway between Washington, Pa., and Cannonsburg, a distance of about nine miles, is being constructed by the Cannonsburg & Washington Street Railway Co., and the road will constitute an extension of the present line in Washington, Pa. The company is doing its own construction work, and owing to several bridges which must be built, material for which cannot be obtained under eight months, the road cannot be ready for operation before spring.

AUGUSTA-AIKEN INTERURBAN OPENED.

The new interurban road between Augusta, Ga., and Aiken, N. C., was opened for traffic August 28th; the cars making the initial trip carried several officers of the company and a large number of invited guests. Special cars took the party from Augusta to Aiken and the appearance of the handsome new cars of the company was greeted with great enthusiasm by the dwellers along the route. The excursion was accompanied by a band of music and after its return to Augusta a barbecue was served by the railroad company accompanied by speeches, music and general rejoicing. The length of the new road is 23½ miles and it parallels the South Carolina & Georgia Ry. for a large part of its route.

WIRE THIEVES IN NEW JERSEY.

Six times within a few weeks the Valley Road line of the North Jersey Street Railway Co. has been crippled by wire thieves. The last attempt was made August 18th, when about 1,000 ft. of copper wire was taken down from the poles. At the time of this theft detectives were watching the south end of the town, where the thieves operated the night before, and the loss was only discovered when the first car in the morning reached Mount Clair. The service was suspended for several hours before new wire could be procured and put into place.

NEW CARS FOR PITTSBURG.

In connection with the description of the open cars, illustrated on page 491 of our issue for August, which the St. Louis Car Co. is building for the Pittsburg Railways Co., it was stated that six of the cars had just been completed. The number should have been sixty.

THE WABASH SPECIAL.

The Wabash Railroad has issued an announcement that for the meeting of the American Street Railway Association it will make a rate of \$9.00 for the round trip from Chicago to Detroit on the certificate plan. A special train of parlor cars (one of which is reserved for ladies) and dining car will leave Chicago Tuesday afternoon, October 7th, at 1:00 p. m., from the station at Dearborn and Polk Sts., and will run through to Detroit, arriving at 7:00 p. m. Dinner will be served on the train until the arrival at Detroit. For those not able to take the A. S. R. A. Special the Wabash has trains leaving Chicago at 11:00 a. m., at 3:03 p. m. and at 11:00 p. m. The special will be personally conducted by Mr. N. C. Keeran, who has had charge of the A. S. R. A. Special trains to the Conventions for the last five years. Applications for space, which should be reserved as early as convenient, should be made to N. C. Keeran, No. 97 Adams St., Chicago, or to T. F. Harrington, 8th and Olive Sts., St. Louis.

PERSONAL.

MR. D. W. DOZIER has resigned as chief mechanical engineer of the Metropolitan Street Railway Co., of Kansas City.

MR. J. Z. GEORGE has resigned as manager and purchasing agent of the Vicksburg (Wis.) Railroad, Power & Manufacturing Co.

MR. A. B. CORYELL, formerly of Waverly, Tenn., has been appointed superintendent and manager of the new electric railway at Huntsville, Ala.

MR. D. W. GORDON has resigned as superintendent of the Lake Cities Electric Railway Co. of Michigan City, Ind., and will remove to Chicago.

MR. J. M. LOFTUS, formerly superintendent of the Newark & Granville lines of Newark, O., has been appointed general manager of the Indianapolis-Martinsville Rapid Transit Co.

MR. M. A. HAYS, formerly with the Southern Railway, has severed his connection with that company to become secretary of the Chamber of Commerce, of Sault Ste. Marie, Mich.

MR. NICHOLAS HAMILTON has resigned as assistant superintendent of the Youngstown (O.) & Sharon Street Railway Co. Mr. Hamilton has not announced his plans for the future.

MR. THOMAS ADDISON, president of the Sacramento Electric, Gas & Railway Co., resigned that position at the annual meeting of the board of directors and Mr. Albert Gallatin was elected his successor.

MR. THOMAS B. WHITTED, manager of the sales department of the General Electric Co., at Denver, has resigned that position to become manager of the gas and electric enterprises owned by Joseph J. Henry.

MR. B. H. RANNELS has resigned as general manager of the Dayton & Kenton Railway Co. and is devoting all of his time to the Cincinnati, Milford & Goshen Street Ry., with which he is prominently identified.

MR. J. W. PERRY has been appointed chief of the electrical department of the H. W. Johns-Manville Company with headquarters in New York City. He was formerly the company's representative in Philadelphia.

MR. F. W. EMERY, formerly of Knoxville, Tenn., has been appointed general manager of the proposed electric interurban between Galesburg and Kewanee, Ill. Mr. Emery will establish his permanent home in Kewanee next month.

MR. A. HALL BERRY, who for many years has been associated with the H. W. Johns Co., as manager of the electrical department, has resigned to become general manager for F. H. Lovell & Co., with headquarters at 100 William St., New York.

MR. B. J. LAMBERT has resigned as chief engineer of the Waterloo (Ia.) & Cedar Falls Rapid Transit Co. to become instructor in civil engineering in the state university at Iowa City. Mr. Lambert graduated from this university in 1900.

MR. WILLIAM LINTERN, formerly master mechanic of the Cleveland, Elyria & Western Ry., has resigned that position and is now giving all his time to the interests of the Nichols-Lintern Co. His headquarters are at No. 312 Electric Bldg., Cleveland.

MR. NICHOLAS RIVIERE, who resigned a year ago from the position he had long held as secretary and treasurer of the St. Charles Street Railroad Co., New Orleans, La., has been appointed to again fill this position by the new management of the road.

MR. FRANK MILLER will act as salesman throughout the New England territory for C. J. Harrington, of New York, manufacturer of electric railroad supplies. Mr. Miller was formerly superintendent and passenger agent of the Worcester (Mass.) & Webster Street Railway Co.

MR. EDWARD B. GRIMES, who for 18 years has been connected with the Dayton Herald and since 1885 has been its editor, has resigned that position to become superintendent of the Ohmer Car Register Co., of Dayton. Mr. Grimes retains his financial interest in the Herald.

MR. F. W. EDMUNDS, who was for several years secretary of the Q. & C. Co., and had charge of the steel department when that company represented the Pennsylvania Steel Co., is now with Wornham & Major, of 29 Broadway, N. Y., engineers and manufacturers' representatives.

MR. WILLIAM WAMPLER, formerly a representative of the Stuart-Howland Company, Boston, Mass., has resigned his position

to accept one as sales agent for the Peckham Manufacturing Co., and he is now looking after the interests of this company during an extended trip through the far West and the Pacific Coast.

MR. GEORGE C. EWING has resigned as president of the Morris Electric Co. and the American Union Electric Co., of New York, and has taken offices in the Board of Trade Bldg., Boston, for the general agency of street railway material. He also represents the Nernst Lamp Co., of Pittsburg, in New England.

MR. F. L. MOWRY has resigned as clerk of the Hartford (Conn.) & Springfield Street Railway Co., and, it is understood, will superintend the construction of new lines in Ohio for the National Construction Co. The employes of the Hartford & Springfield company presented Mr. Mowry on his departure with a smoking set in gold and silver.

MR. J. W. DUGGAN, formerly superintendent of rolling stock of the Youngstown (O.) & Sharon Street Railway Co., has been appointed to a similar position with the Worcester (Mass.) & Webster Street Railway Co.; the Webster & Dudley Street Railway Co.; the Worcester & Connecticut Eastern Street Railway Co. and the People's Tramway Co. of Putnam, Conn.

MR. B. S. JOSSELYN, on August 30th, resigned as general manager of the Kentucky & Indiana Bridge & Railroad Co., to become general manager of the Hudson Valley Railway Co., Waterford, N. Y. Mr. Josselyn has had an extended experience in steam railroad work, and has occupied the position of general manager of the Kentucky & Indiana company for the last three years.

MR. C. F. GLADFELTER severed his connection with the Chicago Electric Traction Co., on June 30th, to become auditor for the Miami & Erie Canal Transportation Co., of Cincinnati. Mr. Gladfelter will be remembered as having been identified with Chicago street railways since 1897 when he was connected with the Englewood & Chicago Electric Street Railway Co.

MR. C. D. PORTERFIELD, engineer and salesman for the Atlas Railway Supply Co., Chicago, has just returned from a very successful business trip in Europe. Mr. Porterfield had charge of the exhibit of his company at the Light Railway and Tramway Exhibition in London during the first two weeks in July. Since that time he has been traveling over England and the continent.

MR. W. O. HANDS has resigned as superintendent of the Northeastern Division of the Metropolitan Street Railway Co., of Kansas City, Mo., and taken a position on the engineering staff of the company. His long experience in railway construction will make his service specially valuable to the company in the large amount of new work which is now under way in the department.

PROFESSOR GEORGE F. SEVER, of Columbia University, who was last year superintendent of electrical exhibits at the Pan-American Exposition, has been appointed electrical engineer of the Department of Water Supply, Gas & Electricity of New York City. Professor Sever, who is consulting engineer for Wendell & McDuffie, of New York, has supervised the plans of the proposed electric railway between Oneonta, Cooperstown & Richfield Springs, N. Y.

MR. JAMES P. POTTER has been appointed general superintendent of the Oakland Transit Co., San Francisco, and has assumed the duties of that position. Mr. A. H. Smith has been appointed general superintendent of all the lines of this company, Mr. E. E. Thornton, superintendent of the Haywards division, and C. P. Piper, superintendent of the eastern and western divisions.

MR. CHARLES G. WINGATE, son of the late Gen. W. Wingate who was formerly vice-president of the Brooklyn Elevated Railroad Co., is now in the New York office of the Crocker-Wheeler Company. Mr. Wingate was formerly superintendent of the Ridgewood Ave. division of the Brooklyn Rapid Transit Co. and has had charge of the construction of several electric lines in Connecticut and New York.

MR. L. E. GOULD, who for the last year has been assistant electrical engineer of the Aurora, Elgin & Chicago Ry., has been appointed electrical engineer for the Sterling, Dixon & Eastern Electric Railway Co., with headquarters at Sterling, Ill. Mr. Gould has had an extended experience with third-rail electric lines, having been with the Albany & Hudson Railway & Power Co. during construction and the first year of operation.

MR. F. J. GREEN, of Springfield, O., has resigned as general manager of the Dayton, Springfield & Urbana Electric Railway Co.,

and, it is stated, will engage in the construction of new electric lines. He will be succeeded by Mr. Richard Emory, general manager of the Columbus, London & Springfield Ry., who will retain his office in the latter company while discharging his duties as general manager of the Dayton, Springfield & Urbana road.

MR. O. E. OLESON, who for the past six years has been chief engineer of the Toledo Railway & Light Co. and its predecessor, has resigned to become the chief of the engineering department of the Twin City Rapid Transit Co., at Minneapolis. On leaving Toledo, Mr. Oleson was presented with an Elks' ring inlaid with diamonds by the employees of the power house. Mr. Oleson will be succeeded as chief engineer of the Toledo Railway & Light Co. by Mr. W. L. Long, who was formerly his first assistant.

MR. GEORGE C. FISK, president of the Wason Manufacturing Co., of Springfield, Mass., recently completed 50 years of continuous service with this concern. During this time he has risen from clerk in a comparatively small shop to president of one of the most important car building establishments in the country. In commemoration of the event the employees of the company presented Mr. Fisk with a handsome black leather album, containing photographs of all the officials of the company and also with a series of photographs showing the places and houses in which Mr. Fisk has lived or carried on business, these forming a pictorial outline of Mr. Fisk's life. The establishment, of which Mr. Fisk is the head, has grown from a small beginning. Started in 1845 by Thomas W. Wason and his brother, Charles, in a shed on the bank of the Connecticut just south of the railway bridge, its first year's work was six single and two double-truck freight cars for the Connecticut River railway company, amounting to less than \$5,000. Work was begun in a shed not large enough to house an entire freight car. Now the company has an output of about 400 cars a year, and has a pay-roll, the largest in the history of the concern, of 575. The output for last year amounted to about \$1,000,000. The magnitude of its undertakings is shown in the contract it has on its hands to equip the Manhattan elevated road with the rolling stock for an electric system, or the making of 250 new cars and the remodeling of hundreds of old.

OBITUARY.

MR. MATTHEW M. ROBY, superintendent of the Electric Railway & Power Co. of Tiffin, O., died in that city August 20th from heart disease. Mr. Roby was 41 years of age.

MR. THOMAS NEVINS, of East Orange, N. J., a large stockholder in several electric traction companies in the eastern part of the United States, and largely connected with railroad and gas enterprises in New Jersey, died at his residence, Mount Shannon, Castle Connell, County Limerick, Ireland, on August 21st. Mr. Nevins and his son, T. A. Nevins of Newark, N. J., had been sojourning in Europe for some months prior to the death of the elder man, for the purpose of investigating the prospects for an electric line between Manchester and Liverpool.

RECENT STRIKES.

The street railway strike and boycott which were in effect for several weeks at Lafayette, Ind., were declared off August 28th. This controversy was rather peculiar inasmuch as but eight men of the 35 or more employed by the company quit work and their attempts to injure the company's traffic were principally through boycott. The settlement was effected by submitting the matter to arbitration at the hands of a committee representing the Merchants' Association of the city, both the street railway company and the Central Labor Union which was promoting the boycott agreeing to abide by the decision of the arbitrators. This committee reported that the five men whose discharge led to the declaration of the strike were properly discharged for cause, that the charges of coercion brought against the railway company were without ground and that the eight strikers should be given employment with the railroad company, being placed on the extra list and in line for promotion in the future. The Central Labor Union, while accepting the decision of the arbitrators, took occasion in a very offensively worded resolution, to denounce them for showing prejudice and "not basing their decision upon the testimony of the strikers."

Two hundred employes of the Hudson Valley Railway Co., whose interurban system comprises 100 miles of railways between Warrenburg, Saratoga, Ballston, Troy and Schuylerville, N. Y., went out on strike on the morning of August 30th, and from that date until 2 p. m., September 12th, no cars were operated on the company's lines. The cause was the company's refusal to reinstate two motormen whom it held responsible for the recent accident, who were discharged for this reason. On September 2d the announcement was made that all persons who had left their employment with the company, and who should apply for positions on or before Wednesday, September 3d, at 6 p. m., would be taken back individually and positions assigned to them in the order in which their applications were made. Few of the former employes availing themselves of this offer, the company secured substitutes, and a number of deputy sheriffs were sworn in. The Stillwater town board passed resolutions forbidding the company to run cars through that town on its lines between Mechanicsville and Schuylerville with motormen and conductors who had not been in its employ for 21 days prior to September 1st. A conference between the company and the strike leaders failed to accomplish an agreement, and other than this the strike was uneventful until September 12th, when the 14-mile line between Stillwater and Schuylerville was opened for passenger traffic. The first car carried several deputy sheriffs. Its departure from the barns was watched by a crowd of 200 strikers and their sympathizers, but no attempt at violence or obstruction was made. At Glens Falls the company's wires were cut on the morning of September 15th. On the same day the village board of Sandy Hill held a special meeting and annulled the company's franchise because of its failure to operate through the village for two weeks. Subsequently, a conference was held with the governor of New York, who said that the question of the right of motormen to run cars without having had previous experience on the road was one for the courts to decide in the event of arrests of such motormen, and that he would not order troops out unless their presence should be necessary to preserve life and property. The sheriffs of the counties through which the lines run were called upon, and three military companies were notified to be in readiness for duty when the company should resume passenger traffic on its Glens Falls division. On September 18th a car left Glens Falls manned with non-union men and in charge of militia and deputy sheriffs. A crowd gathered and the conductor was struck by a stone. The car stopped and the military guard dispersed the crowd. At Fort Edward an attempt was made to stop a car, but the riot act was read and the crowd dispersed. Mr. B. S. Josselyn, formerly of Louisville, Ky., had been appointed general manager of the road and assumed his duties September 15th. On the 16th he announced that all former employes who applied personally for reinstatement would be taken back. Two cars were run from Saratoga to Ballston and back on that day without incident.

All motormen and conductors in the employ of the Ottumwa (Ia.) Traction & Light Co. quit work on the morning of September 12th out of sympathy with the linemen of the company, who had struck for higher wages and the recognition of the union. Operations were entirely suspended on the line after a day of riot, during which trolley wires had been cut and car windows broken. On the following day the blacksmiths joined the strikers and it was feared that the lighting system as well as the street railway service would be affected. The company offered to concede the increase in wages, but at latest reports still refused to recognize the union, and a settlement has not been effected.

A strike was declared on all the tramway lines in the city of Geneva, Switzerland. The cause was the action of the manager of the electric workshops, an American, who had dismissed 42 men employed in the shops, offering them positions as conductors, instead.

The St. Louis, St. Charles & Western Railroad Co. was recently made plaintiff in three damage suits aggregating \$15,000. The plaintiffs claim that they were unlawfully assaulted by the conductor on one of the company's cars. The three plaintiffs, in company with thirteen other persons, became involved in an altercation with the conductor which led to a general fight, and the conductor as well as the plaintiffs were considerably bruised. A counter suit has been filed by the manager of the railroad company for damages against the three plaintiffs.

LARGEST ORDER FOR AIR BRAKES.

Among the numerous orders received by the Christensen Engineering Co. during last month was an order for 392 air brake equipment from the Massachusetts Electric Companies for their different railway divisions. This order will require 13 cars for its shipment and will be sent from Milwaukee to these roads during the month of September. The order is highly gratifying to the Christensen Engineering Co., inasmuch as it shows a substantial appreciation by the railway company of the efficiency of the air brakes in actual service. The first equipment put on any railway line belonging to the Massachusetts Electric Companies was installed on a car of the Taunton & Brockton Street Railway, in May, 1898, and on account of the excellent service given by this and other equipments installed at a later date, the Christensen company has received orders continuously since May, 1898, from the different railway companies which are now a part of the Massachusetts Electric Companies, culminating in the last order for 392 equipments. This makes a total of 604 air brake equipments which have been purchased by the roads controlled by the Massachusetts Electric Companies, and represents every double truck car in service on their lines.

The Christensen Company has also closed within the past month a contract with the Boston Suburban Ry. for 100 equipments to be put on its double truck cars operating on the Commonwealth Avenue Street Ry., Newton & Boston Street Ry., Newton Street Ry. and Lexington & Boston Street Ry. This contract was closed after exhaustive tests.

The Christensen Engineering Co. has just completed the foundation for a 250-ft. extension to its present machine shop, which is 186 ft. in width. This extension when completed will cover 46,500 sq. ft. of ground space. In addition to the ground floor 41,500 sq. ft. more floor space will be provided by the galleries on each side, and in the center of the building, which is three stories in height.

IMPROVED TRACK BROOMS

We illustrate herewith an improved form of railway track broom made by H. Thompson of Concord, N. H. This broom is now made with several attachments which render it very serviceable for street railway work. It is both strong and durable and is



sufficiently light in weight to be conveniently handled. One of its important attachments is a tool for cleaning curves and setting switches. This tool is fastened to the handle and contains a chisel of hardened steel, which will wear indefinitely. This attachment being practically indestructible is arranged to be easily changed from one handle to another as the brooms wear out. The maker will be pleased to furnish circulars and prices upon application.

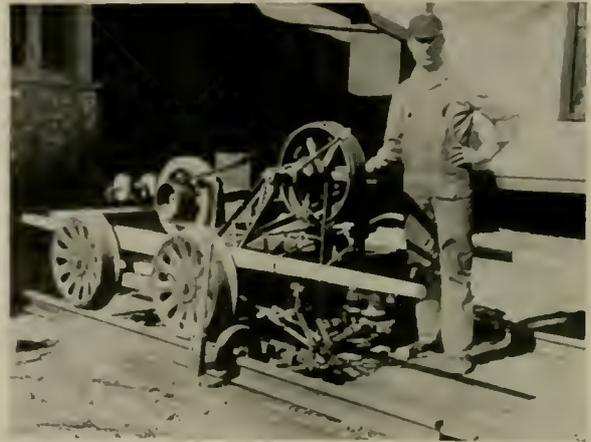
SPEED ON CLEVELAND-TOLEDO LINES.

A high rate of speed has been attained on the new lines of the Lake Shore Electric Railway Co. between Cleveland and Toledo. Recently a trip was made over these lines by the officials of the road, on which occasion a speed of 80 miles an hour was maintained for a stretch of half a mile, and a speed of 70 miles an hour for the distance of three miles. It required five hours to make the trip, including 50 minutes from the Public Square in Cleveland to Rocky River and 20 minutes' run within the city limits of Toledo. The average speed was from 35 to 40 miles an hour. The roadbed is admirably constructed, especially west of Newark, over which part of the route, for a long distance, the road is almost absolutely level.

The Huntsville Electric Railroad Co., of Huntsville, Ala., has temporarily replaced its electric cars with a line of hacks. The generators at the power plant burned out and these, together with other repairs, will require from ten days to two weeks.

GOSLING DUPLEX TRACK DRILL.

The accompanying illustration shows the power driven duplex track drill invented and manufactured by Henry J. Gosling, 15 Talbot St., Cleveland, O. The drill is mounted on a light steel framed car of stiff construction, so that no appreciable vibration results from the operation of the motor. The machine employs a gasoline motor of 1½ h. p. capacity, but it may be speeded up to considerably exceed this power. The machine drills two holes at once at any desired distance apart to suit different lengths of bonds and it is flexible in all directions and swings from one side of the truck to the other, so that either rail may be drilled. It is adjustable vertically and may be set to clear all obstacles encountered on construction roads, crossings, etc., and can be operated by one



GOSLING DUPLEX TRACK DRILL.

man, although it is advantageous to have a helper to keep the soda water tank supplied. These machines were used in bonding the rails of the Aurora, Elgin & Chicago Ry. and the electrical engineer of the road states that more than 200 bonds per day were placed on an average and on one occasion 212 bonds were put in place in ten hours' work. This required from 400 to 425 1-in. holes to be bored through the webs of 80 lb. rails. The machine is easily put into position and four men can remove it from the track when desired. In future machines of this kind it is proposed to use horizontal gasoline engines such as are employed on automobiles which will be capable of developing 4 h. p. and be considerably lighter in weight. This form of machine is more compact and easier of access in case repairs are necessary. Mr. Gosling is an English engineer of wide experience, having been connected with various South American railroads, as locomotive superintendent and engineer of construction. He was also connected with the Grand Trunk Ry., the Montreal Harbor Commission and previous to his present business was superintendent of the Acme Machine Co.

EXCURSIONS VIA PENNSYLVANIA LINES.

G. A. R. Excursions—October 3, 4, 5 and 6. Chicago to Washington, D. C., and return, \$15.85. Good to return until October 14, subject to extension of limit until November 3, 1902.

New York Excursions—October 3, 4, 5 and 6. Chicago to New York and return: Fort Wayne route, \$25.85; Pan-Handle route, \$23.30. Return limit, October 14, 1902.

Boston Excursions—October 7 to 11. Chicago to Boston and return: Fort Wayne route, all rail, \$25.00; Sound Lines, \$24.00. Pan-Handle route, all rail, \$23.00; Sound Lines, \$22.00. Return limit, October 13, subject to extension until November 12, 1902.

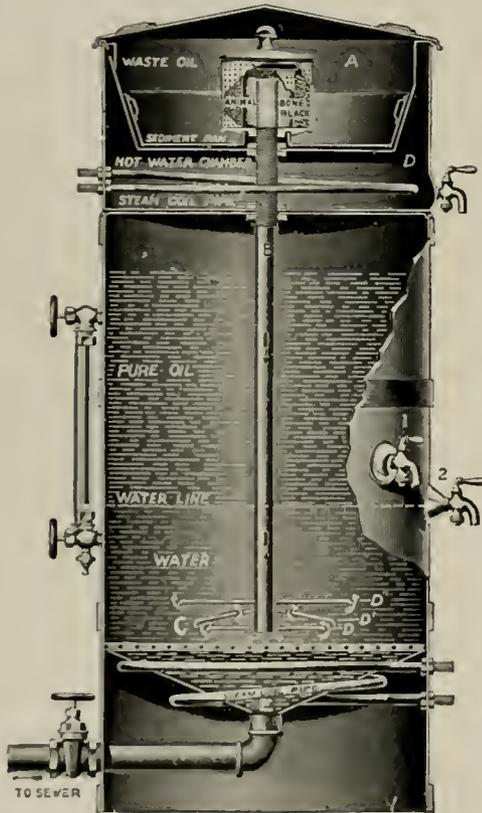
Any further information desired will be furnished by addressing H. R. Dering, Assistant General Passenger Agent, No. 248 S. Clark St., Chicago.

Manistee, Mich., is endeavoring to force the Manistee, Filer City & East Lake Railway Co. to lay new rails on all the paved streets in the city. The city engineer has advised the use of a 70-lb. 7-in. girder rail to take the place of the T-rail at present in use.

THE AMERICAN OIL FILTER.

A new filter recently placed upon the market by the Burt Manufacturing Co., of Akron, O., is shown in the accompanying illustration, and a brief description of the principles involved in its operation should be of interest to all readers who appreciate the saving effected by collecting waste lubricating oil, and filtering it over and over until it has been entirely used up. The saving in this way amounts to from 50 to 90 per cent, depending upon how carefully the oil is collected after having been used. This is an economy which is not generally overlooked in large plants, but the "American" oil filter is made in small sizes which are a profitable investment in connection with engines where even as little as two barrels of oil are used per year.

This filter has been especially designed by the Burt company for use with very heavy grades of oil, which cannot be successfully



SECTION OF "AMERICAN" FILTER.

cleaned in an ordinary filter because of the liability to clog up easily. The claim is made that such oils are readily purified by this filter, and obviously, therefore, it must give perfect results in the filtering of common engine oil. The fact that the oil is heated, and thereby thinned immediately upon being poured into the filter, accounts for its high speed of operation and superior capacity.

The pan for receiving the waste oil is surrounded by a hot water chamber, through which passes a steam coil pipe. When this chamber has been filled with warm water, and the lower part of the filter has also been filled with warm water until it flows from faucet No. 2, the filter is ready for operation, the proper steam connections, of course, having been previously made. The cleaning of the oil is then accomplished as follows:

Through the filtering material in the cylinder the oil makes its way into tube B, and down onto the filter plate D, where the pressure of the oil above overcomes the resistance offered by the weight of the water, and the oil spreads out in a very thin film, becoming thinner and thinner as it travels from the center to the circumference of the plate. Every particle of the oil is thus exposed to the action of the water and this process is repeated as the oil flows upon plate D 1 and D 2. The remaining impurities then settle by force of gravity to the bottom of chamber E, and are drained

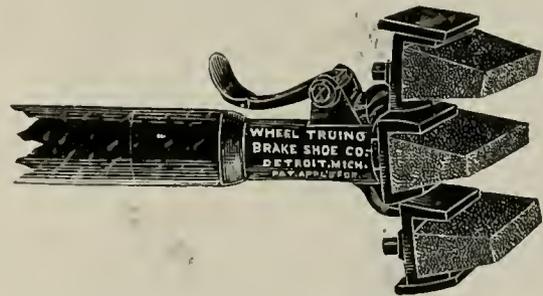
off by simply opening the valve. The pure oil is drawn from faucet No. 1.

Attention is called to the little care required by the filter. Any kind of filtering material may be used, or none at all, and the filtering material may be removed without interrupting the oil service. The method of cleaning the filter is very simple, requiring only that the cylinder at the top be unscrewed, the filtering substance removed, and the sediment pan lifted out and emptied of the dirt and grit which has collected in it. In the "American" filter the bulk of the dirt is collected at the top instead of the bottom, greatly increasing the ease with which the latter may be cleaned.

COMMUTATOR TRUER.

The Wheel Truing Brake Shoe Co., of Detroit, whose "truing" brake shoe has been introduced on both electric and steam railroads in all parts of the world, has brought out a new device that promises to meet with as great success in its field as has the brake shoe.

This little tool consists of a handle upon the end of which are a number of sockets or holders, into each one of which is fixed an abrasive block. Some of these holders are fixed while others are



DEVICE FOR TRUING COMMUTATORS.

movable, so that they can be adjusted independently of the fixed ones.

By a simple and ingenious arrangement the tool is made self-adjustable to any sized cylinder; the blocks conforming to a perfect arc of the circle to be operated upon and held in the desired position while the tool is in use. Insulating strips of hard rubber are used wherever necessary, and prevent short circuiting, and the blocks themselves are made of non-conducting material.

The company makes blocks of different abrasives and of different textures according to the work to be done. For certain work, as for instance turning down steel or iron cylinders, the abrasive blocks are replaced by blocks of steel serrated like a file, so that the tool can be used with a lathe for operating upon various metals as well as upon the commutators in a car while the same is running. It will readily be seen that a device which will true up a commutator while the car is running, or, better still, will prevent a commutator from becoming untrue, will bring about a very perceptible saving in cost of electric repairs. Mr. J. M. Griffin, president and manager of the Wheel Truing Brake Shoe Co., is the inventor and has arranged with his company to handle the device. Various forms and sizes are made, adapted for use upon stationary dynamos and motors.

LOW RATES TO THE NORTHWEST.

Commencing September 1 and continuing until Oct. 31, 1902, second-class one-way colonist tickets will be sold by the Chicago, Milwaukee & St. Paul Ry. from Chicago to all points in Montana, Idaho, Utah, California, Washington, Oregon, British Columbia and intermediate points at greatly reduced rates. Choice of routes via St. Paul or via Omaha.

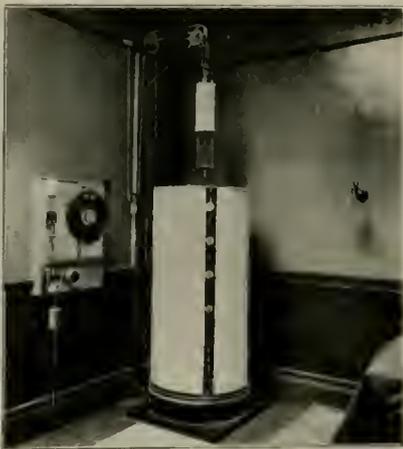
The Chicago, Milwaukee & St. Paul Ry. is the route of the United States Government fast mail trains between Chicago, St. Paul and Minneapolis, and of the Pioneer Limited, the famous train of the world.

All coupon ticket agents sell tickets via Chicago, Milwaukee & St. Paul Ry., or address F. A. Miller, General Passenger Agent, Chicago.

BLUE PRINTS FROM ELECTRIC LIGHT.

Owing to the difficulty in producing blueprints at times when the weather conditions are unfavorable the Pittsburg Blueprint Co., of Pittsburg, Pa., has introduced a machine which makes blueprinting entirely independent of dark or rainy days. The machine is known as the cylindrical electric copier and a view of one type is shown in the accompanying illustration. This standard, upright machine is recommended as the best type for all general work and consists of two glass half-cylinders bent to true curves and bound together with brass bands at top and bottom. A strong canvas cover fits around the glass to hold the tracing paper in place and this method insures excellent contact so that even with folded or crumpled tracings no marks are shown on the blue print. This cylinder rests upon a base which is mounted on wheels and revolves about the axis of the cylinder.

The printing is done by means of an arc lamp of special design which is suspended directly above the cylinder and which has a vertical movement which is regulated by means of an escapement for



CYLINDRICAL ELECTRIC COPIER.

regulating the speed of the lamp in its descent. The tracing and sensitized paper being placed between the glass and canvas cover, the lamp passes axially through the cylinder, giving a uniform exposure to all parts of the print. The time of exposure for any print being once determined, any number of prints thereafter can be made of absolutely uniform tints, and the operation of the machine is extremely rapid, taking only one or two minutes for an ordinary exposure.

It has also been found that the cost of printing with this machine is considerably less than by the old fashioned sunlight exposure.

The Pittsburg Blueprint Co., also makes a tilting machine specially adapted for making copies of small tracings, a large number of which are to be placed in the machine at each loading. The cylinder is mounted on trunions at the center and may be turned over to a horizontal position while being loaded with tracings and paper. It is then turned into an upright position and exposed in the manner just described.

These machines require considerably less floor space than any other type of blueprinting machine, and the company keeps a complete stock of repair parts on hand and can therefore guarantee its customers against any serious delay when repairs are needed.

NEW PLANT FOR KNELL AIR BRAKE CO.

The Knell Air Brake Manufacturing Co., Ltd., of Battle Creek, Mich., which was organized recently to carry on the manufacture of the Knell air brake, is now in full operation. The company's new plant is completely equipped with the most modern machine tools and in addition to the brakes, the company is prepared to build all sorts of special machinery. The company is much gratified at having recently received a number of duplicate orders from roads having the Knell brake in service. The officers of the company are:

President, Charles E. Thomas; vice-president, Minard Lafever; secretary, Joel C. Hopkins; treasurer, R. F. Hoffmaster; manager, A. H. Metzelaar.

THE NEW WESTINGHOUSE FOUNDRY AT TRAFFORD CITY, PA.

The remarkable growth of the affiliated Westinghouse industries was recently signalized by the creation of a new city and the building of another Westinghouse manufacturing plant. This new industrial center is located 17 miles east of Pittsburg on the Pennsylvania R. R. and is to be known as Trafford City. Extensive factory sites have been laid out here to provide for the overflow of the several Westinghouse industries, a number of which have already used up all the available building room at their present locations and are still pressed for space. The first of the Westinghouse companies to erect buildings in the new city is the Westinghouse Foundry Co., which is at present putting up an extensive and model foundry plant and pattern shop described in this article. This addition is necessitated by the rapidly increasing business of the Westinghouse Machine Co., especially in connection with very large steam and gas engines and steam turbines.

In laying out Trafford City provision has been made, not only for the factories that are to be erected there, but also for homes and all modern improvements and comforts for the men who are to work in the factories. The latter will be located on a fairly level area between the Pennsylvania Railroad and the residence portion of the city, which will be reached from the railway station by a steel viaduct 1,100 ft. long. The residence district has been laid out upon hillsides and a generally level plateau, high enough above the factory sites to render it free from smoke and dirt. The town consists of two oblong areas, one of which is about $\frac{1}{2}$ mile by 1-5 mile, and the other $\frac{1}{2}$ mile by 1-7 mile, the two areas meeting in such a way as to form a reversed letter "L," the corner of which is the most northerly part. The town has been laid off into about 800 building lots, each with an average frontage of about 30 ft. and a depth of 100 ft. In addition to this, space has been left for six parks. The entire town has been provided with waterworks and sewer systems, the latter including separate storm water and sanitary sewers. This work, as well as the paving of the streets, was completed before the town was opened to settlement, on June 7, 1902. Many intending purchasers of lots came to the site a day before the sale was to commence and "squatted" on the ground which they wished to possess.

Besides the transportation facilities afforded by the Pennsylvania R. R., over which there are 46 local passenger trains going each way daily and reaching Pittsburg in from 25 to 35 minutes, a street railway line has been built, connecting with the Pittsburg Railway Co.'s line at Wilmerding, $2\frac{1}{2}$ miles distant. This street railway passes over a steel viaduct into Trafford City and forms a loop through the principal streets.

The factory site, located in a bend of Turtle Creek, provides room for nine factory buildings, each about 200 ft. by 800 ft. A system of railway yards and tracks serving this area has been laid out in a very thorough manner, providing a track alongside of each building and transversely through each end. The storage tracks, in connection with this, occupy an area of about 300 ft. by 200 ft. This system of tracks is connected with the main line of the Pennsylvania R. R. by the Turtle Creek Valley branch of the latter. It is also to be connected with the towns of Wilmerding and East Pittsburg, where the works of the Westinghouse Air Brake Co., the Westinghouse Electric & Manufacturing Co., and the Westinghouse Machine Co. are located, by an interworks railway which will be operated by the Westinghouse interests.

The new foundry and pattern shop of the Westinghouse Foundry Co., which, as before stated, are at present being erected, are located at the extreme southern portion of the factory site and near the steel viaduct mentioned above. The pattern shop and storage building, which has already progressed well towards completion, is a steel and brick structure 605 ft. long and 80 ft. wide, with a height to the eaves of the roof of 47 ft. The pattern shop occupies 160 ft. at one end of this building. It is divided into two floors, the second floor being suspended from the roof trusses in order that the first story may be entirely free from columns, thus providing ample space for handling the largest patterns. The remaining 447 ft. of the

building is to be used for the storage of patterns and has three floors, the two upper floors being supported on steel columns and the entire space being divided by interior fire walls into three separate compartments. The foundations are of concrete and the superstructure of steel and brick. The foundation of the ground floor is made up of 8 in. of concrete into which the floor sleepers are bedded and on top of these is a layer of 2-in. maple flooring. The upper floors in both the pattern shop and storage building are supported on steel beams and steel girders, and are made up of 3-in. yellow pine flooring covered by one thickness of maple flooring.

The foundry building is 611 ft. 8 in. long and 184 ft. 3 in. wide outside of the brick walls, which are 36 ft. high at the eaves and 80 ft. at the peak. As in the case of the pattern shop, the foundations are built of concrete and the superstructure of steel and brick. The foundry is divided transversely into three bays, the center bay being 80 ft. 3 in. wide between centers of columns, runways being provided for traveling cranes of 80-ft. span and 150 tons' lifting capacity. The cranes will be electrically driven. The two side bays are each 50 ft. 6 in. wide from center to center of columns and are provided with runways for traveling cranes of 47 ft. 2½ in. span and 50 tons' lifting capacity. At one side of the foundry building runways are provided for yard traveling cranes of 100-ft. span and a lifting capacity of 75 tons. The I-beam purlins are spaced 8 ft. center and center and are covered with 3-in. yellow pine roof sheeting. The roof is covered with slate.

At the middle of one of the side bays, where the cupolas are located, is a charging floor about 50 ft. square, constructed entirely of steel. The melting equipment of the foundry will consist of two air furnaces, each having a capacity of 30 tons, and three cupolas capable of melting 18 tons per hour each. This will enable a casting weighing as much as 100 tons to be easily poured and the casting can afterwards be lifted out of the sand by one of the 150-ton traveling cranes. The air furnaces will be used for the largest and most important castings, owing to the fact that they yield a superior quality of iron, and the cupolas will be used for the ordinary classes of castings, and particularly small castings.

The buildings will be equipped throughout with modern lavatories and conveniences for the comfort of workmen and will be in every respect up-to-date. They will be heated by hot air, the foundry, pattern shop and pattern storage rooms to have minimum temperature of 50, 60 and 35° F. respectively, in zero weather. Artificial light will be furnished by both arc and incandescent lamps. In order to insure plenty of light during the day, the windows are large, and both the foundry building and pattern shop are provided with skylights of large area. The plans for the buildings were prepared under the supervision of the Westinghouse Machine Co. The Security Investment Co., of Pittsburg, Pa., is the financial agent and general contractor for the entire works, and James Stewart & Co., of St. Louis and Pittsburg, are the managers of construction. The Real Estate Trust Co., of Pittsburg, Pa., successfully handled the extensive sale of city lots adjoining the new works.

TRADE NOTES.

DURING THE MONTH of August the New York office of the Otis Elevator Company closed contracts for 63 electric elevators.

THE DEWITT SAND BOX CO., of Troy, N. Y., has appointed C. J. Harrington, 15 Cortlandt St., N. Y. City, its New York agent.

THE "CLIMAX" CATTLE GUARD, as made by the Climax Stock Guard Co., Marquette Bldg., Chicago, has been approved by the Michigan Commissioner of Railroads, as complying with the law of that state.

EM. TERQUEM, 5 Rue des Mathurins, Paris, has sample copies of the publications of the Windsor & Kenfield Publishing Co., and persons in France desiring to subscribe can conveniently order through him.

THE LORAIN STEEL CO. is preparing to erect two new furnaces at a probable cost of \$1,500,000. The plans for these furnaces are now being prepared and a new power mill will also be added to run the furnaces.

THE GOLTZ ENGINEERING CO., Chicago, makes a specialty of manufacturing metal block letters for electric signs and its new bulletin No. 3, just published, should be in the hands of every firm installing electric signs.

THE MANSFIELD ENGINE CO., of Mansfield, O., has just been formed by the consolidation of the Mansfield Machine Works and the Century Machine Works. The new company has a capital of \$100,000, and is erecting a thoroughly modern plant on the site of the old Century plant.

THE WHEEL TRUING BRAKE SHOE CO. reports 1902 as its banner year. Its trade now extends all over the world, and it has recently made shipments to Australia, South America, Portugal, India, Africa, The Netherlands, Ireland, Scotland, England and other foreign countries. Its customers include over 400 electric roads and many steam roads.

THE INDIA RUBBER & GUTTA PERCHA INSULATING CO., of Yonkers, N. Y., has recently installed alternating current motors to replace a number of small isolated steam engines formerly used for driving the carpenter shops and the winding and braiding department. The motors used are of the Westinghouse type and are in sizes from 1 h. p. to 15 h. p.

THE DETROIT AUTOMATIC STOKER CO., of Detroit, makes a side-feed stoker in which hot air is admitted in jet form over the coking coal, and proportionable with the volatile gases distilled from the fuel. The president of the company is T. H. Simpson; vice-president, R. P. Joy; manager, G. L. K. Morrow, and the secretary and treasurer, F. C. Thompson.

THE MICA INSULATOR CO., of New York and Schenectady, announces that it is making an addition to its plant which will increase the output 50 per cent and enable it to fill all orders very promptly. The company was led to take this step in order to meet the increasing demands of the trade for its well-known specialties, Micanite goods, "Empire" goods and M. I. C. compound.

"THE RAILWAY EQUIPPER" is the title of an interesting monthly published by the M. Mitshkun Co., of Detroit, and intended for circulation among railway, mining, lumber and construction companies as well as contractors of all kinds. The September issue is now ready and the paper will be mailed free each month for one year upon application. Trade catalogs will be acknowledged in the paper.

AN INGENIUS CARD device, for displaying the colors of Dixon's silica-graphite paint in such manner as will permit of an exact idea of each color, is being issued by the Joseph Dixon Crucible Co., Jersey City, N. J. The color chart carries with it suggestions as to the class of construction that can be protected with this paint, also instructions as to best methods of applying protective paint. This chart can be secured by request to the company.

JAMES W. COPELAND, 934 Equitable Bldg., Denver, Col., has been appointed sales agent for his state for the Scaife and We-fu-go water softening and purifying systems made by the William B. Scaife & Sons Co., of Pittsburg. Mr. Copeland was formerly located at St. Paul and recently opened an office in Denver, where he acted as manufacturers' agent. He is well known throughout the west in engineering circles and has given much attention to water purification.

F. H. LOVELL & CO., 100 William St., New York, have recently engaged A. Hall Berry as general manager, who will be glad to furnish the trade anything in the way of railway insulations, special molding insulations of all kinds for switch work and for motor controllers, arc lamps, and where high temperatures have to be met. This firm is prepared to supply enclosed fuses, a line of brass castings and intends to push its trade in the general line of electric supplies.

THE LIBERTY MANUFACTURING CO., of St. Louis, Mo., maker of the "Famous" oil refiner and purifier, is mailing a folder explaining the method of testing purified oil. The folder is accompanied by a flat tin pan in which to place some dirty waste oil upon the steam chest of an engine where it is heated from 150 to 200 deg. F. By means of this heating all the grit and other impurities are precipitated and the oil on top becomes clear and bright. This method of heating is the principle adopted in the operation of the "Famous" oil filter.

THE BULLOCK ELECTRIC MANUFACTURING CO., of Cincinnati, O., has recently issued four bulletins on its various electrical apparatus. Bulletin 1,002 describes the Bullock type of "N" motors, 1,003 gives descriptions and dimensions of the Bullock marine generating sets, 1,012 shows views and describes the Bullock motors installed at the Hudson County Brewery, Hoboken,

N. J. and 1,013 illustrates the power house of the People's Electric Railway Co., of Wilmington, Del., which contains five Bullock generators ranging in size from 250 to 350-kw.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has installed a 440-volt plant for lighting five new buildings of the University of Illinois, at Champaign. Two phase alternating current will be used, and each phase will be treated as a single-phase circuit operated on the three wire system, the neutral wire being supplied with current from an auto-transformer. The generating plant contains two belted two-phase generators of 50 and 75 kw. capacities, operated at 440 volts, to which will shortly be added an engine type revolving field 120-kw. alternator.

J. HOWARD EWALD has been appointed general sales agent for the Scaife and We-lu-go water softening and purifying systems for the territory of Southern Illinois, Missouri and Texas. Mr. Ewald's headquarters will be 83 Laeclde Bldg., St. Louis, Mo. These systems for water softening and purifying are manufactured by Wm. B. Scaife & Sons Co., of Pittsburg, Pa. Mr. Ewald has made a special study of water purification, and is well qualified to take care of this line of work. He has been for many years identified with the iron and steel industries in this territory, and is well known in engineering circles.

PROBABLY THE LARGEST elevator contract ever awarded is that given the Otis Elevator Co. by the Metropolitan Life Insurance Co., for the additions to its building, Fourth Ave., 23d and 24th Sts., New York City. The new equipment consists of 23 high-pressure passenger elevators, 4 hydraulic freight elevators and 2 electric passenger elevators, and contemplates converting the 13 passenger elevators in the original building, so as to operate them at the increased pressure. The plant, when complete, will consist of 40 hydraulic elevators, operated from one pumping station. Messrs. N. LeBrun & Sons are the architects and V. J. Hedden & Sons, builders.

THE UNITED RAILWAY & ELECTRIC CO., of Baltimore, has awarded a contract to E. Saxton, the well-known contractor of Washington, to lay 200,000 feet of conduit in the outskirts of Baltimore, and the contract calls for a nine multiple duct to be manufactured by the Standard Vitrified Conduit Co., of New York. The Standard Underground Cable Co., of Pittsburg, is to furnish the cable. The Standard Vitrified Conduit Co. has also an order for 200,000 feet for the Richmond Telephone Co. of Richmond, Va., large orders for the Niagara Falls Power Co., the Southern Bell Telephone Co., and the Mobile Light & Railway Co., of Mobile.

THE J. A. FAY & EGAN CO. and THE LANE AND BODLEY CO. are planning the erection of a building near their Bond Hill factories for the use of their workmen. The building is to be in the nature of a boarding house and restaurant, and it is to be conducted so as to take the place of the saloons and boarding houses which are invariably found in the neighborhood of large manufacturing establishments. Everything offered by the saloon except liquors will be offered here, but in an attractive way, and at such an economical price as to make saloon competition impossible. Meals and rooms will be offered at a price much less than workmen could otherwise secure.

C. J. HARRINGTON, 15 Cortlandt St., New York City, is out with a new catalog of the electrical material handled by this firm. The book contains 127 pages, with complete index and code, and is fully illustrated. This house keeps in stock a large assortment of overhead line material and other supplies and is in a position to furnish anything needed by electric railway, lighting and telephone companies. Among other prominent concerns represented by Mr. Harrington may be mentioned the Heil Railjoint Welding Co., the New Century Car Heater Co., the Knell Air Brake Co., the United States Fender Co., and the Seranton Fire Brick & Conduit Co. The new catalog will be sent on request. Mr. Harrington has purchased the entire plant where "Medbury" insulation was made and removed it to his Newark factory where Medbury material will be made and sold under the name "Empire."

THE BUDA FOUNDRY & MANUFACTURING CO., of Harvey, Ill., has issued its 1902 catalog of "Railway and Contractors' Supplies," which is a book of 150 pages, pocket size, bound in flexible leather covers. Among the apparatus and supplies which will particularly interest street railway companies and contractors we note the following: Dump cars, of from 1½ yd. to 5 yd. capacity; rock dump cars; the "Buda" pattern heavy base rail drills; the Paulus track drill; a complete line of switch stands; rail benders;

the Bogue & Miller system of street and crossing guards. Interested parties can secure copies of the catalog by addressing the company at Harvey, or at the Chicago office, 617 Monadnock Bldg.

"A NEW DEPARTURE IN CIRCUIT BREAKERS" is the title of a catalog issued by the Hartman Circuit Breaker Co., of Mansfield, O. These circuit breakers are designed on new lines and are practically oil switches as well as circuit breakers, as the break in all cases is made in oil. They are made in various types suitable for motors, switchboards and trolley cars. Larger instruments of the double pole type are set by means of two handles so that if a short circuit exists on closing the second handle the first one will immediately fly open. The catalog contains illustrations and descriptions of all the different types, together with tables showing the carrying capacities, range of adjustment and price list.

THE J. G. BRILL CO., Philadelphia, has issued a new catalog on the Brill snow sweepers, snow plows and track scrapers. These machines are all illustrated and briefly described and the standard dimensions are also given. In the standard sweeper short brooms are used, independently adjusted, which conform to the curvature of the pavement and are set at an angle so that the snow is thrown clear of the tracks instead of being pushed ahead. The plows are made in three styles, namely, the shear plow, the nose plow and the combined snow plow, electric locomotive and construction car. The track scraper is designed for use on either high or low cars and is provided with an attachment whereby the blades are dropped instantly into place by a touch of the foot.

THE GENERAL RAILWAY SUPPLY CO., of Pittsburg, Pa., is rapidly taking its place among the leading street railway supply houses. Commencing business a few years ago practically unknown to the street railway trade, this company has enjoyed a remarkable growth, representing at present many of the leading manufacturers of railway supplies, among which are the R. D. Nuttall Co., the Mayer & England Co., the International Register Co., the Speer Carbon Co., the Protected Rail Bond Co., the Frank Ridlon Co., the Sills-Eddy Mica Co., and the Garton Daniels Co. The manager, Mr. George W. Provost, who has by hard and persistent efforts brought about the success of this company, is well known to the trade, and it is needless to say that under his capable management its future success will be equally marked.

THE STUART-HOWLAND CO., of Boston, has recently appointed Mr. Harry DeSteele manager of its New York branch. Mr. DeSteele has been for 12 years constantly engaged in various branches of street railway work, both in this country and Europe, and has shown marked ability in his line. His earliest experience was gained under Postmaster General Payne at Milwaukee. He was manager of the railway department of the Western Electric Co. at New York from 1896 to 1900 and left to take charge of establishing a supply business at London, Eng. His many friends throughout this country will be glad to learn that he has become associated with this enterprising house, and the Stuart-Howland Co. are to be congratulated on having secured so able and energetic a representative.

THE ELLIOTT BROTHERS ELECTRIC CO. has been organized with W. H. Elliott president and manager, and G. E. Elliott secretary and treasurer, the offices of the company being 970-972 Hamilton St., Cleveland, O. Announcement is made that Messrs. Elliott have severed all connection with the Van Dorn-Elliott Electric Co. and opened a new factory which is equipped with modern appliances for doing an extensive repair and supply business. A special effort will be made to give prompt service, and quick deliveries as well as first class repair work. W. H. Elliott will have charge of the trade in the field and will spend a considerable portion of his time in traveling, while G. E. Elliott will have the management of the office and plant. Particular attention is directed to the armature and motor field coils for the manufacture of which special designed machinery has been installed.

THE SYRACUSE RAILROAD CONSTRUCTION CO., which is building a twenty-five-mile electric railroad between Auburn and Syracuse, New York, has recently closed a contract with the Westinghouse Electric & Manufacturing Co. for two 650-kw. engine-type alternators, delivering three-phase current at 360 volts and 2,000 alternations; also for five 400-kw. rotary converters, together with raising and lowering transformers for operating a 15,000-volt transmission line to two sub-stations. A complete switchboard is included and in fact everything for the operation of a

complete railway line. The generators are to be direct connected to two 22 and 44 x 48-in. cross-compound, horizontal, Corliss engines, purchased from Westinghouse, Church, Kerr & Co., and built by the Westinghouse Machine Co. The engines are to receive steam at 150 lb., are to run at 100 r. p. m., and are rated at 1,000 h. p. each, with a maximum rating of 1,800 h. p.

THE AMERICAN BRAKE SHOE & FOUNDRY CO., which our readers will remember was organized a few months ago to operate the plants formerly controlled by the Ramapo Foundry Co., Mahwah, N. J., the Lappin Brake Shoe Co., Bloomfield, N. J., and Buffalo, N. Y., the Corning Brake Shoe & Iron Works, Corning, N. Y., the Sargent Co., Chicago Heights, Ill., the Ross Meehan Foundry Co., Chattanooga, Tenn., is now in the field as a manufacturer of brake shoes under all the different patents controlled by the companies mentioned. The American company will, in its product, combine all the merits of the various brake shoes and eliminate the disadvantageous points from the design. Among the names well known in connection with this company's shoes are the Sargent, "Diamond S," Lappin, Corning, Streeter, Herron and Cardwell. A considerable portion of the output of the company is in miscellaneous steel and iron castings.

METROPOLITAN INJECTOR is the title of the latest catalog of the Hayden & Derby Manufacturing Co., of New York City. The products of this company are the Metropolitan automatic injectors, the Metropolitan 1898 injectors and the Metropolitan double tube injectors, which are used in stationary plants and for marine and portable boilers. The company also manufactures H. D. ejectors and other jet apparatus. The company has lately moved into its new factory, where it has installed the most improved machinery. Its laboratories are equipped with every kind of instrument for carrying on experiments and research, and its testing facilities are excellent and are arranged so that its products can be tested thoroughly under all conditions found in practice. The catalog embodies a great deal of useful information relating to injectors and ejectors, showing the results that can be attained under the various conditions. Copies of the catalog will be forwarded to any one interested in the subject.

THE GENERAL ELECTRIC CO. has recently issued the following publications: "Electric Pumping Machinery," a 106-page pamphlet illustrating and describing modern types of electrically driven pumps. Bulletin No. 4287, on "Single-Phase Alternating Current Generators—125 cycles." Bulletin No. 4290, on "Electric Railway Apparatus," being a reprint of the paper by Ernest J. Berg, read before the American Institute of Electrical Engineers, at Buffalo, Aug. 24, 1901. Bulletin No. 4291, on "Compensated Revolving Field Generators." Bulletin No. 4292, on "C. E. Generators." Bulletin No. 4293, on "Constant Current Transformer Panels." Bulletin No. 4294, on "The G. E.-73 Motor." "Lightning Arresters," a 68-page pamphlet describing General Electric lightning arresters, with an introduction on "Atmospheric Electricity and Lightning Protection," by Elisha B. Thomson. "Advantages of Using Oil in Transformers," a 14-page pamphlet. Catalog and Price List No. 7550 (superseding No. 7529), on "T-H Series Open Arc Lamps." Price Lists Nos. 5100 and 5101, on "General Electric Measuring Instruments" and "Lightning Arresters."

PAWLING & HARNISCHFELGER, Milwaukee, Wis., state that the demand for electric cranes and hoists remains very satisfactory and that buyers are now inclined to secure hoisting apparatus conforming to standard design. Among recent sales the following may be noted: Davenport Foundry & Machine Co., Davenport, Ia., one 5-ton crane. Allan Wood Iron & Steel Co., Conshohocken, Pa., one 15-ton crane. Smeeth Copper & Bronze Co., Chicago, one 10-ton crane. Copper Queen Consolidated Mining Co., Bisbee, Ariz., three 10-ton cranes. International Harvester Co., Deering Division, Chicago, two special 5-ton hoists. Vulcan Crucible Steel Co., Alliquippa, Pa., one 15-ton crane with 3-ton auxiliary hoist; American Sheet Steel Co., Cambridge, O., and McKeepport, Pa., two 30-ton cranes with 5-ton auxiliary hoists and one 10-ton crane. Greenlake Foundry Co., Milwaukee, Wis., one 15-ton crane. American Foundry & Construction Co., Pittsburg, Pa., one 3-ton crane; Reading Iron Co., Reading, Pa., one 10-ton crane. Canonsburg Steel & Iron Works, Canonsburg, Pa., one 25-ton crane with 5-ton auxiliary hoist. The Holtzoff Machinery Co., Cudahy, Wis., one 3-ton hoist. Albi-Chalmers Co., Milwaukee, Wis., for Sanitary District of Chicago, one 15-ton crane. McCroway & Lorley Co., Pittsburg, Pa.,

one 2-ton crane; Brown Corliss Engine Co., Corliss, Wis., one 30-ton crane with 5-ton auxiliary hoist; Gisholt Machine Co., Madison, Wis., one 10-ton crane; The Milwaukee Electric Railway & Light Co., Milwaukee, Wis., one 5-ton special hoist; The Standard Steel Works, Burnham, Mifflin Co., Pa., one 10-ton crane; Christensen Engineering Co., Milwaukee, two 10-ton cranes; Hanson & Tunelis, Chicago, one 1½-ton hoist crane; Sterritt-Thomas Foundry Co., Pittsburg, one 10-ton crane; The Elyria Iron & Steel Co., Elyria, O., one 15-ton crane.

THE ALLIS-CHALMERS CO. reports for July the following partial list of "1890" frame Reynolds-Corliss engines: L. T. Williams & Sons, New York; G. A. Bergland, Milwaukee, Wis.; John M. Stone Cotton Mills, Starkville, Mass.; Combination Rubber & Belting Co., Bloomfield, N. J.; Lidgerwood Manufacturing Co., New York; Brunswick-Balke-Collender Co., Chicago; C. A. McDonald, Chicago; Griffin Wheel Co., Chicago; International Paper Co., New York City; also the following orders for girder frame Reynolds-Corliss engines: Owosso Casket Co., Owosso, Mich.; Rock Plaster Co., New York City; Madero & Rinson Gallardo, Lagos, Mexico; Springfield Manufacturing Co., Rockville, Conn.; Keye Brothers, Argyle, Minn.; Barnet & Record Co., Minneapolis, Minn.; Cashier Mining & Milling Co., Breckenridge, Col. The following miscellaneous sales were also made: Buffalo & Susquehanna Iron Co., Buffalo, N. Y., four boilers of the convertible cross-compound steeple type blowing engines; Studebaker Brothers Manufacturing Co., South Bend, Ind., independent air pump and condenser; Thomas Kent Manufacturing Co., Clifton Heights, Pa., one Reynolds convertible boiler; Milwaukee Electric Railway & Light Co., Milwaukee, Wis., two convertible cross compound direct-coupled engines; Tonawanda Iron & Steel Co., North Tonawanda, N. Y., one vertical long crosshead type blowing engine; American Steel & Wire Co., Pittsburg, Pa., six pairs of convertible cross-compound steeple type blowing engines and two convertible low pressure long cross head blowing engines; McCormick Harvesting Machine Co., one vertical cross-compound direct-connected Reynolds-Corliss engine; New Orleans Railways, New Orleans, La., two vertical cross compound direct connected engines; Omaha Water Co., Omaha, Neb., one 20,000,000-gallon vertical triple pumping engine; San Antonio Water Co., one 50,000,000-gallon vertical triple pumping engine; the Ptarmigan Mines, British Columbia, one single Riedler express compressor; Pennsylvania Railroad Co., Pa., two Sederholm boilers.

SEVEN HOURS AND FIFTEEN MINUTES TO ST. LOUIS—FAST TIME MADE BY THE B. & O. S. W.

The Cincinnati and St. Louis Express, No. 1, due to leave Cincinnati via B. & O. S. W. 9:00 a. m., arriving St. Louis 5:45 a. m., made a fast run Saturday, August 16th. The train left Cincinnati 51 minutes late, was delayed 22 minutes en route, and arrived St. Louis on schedule time. The run was made in 7 hours and 47 minutes; the distance is 339 miles, and the regular time 8 hours 45 minutes.

This fast time was beaten a few days later. Second No. 1 left Cincinnati 10:30 a. m., made the run to Washington, Ind., a distance of 170 miles, in 210 minutes; consolidated with regular No. 1 at the latter point, arriving St. Louis 5:45 p. m., on time, making the run from Cincinnati to St. Louis in 7 hours and 15 minutes. This is the fastest run ever made between these two cities.

WIRES CUT AT TAMAQUA, PA.

The striking miners in the Panther Creek Valley committed depredation on the electric railway that runs from Tamaqua, Pa., to Summit Hill, August 27th, for the purpose of incapacitating the line and thus preventing the expected arrival of troops from Manila Park. Several of the poles on the line were chopped down and the wire cut.

The Interurban Motor Co., which was recently incorporated at Indianapolis, with a capital of \$5,000, has commenced making regular trips with an automobile buss between Garrett, Auburn and Waterloo, Ind.

FINANCIAL.

BROOKLYN RAPID TRANSIT.

The report of the Brooklyn Rapid Transit Co. for the year ending July 30th, last, shows a decrease in the net earnings of \$292,000, but it also shows an increase in the gross earnings of \$688,507. The decrease in the net earnings is due to the fact that they have been used for improvements, betterments, and equipments, but hereafter as the company is now provided with dividends for its new bond issue the earnings will not be diverted in this way. A comparative statement of operation for the months of June and July, 1901 and 1902, are as follows:

	JUNE		
	1902.	1901.	Increase.
Miles operated (single track).....	489.3	488.9	.40
Gross receipts	\$1,195,287	\$1,181,023	*\$ 14,264
Expenses, including taxes.....	732,152	732,740	*588
Net receipts	433,135	448,282	*15,147

	JULY		
	1902.	1901.	Increase.
Miles operated (single track).....	489.3	488.9	.40
Gross receipts	\$1,236,400	\$1,203,700	\$ 32,700
Expenses, including taxes.....	708,130	759,494	*50,358
Net receipts	528,263	445,206	\$ 83,057

*Decrease.

A comparative statement for the fiscal year ending June 30th, 1901 and 1902, is given as follows:

	1902.			1901.		
	Miles operated (single track).....	Gross receipts	Expenses, including taxes.....	Net receipts	Increase.	Decrease.
Miles operated (single track).....	489.3			488.9	\$688,507	
Gross receipts		\$1,278,704		\$1,201,107	\$77,597	
Expenses, including taxes.....		8,952,214		7,970,634	*203,072	
Net receipts		3,837,490		4,130,593		

*Decrease.

It is stated that the earnings of the system for the month of August exceeded by \$75,000 the large returns for the corresponding month a year ago.

NEW YORK METROPOLITAN.

The Metropolitan Street Railway Co., of New York, it is stated, has paid all of its fixed charges, with the deficit of about \$104,000 after the 7 per cent dividends guaranteed by the Metropolitan Securities Co. were paid. This is considered very satisfactory in view of the condition of the streets on which some of the leading lines run, on account of the excavations for the rapid transit subway. The Third Ave. line is reported to have earned its fixed charges and a small surplus. With the securities company furnishing the money to make the necessary betterments the earnings will hereafter, it is generally considered, more than suffice for the 7 per cent guaranteed dividends.

NEW YORK RAPID TRANSIT.

The total expenditure for the Rapid Transit work, including that for the month of August, has been \$20,300,000, or 58 per cent of the total appropriation of \$35,000,000. The figures for the last five months showed an average monthly expenditure of \$1,200,000. The road has now assumed a very tangible shape and the engineers in charge of the work are confident that the west branch will be completed within 16 months, and the entire east branch will be finished at about the same time.

MANHATTAN ELEVATED, NEW YORK.

The Manhattan Railway Co. recently issued its report for the fiscal year ending June 30th. The gross earnings for the year amounted to \$10,665,911, an increase of \$1,242,233. The balance available for dividends was \$3,073,476, an increase of \$751,120. The number of passengers carried during the year was 215,250,345, which is the largest number carried during any year since 1893. During 1899 the management of the road raised \$18,000,000 from the sale of new stock authorized to meet the expenses of the change in motive power. A portion of this capital is loaned on interest, which considerably augments the revenue of the company. The following table shows the earnings of the company during the last fiscal year in comparison with that of the previous year:

	1902.	1901.
Gross earnings	\$10,665,911	\$ 9,416,888
Operating expenses	5,518,585	5,253,239
Net earnings	5,147,326	4,163,658
Other income	625,800	836,384
Gross income	5,773,126	5,000,042
Interest and taxes	2,699,671	2,677,706
Net income	3,073,455	2,322,335
Dividends, 4 per cent.	1,920,000	1,920,000
Surplus over dividends.....	1,153,455	402,335
Passengers carried	215,250,345	199,049,741

THE PHILADELPHIA CO., PITTSBURG.

The Philadelphia Co. with its affiliated corporations has issued a comparative statement of earnings, expenses and net income for the months of August, 1901 and 1902, as follows:

	1901.	1902.
Gross earnings from operations.....	\$928,868	\$1,061,378
Operating expenses and taxes.....	592,641	793,925
Net earnings from operations.....	336,257	357,453
Other income	17,489	83,198
Total earnings and other income.....	353,743	440,652
Deductions from income.....	34,593	70,519
Total income	319,150	370,132
Fixed charges	266,953	321,989
Net income	53,099	48,143
Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Co.....	69,172	1,386
Balance represents Philadelphia Co's interest in the total net income.....	*16,076	49,756

*Deficit.

The Philadelphia Co. includes the Consolidated Gas Co., of Pittsburgh; Allegheny Illuminating Co., the Allegheny County Light Co., Chartiers Valley Gas Co., Union Gas Co., of McKeesport, and the Equitable Gas Co., of Pittsburgh, in addition to its electric railway properties.

CINCINNATI, NEWPORT & COVINGTON.

The Cincinnati, Newport & Covington Railway Co. has issued a financial statement showing comparative figures for July, 1902 and 1901, and also for the first seven months of each year. The statement is as follows:

	JULY.	
	1902.	1901.
Gross receipts	\$ 77,887.00	\$ 76,620.00
Operating expenses	29,875.00	33,458.00
Rents	215.00	215.00
Taxes	3,500.00	3,000.00
Rents	1,565.00	1,511.00
Tolls	7,763.00	7,846.00
Total expenses	42,853.00	46,021.00
Net earnings	35,034.00	39,599.00
Fixed charges, interest on bonds.....	15,416.00	15,416.00
Interest on temporary loans.....	551.00	
Total fixed charges	15,967.00	15,416.00
Net profit	19,066.00	15,182.00
Operating ratio	38.35	43.66
Same including damages, taxes and rents....	45.05	49.80
Same, including damages, taxes, rents and tolls	55.01	60.00

SEVEN MONTHS.

Gross receipts	500,937.00	461,258.00
Operating expenses	199,706.00	194,550.00
Damages	10,500.00	10,500.00
Taxes	24,500.00	21,000.00
Rents	1,505.00	1,511.00
Tolls	54,519.00	54,311.00
Total expenses	290,730.00	281,873.00
Net earnings	209,306.00	179,385.00
Fixed charges, interest on bonds.....	108,244.00	107,916.00
Interest on temporary loans	748.00	1,604.00
Total fixed charges.....	108,992.00	109,520.00
Net profit	100,314.00	69,865.00
Operating ratio	39.93	42.17
Same including damages, taxes and rent....	47.23	49.33

DAILY STREET RAILWAY REVIEW

PUBLISHED BY

WINDSOR & KENFIELD PUBLISHING CO.

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CLEVELAND OFFICE,	- - - -	302 Electric Building

Application made for entry as second-class matter.

VOL. XII. Wednesday, October 8, 1902. No. 1

Special attention is called to the fact that all the meetings will be called on Detroit city time, which is 28 minutes faster than central standard time.

The local committee announces that there is a large amount of mail matter and a few telegrams still uncalled for at the manager's office in Exhibition Hall. All exhibitors and representatives of supply houses are encouraged to call and enquire for mail.

Our readers will note that the first page of this issue is No. 613. The folio numbers for the "Daily Review" are consecutive with those of the regular monthly issues of the "Street Railway Review" and all four "Dailies" should be preserved for binding, in order to have the year's file complete.

The headquarters of the "Review" at the Convention Hall are at Space No. 28, just at the left of the main entrance, where we shall be glad to welcome our friends. Both street railway men and supplymen are requested to leave their cards at the "Review" space in the Armory.

We hope that the American Street Railway Association will seriously consider the question of changing its name to that of the American Electric Railway Association, as was suggested in the "Review" for Sept. 20, 1902. As we said in that issue, all the arguments in favor of changing the name of the association apply with equal force to the name of the "Street Railway Review," and we then announced our intention of changing the name of the "Street Railway Review" to the "Electric Railway Review."

It is noticeable that every year a larger number of street railway companies are sending as delegates to the convention their heads of departments, as well as the president and general manager. Among the companies that are sending large delegations this year are those of Milwaukee, Wis.; Rochester, N. Y.; Philadelphia, Buffalo and New York City.

Messrs. Berry Brothers, Limited, the varnish manufacturers whose home is in Detroit, will give a carriage ride, Thursday afternoon, to the ladies in attendance upon the convention. This feature of the entertainment was determined upon after the official program was printed so it does not appear in that. An announcement will be made in tomorrow's "Daily Review" of the time the carriage and ladies will leave the Cadillac.

The Crocker-Wheeler Co. invites its friends to join it on a trolley party Thursday afternoon to the Rochester Power House of the Detroit United Ry. Special cars will leave from Griswold and Congress Sts. at two o'clock sharp (city time) for the delegates and representatives attending the convention. The trip will afford an entertaining ride through an attractive country and give an opportunity of inspecting a complete railway plant in operation. Mr. Charles W. Startsmann, of the Crocker-Wheeler Co. can be found at the Knell Air Brake exhibit, Space No. 23, Exhibition Hall.

The American Street Railway Association will meet at 11 o'clock, in the assembly hall, which is on the floor below the main exhibit hall.

There will be a meeting of supplymen at the convention hall at 11:30 a. m. today, to hear the report of F. S. Kenfield, the secretary of the committee appointed last year at New York to consider the organization of a Street Railway Manufacturers' Association. Further information may be had by inquiring at the "Street Railway Review" space or at the general information bureau.

The Wheel Truing Brake Shoe Co., of Detroit, advises us that it has arranged for an "overflow theater party" for Thursday. For fear that the capacity of the Detroit Opera House may not be sufficient to accommodate all those desiring to accept the courtesies of the A. S. R. A., the lower floor of the Temple Theater has been secured for the same evening, and those failing to secure tickets for the Detroit Opera House may get places for the Temple by applying at the space of the Wheel Truing Brake Shoe Co. in Convention Hall.

ANNOUNCEMENTS FOR REVIEW DAILY.

The editors of the Daily Street Railway Review will be pleased to receive copies of any special announcements or invitations, and notice of outings, or excursions of any kind not arranged for by the official program. A memorandum of any coming event or notice of any kind intended for the "Daily" may be left at our headquarters at Space No. 28, Exhibition Hall, at the Hotel Normandie, or at our printing headquarters with the R. L. Polk Printing Co., 65 Congress Street West, Detroit, Mich.

HOW TO REACH EXHIBITION HALL.

The annual exhibition of street railway material is being held this year at the Light Guard Armory, corner of Larned and Brush Streets. To reach the hall from the Cadillac Hotel, take a Michigan avenue car and transfer to Jefferson avenue, getting off at Jefferson avenue and Brush street. The hall is one block north of this point. From any of the Woodward avenue hotels, take a Jefferson avenue car and get off at the same place. The hall is about eight minutes ride from the Cadillac.

PRESIDENT HUTCHINS.

It was extremely gratifying to learn that President Hutchins, of the Detroit United Railway, had sufficiently recovered from his serious illness to meet the officers of the association yesterday, and everyone regrets that Mr. Hutchins' health will not permit him to take a more active part in the association meetings and entertainments.

SECRETARY PENINGTON'S GOOD WORK.

It is difficult for an outsider to appreciate the hard work involved in getting under way a large convention such as the American Street Railway Convention. Much of this task naturally falls on the secretary of the Association, and too much credit can not be given Secretary Penington for the able way in which he has handled the exhibits, the registrations, and the matters in general incident to starting the convention.

Secretary Penington has been on the ground since Saturday, working hard to clean up the odds and ends and have everything in readiness for the opening day. An innovation this year was the opening of the registration books on Tuesday afternoon and evening, thus enabling supplymen and delegates to obtain badges, theater and banquet tickets, etc., before the rush on Wednesday morning.

Anyone seeing the secretary without his coat and eating his supper and giving out badges at the same time will not doubt the truth of what we have said.

A. S. R. A. PROGRAM.

All meetings, etc., will be called on Detroit city time. Detroit time is 28 minutes faster than standard time.

Papers will be presented at the American Street Railway Association convention on the following subjects.

"Registration of Transfers"—Brooklyn Heights Railroad Co., by C. D. Meenely, secretary and treasurer.

"Benefit Associations"—Metropolitan Street Railway Co., of New York, by Oren W. Root, assistant general manager.

"Discipline of Employes by the Merit System"—Metropolitan Street Railway Co., of Kansas City, by W. A. Satterlee, general superintendent.

"Transportation of Light Express and Parcel Delivery"—Detroit United Railway, by George W. Parker, general express agent.

"The Steam Turbine: Its Commercial Aspect"—E. H. Sniffen, of Westinghouse, Church, Kerr & Co., New York.

"Signals for Urban and Interurban Railways"—Old Colony Railway Co., Boston, by G. W. Palmer, jr., electrical engineer.

"The Adjustment of Damage Claims"—Chicago City Railway Co., by M. B. Starring, assistant general counsel.

The papers have not been assigned to the different sessions, but other details of the program are as follows:

WEDNESDAY.

Address of welcome by Mayor W. C. Maybury, of Detroit.

Roll call.

Invitations extended to join the Association.

Address of President.

Report of Executive Committee.

Report of Secretary and Treasurer.

Appointment of committee on nomination of officers and selection of next place of meeting.

THURSDAY.

No business session will be held on Thursday.

FRIDAY.

Report of Committee on Rules for the Government of Employes: J. C. Brackenridge, general manager Brooklyn Heights R. R., chairman; E. C. Foster, general manager Old Colony Street Railway Co.; T. E. Mitten, general manager International Railway; W. E. Harrington, general manager Camden (N. J.) & Suburban Railway Co.

Report of Committee on Standards: N. H. Heft, president Meriden (Conn.) Electric R. R., chairman; E. G. Connette, vice-president and general manager, Syracuse (N. Y.) Rapid Transit Co.; C. F. Holmes, Kansas City; John I. Beggs, president and general manager Milwaukee Electrical Railway & Light Co.; E. A. Newman, general manager, Portland (Me.) Railroad Co.; R. T. Ladd, general manager, Worcester (Mass.) Consolidated Street Railway Co.; Will Christy, vice-president Northern Ohio Traction Co., Akron, O.

Election of officers.



ENTERTAINMENTS.

WEDNESDAY.

An informal reception will be tendered the ladies in attendance at the convention from 10 a. m. to 4 p. m. at Hotel Cadillac.

A general reception will be held at Hotel Cadillac at 8 o'clock in the evening.

THURSDAY.

The entire day will be devoted to the examination of exhibits at Convention Hall.

Thursday evening there will be a theater party at the Detroit Opera House to see "When Johnnie Comes Marching Home."

FRIDAY.

A trolley ride will be given for the ladies on Friday morning, leaving Hotel Cadillac at 10 a. m. for Mount Clemens, via the Rapid Railway and Gratiot Ave., returning via the Shore Line to the Country Club, Grosse Pointe, where luncheon will be served at 1 o'clock. The return to the city will be made at 4 p. m.

The banquet will be held at Hotel Cadillac at 8 o'clock, at which the installation of the officers elect will be held.

PROGRAM OF ACCOUNTANTS' ASSOCIATION

WEDNESDAY, OCT. 8, 1902, 10 A. M.

Address of Welcome by Hon. E. A. Blades, Comptroller of the City of Detroit.

Annual Address of President

Annual Report of Executive Committee.

Annual Report of Secretary and Treasurer.

Paper: "The Collection and Reporting of Fares on City and Interurban Lines," by Wm. C. Sampson, treasurer Union Traction Co. of Indiana.

Appointment of Convention Committees on Nominations and Resolutions.

Afternoon, 2 o'clock.

Annual Report of Committee on Standard Material and Supply Accounting.

Paper: "The Stationery Store-room," by J. R. Shurtz, auditor South Jersey Gas, Electric & Traction Co., Camden, N. J.

NO SESSION ON THURSDAY, OCT. 9, 1902.

FRIDAY, OCT. 10, 1902, 10 A. M.

Chart of Street Railway Blanks, suggested by G. E. Tripp, general auditor, Stone & Webster's Co.'s, Boston, Mass.

Annual report of Standardization Committee.

Afternoon, 2 o'clock.

Report of Committee on Standard Form of Report for Electric Railways.

Report of Committee on Nominations.

Election of Officers.

Report of Committee on Resolutions.

Installation of Officers.

Adjournment.



ANNOUNCEMENTS.

Badges of the Association will be honored on all city and interurban lines.

Information bureaus will be established at Hotel Cadillac and at Exhibition Hall.

The Western Union and Postal Telegraph companies will establish offices in the Exhibition Hall and the Michigan Bell Telephone Co. has installed telephone instruments for the use of the delegates at the hall.

The American District Telegraph Co. will also install its service at Exhibition Hall.

The power houses and storage battery stations at Riopelle St. and Hancock and Third Aves., in Detroit, and at Farmington Junction, Birmingham, Rochester, Ecorse, New Baltimore, Ypsilanti, on the interurban lines, will be open for inspection of delegates at the convention.



LOCAL COMMITTEES.

GENERAL COMMITTEE.

Jere C. Hutchins, Chairman.

George H. Russell.	Irwin Fullerton.
Albert E. Peters.	John H. Fry.
Albert H. Stanley.	Walter Ross.

EXHIBIT COMMITTEE.

John Kerwin.	John H. Fry, Chairman.	Edward J. Burdick.
W. O. Wood.		T. E. Merrill.
Albert Eastman.		William Webber.
W. O. Russell.		James Bullen.
James Anderson.		Fred C. Peters.
Thomas Farmer.		F. W. Heninger.

PUBLICITY AND INFORMATION COMMITTEE.

Albert E. Peters, Chairman.

David Brown.	Thomas Patterson.
Thomas B. Lynch.	Harry V. Catlin.
C. B. King.	W. F. Bien.
Thomas Beath.	R. W. F. Peters.
W. C. Hopper.	Paul Dohrman.

ENTERTAINMENT COMMITTEE.

Irwin Fullerton, Chairman.

- | | |
|------------------|-------------------|
| A. F. Edwards. | F. A. Hinchman. |
| John Twomey. | Robert Oakman. |
| Edward H. Ives. | George W. Parker. |
| Wm. R. Frazer. | Joseph Hampton. |
| Louis Schneider. | E. W. Brooks. |
| Ernst Klussman. | |

LADIES' COMMITTEE.

Albert H. Stanley, Chairman.

- | | |
|--------------------------|-------------------------|
| John L. Ross. | Harry Bullen. |
| H. S. Swift. | W. J. Dawson. |
| Charles Roe. | Dr. Hedley Williamson. |
| Robert Johnson. | Mrs. George H. Russel. |
| Mrs. James T. Keena. | Mrs. Michael Brennan. |
| Mrs. Arthur Paek. | Mrs. A. B. du Pont. |
| Mrs. W. R. Frazer. | Mrs. John H. Fry. |
| Mrs. Thomas Farmer. | Mrs. Albert H. Stanley. |
| Mrs. F. A. Hinchman. | Mrs. Irwin Fullerton. |
| Mrs. J. D. Hawks. | Mrs. G. B. Gunderson. |
| Mrs. C. M. Swift. | Mrs. W. J. Gray. |
| Mrs. S. F. Angus. | Mrs. John C. Donnelly. |
| Mrs. F. W. Brooks. | Mrs. C. J. Reilly. |
| Mrs. C. B. King. | Mrs. Walter Ross. |
| Miss Sarah H. Russel. | Mrs. C. D. Joslyn. |
| Miss Fanny M. M. Peters. | Mrs. Thomas T. Leete. |

RECEPTION COMMITTEE.

George H. Russel, Chairman.

- | | |
|-------------------|---------------------------|
| H. A. Everett. | Gov. A. T. Bliss. |
| E. W. Moore. | Mayor William C. Maybury. |
| R. A. Harman. | C. J. Reilly. |
| C. M. Swift. | H. M. Duffield. |
| J. D. Hawks. | Arthur Paek. |
| S. F. Angus. | J. B. Corliss. |
| George Hendrie. | F. J. Hecker. |
| Clarence Black. | Dr. Benjamin P. Brodie. |
| O. B. Taylor. | C. D. Joslyn. |
| J. T. Keena. | Benton R. Hanchett, Jr. |
| Michael Brennan. | Thomas T. Leete, Jr. |
| Fred Smith. | G. B. Gunderson. |
| John C. Donnelly. | W. E. Quinby. |
| William J. Gray. | James E. Scripps. |

PRESS COMMITTEE.

Walter Ross, Chairman.

- P. C. Baker, Detroit Evening News,
 James Schermerhorn, Detroit To-Day,
 George E. Miller, Detroit Tribune,
 Theodore E. Quinby, Detroit Free Press,
 Henry P. Hetherington, Detroit Journal,
 Carl Hoffman, Abend Post,
 Adolph Niederpruem, Michigan Volksblatt,
 PRESS AGENT—G. Walter Meade.



"TO WHOM THE HONOR BELONGS."

To the convention delegate or visitor who walks into the Light Guard Armory for the first time Wednesday morning there may not be anything that will strike him as being particularly remarkable. We have had tastefully decorated exhibit halls before, and we have even had conventions where most of the exhibits were in place by Wednesday morning, as they are here, but if the visitor will take the trouble to ask the first exhibitor what kind of treatment he has had from the local exhibit committee, the reply will be, "Never finer in the history of the Association." The words may be changed, but that will be the sentiment. Yesterday the hall was chaos. To-day every display is practically completed, and the suppliers are ready to receive the delegates.

Who made it possible?

First and foremost must be mentioned Mr. John H. Fry, chairman of the exhibit committee. The boys call him the "man on deck." If you wanted Mr. Fry, all you had to do was to speak his name, and he immediately stood not a dozen feet away. You told him your troubles, and instantly the telephone, the telegraph, half dozen messenger boys, all the machinery of the Detroit

United Railway, and all the influence of the City of Detroit, were called into action to get what you wanted. Mr. Fry doesn't sleep, doesn't eat, and unfortunately doesn't smoke. The only thing Mr. Fry cannot do is grant additional exhibit space this morning because he thinks most of the exhibitors would object to having exhibits more than one layer deep. He has even accomplished the seemingly impossible by adding several hundred square feet to the floor space available by getting a special resolution from the Detroit City Council giving the committee permission to cover one half of the adjoining streets as an annex to the exhibit hall.

Next comes Mr. Edward J. Burdick, assistant superintendent of motive power for the Detroit United Railway. Mr. Burdick is the electrical man who did all the wiring. If you wanted power of any description you asked Mr. Burdick. He went out, touched a button, and on came the power. Mr. Burdick arranged the striking electrical sign over the front entrance to the hall, and also the festoon of colored lights over the street.

And then there is Mr. John Kerwin, superintendent of track construction. Mr. Kerwin can carry a 60 ft. car from any freight depot in the city to the hall in less time than the messenger boy can get there with the bill of lading. Mr. Kerwin's scheme of portable track laying solved the problem of unloading the heavy exhibits.



JOHN H. FRY,
 Chairman Exhibit Committee.

Then there is Mr. Eastman. Mr. Eastman is the man who finds things. If you have lost anything from a street car to your hair, Mr. Eastman can help you. When he hears your troubles he puts his forefinger up to his forehead, waits a minute, goes to the telephone, says a few mystic words to his steam railroad friends up at the freight office, and before you get back to your space, your boxes are all there with a written apology from the railroad or express company for having kept you waiting.

We might go on indefinitely telling how things are done by Mr. Farmer, Mr. Parker, Mr. Russell, Mr. Lynch, and all the rest of the efficient staff from the Detroit United Railway, but it is late, and we must get to press. Sufficient it is to say that we never had more courteous treatment or attention. Gentlemen, the suppliers doff their caps to you.



Mr. John C. Dolph, manager of the insulating varnish department of the Standard Varnish Works, of New York City, is busy talking the good qualities of "Standard" varnishes. Mr. Dolph can be found at the Cadillac and at Convention Hall.



Some of the phrenids around the lobby of the Cadillac Hotel give the following information:

- "C. J. Harrington, of New York, has headquarters in Parlor E."
- "See Brill Convertible and Semi-convertible Cars at Convention Hall Annex, Space No. 3."
- "Rossiter MacGovern & Co. are at Parlor I."
- "J. G. Brill Co. headquarters are in Parlor J."
- "MacPherson Safety Switch & Frog Co. has working model of its appliances on main floor of Cadillac Hotel."

DETROIT, THE "CITY OF THE STRAITS."

From first to last Detroit has had a thrilling history. This is one of the few genuine "oldest" cities in the United States, for before New York, New Orleans, Philadelphia, or Boston had been actually founded, the site later known as Detroit from "de-troit," meaning strait, had been visited and described as a fort and trading post of the Indians. The first permanent settlement by white men was effected in 1701, when Cadillac, a sailor, soldier, explorer, and statesman of France, made his way down Lake Huron, through the St. Clair River and Lake St. Clair, into the Detroit River, and (it is interesting to note), landing at a spot very near the present offices of the Detroit United Railway, took possession of all the region for his majesty, Louis XIV, King of France. The old fort which he built occupied what is now the site of the City Hall.

For a century following, the territory about Detroit was drenched in blood, Indian massacres and wars alternating with strifes and deadly discords between the French and the British for the possession of the coveted land, which all could see was to become the key to all the Great Lake region with its vast

Lakes, and of all this trade Detroit took the lion's share. Under the guidance of General Cass, the first civil governor, and a long line of gifted public spirited citizens, Detroit and the state of which it is the chief city, have been given over to the more peaceful pursuits of trade and commerce, although the martial spirit is still there and ready to be roused into action.

During the war with Mexico, the Civil War and more recently the war with Spain, Detroit and Michigan have sent their full quota of men to fight the battles of the Union. As a permanent memorial of this patriotism there stands in the Campus Marthus, the chief center of the city, a striking monument to Michigan's soldiers. This work of art was designed by Randolph Rogers, of Rome. It is constructed of Rhode Island granite, with statues of golden bronze cast at Munich, the whole costing upwards of \$70,000. It is 60 ft. in height, and was unveiled April 9, 1872. On its four sides are medallions of Lincoln, Grant, Farragut and Sherman. On the plinths at each corner of the base are statues 7 ft. high, representing the Infantry, Cavalry, Artillery and Navy, and higher up are allegorical figures of Union, Victory, Emancip-



BIRDSEYE VIEW LOOKING UP GRATIOT AVENUE, DETROIT.

and varied commerce. Not only was ownership in the land disputed by the Iroquois, the probable rightful claimants, but roving bands of Indians and wild English, French, and Spanish voyagers as well, whom someone has called the first commercial travelers of America—laid claim to certain tracts along the Detroit and joined in the general melee. The discovery of the bloody conspiracy of the great chief, Pontiac, who designed to capture and burn the fort, the battle of Bloody Ridge, and an attempt to fire the powder magazine at the citadel, are important incidents related by history of this strenuous period.

Despite this hard life the settlement grew and prospered. In 1760 it passed into the hands of the English as a result of the British victory over the French at Quebec. The city was formally ceded to the United States in 1783, but the Americans did not take full possession until 1796. After a period of desultory border warfare, and the almost total destruction of the city by fire in 1805, came the war of 1812, the fall of Mackinaw and the surrender of Detroit to the English by Hull in 1812. The advance of General Harrison and the victory of Commodore Perry in Put-In-Bay, on Lake Erie, again restored the city to the United States, and ended the long regime of siege, warfare and strife. During the next few decades the population increased enormously and the city began to develop at a rate almost unprecedented. Fleets of steamboats from the East, and from the North and West as well, began to ply up and down the Great

pation and History. The whole is mounted by a female figure, 11 ft. in height, with sword and shield, representing the State of Michigan. On granite pedestals in front of the faades are four bronze eagles.

Even in the number and variety of the names by which it has been known, the city of Detroit has been favored above most cities. In the old traditions of the Algonquin Indians, it was referred to as *Yon-do-tiga*, or *Yon-do-tia*, Great Village. It was also called *Wa-we-a-tun-ong*, Circuitous Approach, on account of its location at the bend of the river. The Wyandotte called the site of Detroit, *Toghsaghrondie*, or *Tyschsarondia*, modernized into *Teuchsa Grondie*, and also referring to the course of the river. The Huron Indians called the place *ka-ron-ta-en*, the coast of the strait.

When first settled by Cadillac, the location received the name of Fort Pontchartrain, in honor of Count Pontchartrain, then French Colonial Minister of Marine. As the number of inhabitants increased, and the village grew, it received its present name.

The city's corporate names have been as follows: By Act of Jan. 18, 1802, it was designated the "Town of Detroit;" by act of Oct. 24, 1815, it was called the "City of Detroit;" on April 4, 1827, an act was passed providing that the corporate name should be "The Mayor, Recorder, and Aldermen of the City of Detroit;" and on Feb. 5, 1857, it was enacted that the name should be "City

of Detroit." Some time after the almost complete destruction of the city by fire, in 1805, the present emblematic seal of the city was adopted, the design appropriately bearing the motto, "Resurgit Cineribus"—"She rises from the ashes" and "Speramus Meliora"—"We hope for better times."

Detroit lies on the westerly and northerly bank of the Detroit River, which separates Canada from the United States, or, to be more specific, the British Province of Ontario from the State of Michigan, County of Wayne. The river makes a sharp bend within the city limits, thus bringing that portion of Canada across the river south of the city of Detroit. It would be well to keep this topography in mind, as it is apt to be confusing to the stranger when told for the first time that Canada is south of Michigan.

The Detroit River in some respects is undoubtedly one of the most remarkable in the world. From the northern end, where it leaves Lake St. Clair, to its southern end, where it empties into Lake Erie, the river is 27 miles long, and varies in width from one-half mile to three miles. The total tonnage of all vessels passing Detroit in the seven months of the year during which navigation is open aggregates 35,000,000 tons, or is nearly equal to the combined tonnage of all the vessels clearing annually at London and Liverpool.

The depth of the Detroit River varies from 10 to 60 ft., and averages 34 ft. The river bottom is sandy or stony, and is free from dangerous obstructions. The stream is navigable for vessels of the largest class, and forms one of the safest harbors in the world. Through this comparatively short water-course passes all the water from the three northern Great Lakes, Superior, Michigan and Huron, and from Lake St. Clair and the bays of Green, Saginaw and Georgian, or a water surface of 82,000 square miles, comprising the drainage from 125,000 square miles of land. The water is very pure, and the current is rapid and generally uniform, the direction being first west and then south.

There is, of course, no tide, but, like other portions of the remarkable body of water comprising the Great Lakes, there is considerable fluctuation in the mean water level, the extremes seemingly dependent for the most part on the direction and velocity of the wind, a strong southwest wind having been known to lower the river 5 ft. below mean level. In addition to this, however, there seems to be through all the lake region a rise and fall in the mean water levels that amounts almost to a tidal movement, but the cycle of this fluctuation has never been satisfactorily determined, and it is not even known whether the periods are regular or subject to variations.

The river forms part of the International boundary line between the United States and Canada; the boundary line opposite Detroit is located about midway of the stream, and for the most part nearest the Canadian shore, so that the United States controls the greater portion of the water-way, although the stream has been declared a public highway by Act of Congress, dated Dec. 13, 1819.

A recent innovation on the river, instituted by the government, is the collection of mail matter from all vessels passing Detroit in either direction. Many of these crafts do not stop at Detroit and the government has made arrangements to have a steamer meet all vessels in mid-stream and deliver and receive mail matter. The mail steamer, which is a small white boat, can be seen from the foot of Woodward Ave. at all times of the day, darting in and out from the shore, intercepting passing craft. The procedure is to send off a man in a row boat from the main vessel, who pulls alongside the passing steamer, and throws a line to the deck. The steamer takes the row-boat in tow long enough to pass the mail over the taut line; the row-boat is then cut loose and man and row-boat are picked up by the mail steamer, which, during the operation, has been hovering near. This service is given regardless of weather conditions, and at times is fraught with considerable danger to the man in the row-boat.

It is claimed that in the Detroit River were made the first experiments with submarine craft of the Holland type. The first Holland boat built for subsurface navigation was constructed at the Detroit Boat Works, in 1891.

Detroit is 18 miles from Lake Erie; 207 miles from Saginaw River; 303 miles from Mackinac; 509 miles from Milwaukee; 634 miles from Chicago; 316 miles from Sault Ste. Marie; 742 miles from Duluth; 57 miles from Toledo; 105 miles from Cleveland; 255 miles from Buffalo; and 629 miles from Montreal.

Detroit lies in latitude 42° 19' 50.28" north, Boston, Rome and Constantinople being in about the same latitude; the longitude is 83° 2' 47.63" west of Greenwich, England, and 5° 59' 45.83" west of Washington, D. C.



POST OFFICE.

In this region the Detroit River has been made the dividing line between eastern and central standard time, and all trains arrive at and depart from Detroit on central standard time, which is the same as Chicago time, or one hour later than New York or Washington time. Across the river from Detroit the time changes to eastern standard.

However, in all ordinary matters in the city of Detroit, standard time is frequently disregarded and local, or sun, time is used. This time is 23 minutes and 59.06 seconds slower than Washington, or eastern, standard time. This gives rise to a great amount of confusion, and strangers are cautioned when making appointments or referring to clocks in the city, to make sure which reckoning is designated. To make matters worse there is considerable lack of uniformity among the residents and store-



PAVILION IN BELLE ISLE PARK.

keepers as to the adoption of a standard. For instance, the clock on the city hall gives local, or sun time, and the clock on the Post Office gives central standard time. The clocks in the lobbies of most of the hotels give central standard time. The clocks in some of the stores give central and in others local time. The street railways are operated according to local time.

Much of this confusion arises from a recent decision of the Common Council. Formerly all clocks in the city were set by local time, which was acknowledged as authority. A few months ago, in response to a strong public sentiment, the Common Council passed an ordinance abolishing the local standard and recognizing central standard time as official. This ordinance was generally heeded throughout the city, but immediately gave rise to a number of difficulties, such as the use of street railway tickets bearing certain designated hours of the day within which they could be used, etc. After several lawsuits had arisen, in which the courts held that local, or sun, time was the official standard of the city, the Common Council repealed the ordinance and restored sun time as official. But many of the citizens who had petitioned for the change to central standard refused to abide by the later act of the council, and still adhere to the central standard for reckoning. Hence the confusion.

On the opposite side of the river from Detroit are the Canadian towns of Windsor, Walkerville and Sandwich, where are terminals of several of the main steam railroad trunk lines. The owners of lake shipping have thus far prevented the building of

land side and connection can be had by boat from several points.

Nearer the city are several islands that vie in popularity with the Flats as resorts for the summer excursionists in search of recreation. Chief of these is Belle Isle, reached by boat from the foot of Woodward Ave. or by Jefferson Ave. electric cars. Belle Isle is north of the center of the city, but lies within the city limits. The island comprises a beautiful park, containing about 700 acres. It has been improved and beautified and forms a charming place for recreation and amusement. Beautiful lawns, walks and flower beds, facilities for boating, bathing and picnicking, a fine collection of birds and animals, and opportunities for rest, refreshment and amusement, are among the attractions offered. The island is reached from the Detroit side by a bridge, the only bridge over the Detroit River, and this passes over only one channel of the river. There has been spent in improving the island, including the cost of the bridge, nearly \$1,850,000.

Tashmo Park is another resort in great favor with pleasure seeking Detroiters and their visitors. The property is owned by the White Star Line, and comprises 60 acres of land in the St. Clair River, about 20 miles above Detroit. The park is reached



CENTRAL AVENUE IN BELLE ISLE PARK, DETROIT.

bridges across the river at Detroit, and all the steam roads entering this point from the east are therefore compelled to ferry all freight and passenger cars over the stream on barges. There are some half dozen of these railway ferry routes, and there are in addition numerous ferry and steamboat lines plying across and up and down the river to the various islands and Canadian points.

In the matter of attractive pleasure and outing resorts made easily accessible by steamer lines up and down the river and by the interurban electric lines, Detroiters are especially favored. In the warm months the pleasure traffic carried by the pleasure boats and by the interurban cars is enormous.

A very popular trip is up the river, through the United States ship canal to the St. Clair Flats, a group of wooded and marshy islands near the entrance to Lake St. Clair. The Flats are famous throughout the region as the home of many specimens of the feathered and finny tribes, and for the splendid club houses, hotels, cottages and pleasure resorts that cover the islands and line the banks of the many crystal water streams. The electric line of the Detroit Rapid Railway also approaches these happy hunting, fishing and pleasure grounds and waters from the main-

during the excursion season by the mammoth new steamer, "Tashmo," which is said to be one of the finest excursion steamers on the lakes. Access is also had to the park by way of the Rapid Railway system to Algonac, and by launch ferry to Tashmo Park. The property is laid out with fine groves, ball grounds, race track, bathing beaches, and has all the attractive features that go to make up a modern pleasure park.

A little beyond Tashmo Park lies the popular summer resort known as "Grande Pointe." There are many attractive and expensive family cottages here, and a well-appointed hotel, with wide verandas, from which an exceptionally delightful view is commanded.

These two resorts are within easy rowing distance of the best fishing banks of the St. Clair Flats.

South of Detroit, on the Detroit River, is the popular "Bois Blanc" park, which is owned and managed by the Detroit, Belle Isle & Windsor Ferry Co. It is 14 miles from Detroit, at the confluence of the Detroit River and Lake Erie. The company has made many improvements in this place, and fitted it up with every detail for the amusement and pleasure of visitors. It is particularly used for picnic parties. There is also a fine cafe

where meals may be enjoyed amid the ever-changing panorama of the Detroit River. "Bois Blanc" Park is reached by excursion steamer "Columbia," which leaves from the foot of Woodward Ave. twice daily during the summer season.

Another large island in the Detroit River that is much frequented by excursionists is "Grosse Isle," 12 miles below the city and reached thrice daily by the steamer "Wyandotte," and also



WATER WORKS PARK.

by ferry from Trenton, where connection is made with the Trenton Division of the Detroit United Ry.

In addition to these resorts on the river and Great Lakes, the interurban lines of the Detroit United Ry. serve a score or more of inland lakes, ranging from mere ponds to extensive bodies of water, each one of which has become a center for groups of summer homes that are occupied by all classes of Detroiters seeking to escape the crowded city during the summer months. These lakes abound in fine specimens of the "finny tribe," and small game of almost every description can be found around their shores during the seasons. Cass Lake, Pine Lake, Sylvan Lake, and Orchard Lake are a few of this group of small inland lakes reached by the Orchard Lake Division of the Detroit United Ry. On the Flint Division of the same system is Lake Orion, where is held every year a popular and well-attended "Bible Conference."

In the matter of public parks Detroit is well equipped. There are numerous squares and open areas, chief of which are the Campus Martius (named after the military camp of Rome), in front of the City Hall, and Cadillac Square, running east from the City Hall. There are nearly 1,000 acres embraced in the park system, which includes Palmer Park, Water Works Park, Cass Park, and Clark Park.

Detroit owns its own water works and its own electric lighting plant. The water works are on the river front, in the extreme eastern portion of the city. The grounds about the plant embrace 70 acres, and are given over to fine floral displays and ornamental gardening. The property is worth \$5,000,000; there are over 500 miles of water mains, and 10,000,000 gallons of water are pumped daily.

The method of lighting the city is unique, and will attract the immediate attention of strangers. The arc lamps are supported on steel towers, placed to average six towers to each square mile, there being from four to eight 2,000 c. p. arc lights on each tower. The towers vary in height from 101 to 150 ft. They are triangular in section, and are made of steel pipe and rods, each tower being thoroughly braced from four directions by long guy cables attached to posts in the streets or sidewalks. The towers are fitted with a small cage-like elevator in which the man who cleans and trims the lamps raises himself to the platform at the top. The elevator is counterweighted to balance the weight of an average man, and the lamp cleaner has merely to apply

enough force to the rope to overcome friction and slight excess of weight. There are 133 of these towers in the city. They were erected in 1884 at a cost to the city of \$1,200 for each tower, although the actual cost of building them was about \$100 for material and \$100 for labor, per tower. The theory followed in placing the arc lights on high towers seemed to insure a more even and uniform distribution of light over the entire city than could be secured by lights mounted on single poles of the usual height. The same scheme has been tried in New Orleans, Mobile, and various other cities, but does not appear to have met with the same success elsewhere as it has in Detroit.

It is noteworthy that Detroit has been remarkably free from large fires, since the great fire of 1805, when most of the city was laid in ashes. The fire department is excellent, there being 24 steamers, 5 chemical engines, 10 hook and ladder trucks and a force of 500 men. The water front is protected by the fire-boat "Detroiter," which is manned by 12 men and can throw 15 effective streams at one time.

The police force is maintained in splendid condition, there being a total force of 500 men and officers located at 10 central stations.

The city has two telephone systems, one operated by the Michigan Bell Telephone Co., and one by the Detroit Telephone Co., and public pay stations are placed in convenient places in all parts of the city. City calls may be made for five cents, either from central offices or from automatic nickel-in-the-slot 'phones.

The schools, theaters, churches and city and public buildings in Detroit cannot be excelled by any city of equal size. Detroit has long enjoyed the appellation of the "Convention City," and there are upwards of 20 good hotels, which, with innumerable good boarding houses, insure comfortable accommodations to suit all tastes and likes from the most fastidious down. The Russell House, opposite the City Hall, is the oldest house, and is first-class in all appointments.

Among other things for which the city is noted are the following: Population (1900), 285,704, with suburbs, 300,000; 250 miles of paved streets; 461 miles of sewers; 66 public schools, 91 private schools and colleges; 190 churches; 52 banks; banking clearings per year, \$100,000,000; the largest seed house, the largest



DETROIT MUSEUM.

stove factories, the largest chemical laboratory, the largest varnish factory, the largest parlor and library table factory; and the second largest pickle and condiment factory in the world; more conventions than any other city in the country; largest directory publishing house in the world; largest patent factory in the United States; largest factories in the United States for the making of capsules; large car and wheel works; immense plants for the production of iron, steel and brass castings, machinery of all kinds, and plus.

PRESIDENT VREELAND.

TEN AND TWENTY YEARS AGO.

Mr. Herbert H. Vreeland, president and manager of the Metropolitan Street Railway Co., of New York City, has earned the distinction of being known as "the busiest man in Manhattan."

Mr. Vreeland was born in 1858, in the little town of Glen, in the Mohawk Valley. He was the youngest of a large family of children, whose father was for a quarter of a century pastor of the Dutch Reformed Church at Glen. Mr. Vreeland's business career began at the age of 13, when he obtained employment delivering ice in Newark, N. J. In 1875 he entered the service of the Long Island R. R., first on one of the company's night construction trains, and later as inspector of ties and roadbed. In 1881 he was employed as a freight brakeman on the New York & Northern R. R. Subsequently he was a conductor on a train on this road and was advanced in their order to the positions of train



H. H. VREELAND.

master, assistant superintendent, general superintendent and general manager. While serving in one of those capacities, Mr. Vreeland first made the acquaintance and won the regard of William C. Whitney, who was one of the principal owners of the New York & Northern R. R. When Mr. Whitney organized the Houston Street, West Street & Pavonia Ferry R. R., Mr. Vreeland was made a director of that company, and thus began his connection with the street railways of New York. In 1893 he was elected president of the Metropolitan Street Railway Co., which was the successor of the Houston Street, West Street & Pavonia R. R.

Mr. Vreeland has repeatedly held offices on the board of the American Street Railway Association and other prominent transportation societies.



The Rapid Transit Co. of Chattanooga will put six new passenger cars in service for regular passenger traffic. The company has converted a work car into a handsome and commodious "special" car, provided with upholstered, revolving chairs and many luxurious appointments. A compartment at one end of the remodeled car will be used as a smoker.



The Christensen Engineering Co. will distribute at the convention a booklet containing the names of the roads upon which its air brake apparatus is installed, together with the number of equipments on each road. This is in accordance with the Christensen company's well-established policy of publishing the names of patrons, so that anyone who desires to consider the merits of the Christensen air brakes may know where to see the equipments in use under the severe conditions of actual service, which is the only satisfactory test for mechanical appliances.

The American Street Railway Association was organized in Boston 20 years ago, at a most auspicious time—the beginning of the epoch of electric transportation. At the time the association was organized there were 415 street railways doing business in the United States and Canada, employing a total of 35,000 men and operating altogether 18,000 cars over 3,000 miles of track. These roads carried annually about 1,212,000,000 passengers, who depended as to the manner of local transportation solely upon the horse or mule, these beasts of burden not having at that time been rendered hors de combat by the electric motor. The total amount of capital invested in these roads was \$150,000,000, "with no security but the faithfulness of the service rendered by the companies themselves." The organizers of the association very justly considered these conditions greatly in advance of those of the previous decade during which the omnibus had rattled erratically through the streets of the principal cities, and the street car had been avoided by a certain class as suitable for persons bound on vulgar business, but not at all adapted to the requirements of polite society. At the first convention meeting one of the organizers in a speech before the assembly boasted that society folk had lately availed themselves of the horse car and that it was no longer an uncommon thing "for ladies in silks and velvets and resplendent with gems" to affect this means of transportation to and from the theater and concert hall. What would the amazement of this gentleman have been had it then been revealed to him that within 20 years street cars would be in requisition for funerals, weddings and fetes of all kinds, that in the course of events, even senators of the United States would be ejected for failure to pay their fare, and that the street car, sans horse, or locomotive, or any visible motive power, would daily carry many thousands not only about town, but from one large city to others in a neighboring state.

The first meeting of the association was held in Boston, December 12th, 1882, in response to a circular issued by Mr. H. H. Littell, of Louisville, Ky., to all the presidents and superintendents of companies in the United States and Canada, calling upon every road to send a representative for the purpose of forming a fraternity. The meeting was held at Young's Hotel, Boston, and was called to order by Mr. Littell at 2:15 p. m. with some 60 representatives of street railways in attendance. The enthusiasm with which the business proceeded indicated the extent to which the need of such a fraternity had been generally felt and helped to expedite the progress of organization. Hon. Moody Merrill, president of the Highland Street Railway Co., of Boston, was elected chairman and made an eloquent address, in which the necessity of concerted effort in the acquisition of knowledge concerning the operation and management of street railway systems, the benefits of business fraternity, and the present outlook were clearly stated. There followed a general discussion of the situation, and the appointment of committees for the framing of constitution and by-laws. The matters principally discussed were whom should be eligible for membership, and whether members should pay initiation dues and assessments per ratio of the business done by their respective roads, or whether Big Clause and Little Clause should share and share alike in the expenses as well as the benefits of the association. The manner in which these matters were adjusted is surely as familiar to all good members of the present day as the articles of catechism, and it is safe to say that no similar body was ever organized with greater unanimity of spirit, as none have been organized to better purpose.

At the meeting on the following day, December 13th, the organization was completed by the adoption of constitution and by-laws, the first article of the former reading: "The name of the association shall be the American Street Railway Association, and its office shall be at the place where its secretary resides," and the second, "The object of the association shall be the acquisition of experimental, statistical and scientific knowledge relating to the construction and operation of street railways, and the diffusion of this knowledge among the members of the association, with a view to increasing the accommodation of passengers, improving the service and reducing its cost,—the establishment and maintenance of a spirit of fraternity among the

members by social intercourse, and the encouragement of cordial and friendly relations between the roads and their patrons." The following officers were elected: President, H. H. Littell, of Louisville; first vice-president, William H. Hazzard, of Brooklyn, N. Y.; second vice-president, Calvin A. Richards, of Boston, Mass.; third vice-president, George B. Kerper, of Cincinnati, O., and secretary and treasurer, Wm. J. Richardson, of Brooklyn, N. Y.

The meeting adjourned, and delegates and visiting friends attended a banquet at 4 p. m. at Young's Hotel, tendered by the presidents of the street railway companies of Boston. At the conclusion of an elaborate repast, Mr. Richards, president of the Metropolitan Railroad Co., of Boston, who acted as host, in an after dinner talk, spoke in part as follows:

"The position of the horse railroad president is not to be described. It is an onerous position, calling for indomitable perseverance because it supplies the demands of the public. The public will put up with everything in steam cars, but the least thing out of the way in horse cars will cause complaint. This is a peculiar freak of human nature. In Boston we have great difficulties to surmount. Owing to the great competition in this city between street railway companies the public has been educated to expect everything, and I should not be surprised if we were obliged eventually to back our cars up to the very doors of dwellings. There should be an exact understanding of what we have to do. We should consider the best way of feeding horses and caring for them, the best pattern and manufacture of cars, and how to make conductors honest. Above everything else let the members of this association foster a brotherly regard for each other, so that, when we meet in strange cities we shall be as brothers, and there shall be no north, south, east or west with us."

The American Street Railway Association prospered and grew to large proportions in the 10 years that followed the organization meeting at Boston in 1882. The association convened in Cleveland October 19th, 1892, with some 250 representatives of member companies in attendance, about 100 representatives of non-members, and 7 representatives of applicants for membership. The president, Mr. John G. Holmes, of Pittsburg, Pa., called the meeting to order at 10:45 a. m. and introduced Hon. William G. Rose, mayor of Cleveland, to the assembly, whose speech of welcome is here quoted as showing the change that had been brought about in 10 years in transportation facilities and the fact that the trials of the street railway manager, as experienced in Cleveland, had not been mitigated by reason of the vast improvement in the service rendered. Mayor Rose said in part: "This convention, representing all kinds of surface street railways, steam dummies, horse, cable and electric cars, is one of the most important conventions that ever assembled in this or any other city. * * * In the New York World of August 15th there is a communication written from this city, two and a half columns in length, from which I will read the following extract: 'Prospect street, from one of the finest residence streets in the country, has been transformed into a street where life is almost a burden. The electric cars with their horrible uproar are tearing up and down at all hours of the day and night and at intervals of less than a minute. The charged rail is continually knocking horses high into the air and sending them sprawling to the ground. Driven mad by the electric shock and terrified by the electric motor the crazed animals tear through the streets strewing the roadway with wrecks of carriages and with thrown riders.' The mind shrinks back appalled at the contemplation of such a scene. Horses 'knocked high in the air'—You may search in vain for a man, woman or child who ever saw one of these horses, that was knocked so high in the air, come down again. Where have they gone? Perhaps beyond the reach of the earth's attraction, and they may still be soaring through space. What a picture Prospect street, as portrayed by this writer, would be for the brush of a Raphael, a Rubens or a Michel Angelo.

It is true that accidents often happen. I would, however, rather bear the ills we have than to go back to the barbarous system of horse cars. The use of electricity as a motive power is yet in its infancy, and it is only a question of time when all desirable improvements will be accomplished. It is less than five years since the first electric railway was successfully put in operation in the United States. You will find in the Forum for

September, 1891, a very able article on this subject from the pen of Mr. Frank J. Sprague, who says there were then in operation and under contract in the United States, Europe, Australia and Japan not less than 350 electric street railways, using more than 4,000 cars and 7,000 motors, with 2,600 miles of track and a daily mileage of nearly 500,000 miles, and carrying nearly a billion passengers annually. This was over a year ago, and the tabulated statement contained in the "Electrical Industries" for October, 1892, shows that on the 15th of September last, just one year later, there were in the United States alone 469 electric roads, with 5,446 miles of track, using 7,769 motor cars and 3,790 trail cars. If these statements are both correct, wonderful progress has been made in the construction of electric railways during the past year."

President Holmes in his address said: "This city offers a fine opportunity for the study of practical street railroading. Here we see the most advanced ideas of construction, the highest development of the electric system, and a splendid new cable plant as nearly perfect as capital, invention and engineering skill have been able to make it, and by way of contrast and historical interest we find a few horse car lines to remind us of the meetings a decade ago when we used to grow excited over discussions of the relative merits of the horse and the mule as a street railway motor. The street railway interests of the United States are assuming wonderful proportions. Every day some new company is born, and every morning paper brings us rumors of consolidations, absorptions and syndicate purchases until the statistician lays aside his pencil bewildered by the mass of accumulating and shifting figures. Definite data is out of the question and I shall not attempt to tell you how great we are even in round numbers."

The convention proceeding in the order of business, a summary of the treasurer's report was read, which showed receipts of \$7,574 and disbursements of \$6,049.

The reports of the special committees were then read, the program being as follows: A history of the Events Leading up to the Formation of the American Street Railway Association, by Mr. D. F. Longstreet, general manager of the West End Street Railway Co., Denver, Col.; A Model Electric Street Railway Roadbed and Underground Wiring, by Mr. George W. Baumhoff, general manager of the Lindell Ry., St. Louis, Mo.; A Perfect Overhead Electric Construction, by Mr. Charles H. Smith, superintendent of the Troy & Lansingburg R. R., Troy, N. Y.; Economy of Machine Shops for Electric Street Railways, by Mr. J. H. Bickford, engineer Naumkeag Street Ry., Salem, Mass. Other reports of committees covered Forms for Street Railway Electrical Statistics, Power House Engines, Relative Cost of Operation of Horse, Cable and Electric Roads, and Standards for Electric Street Railways.

Resolutions were adopted that the association send greeting to the tramway managers and officers of Europe and foreign countries, cordially inviting them to attend the 12th annual meeting of the association to be held at Milwaukee in 1893, during the World's Columbian Exposition, and a vote of thanks was extended to the Short Electric Street Railway Co. for its entertainment of the delegates while in Cleveland. On the morning following the adjournment of the last session carriages were provided by the Walker Manufacturing Co. in sufficient numbers to transport all who were in attendance at the convention, including delegates, supply men and the ladies who had accompanied them, for a drive about the city and a visit of inspection to the Walker company's works. Subsequently a banquet was served at the Hollenden Hotel, at which the late Thomas H. McLenn, first vice-president, presided in lieu of the president, Mr. John G. Holmes, who had been called home on account of a sudden bereavement in his family. Following the speech of the toastmaster, Mr. McLenn, these toasts were in order: "Some Phases of the Legal Liabilities of Street Railroad Companies," by Mr. Andrew Squire; "The City of Cleveland," by Gen. Edward S. Meyer; "An Ideal Street Railway, a Prophecy," by Mr. R. A. Russell; "The Currier, from the Standpoint of the Currier," by Mr. James H. Hoyt; "The Benefits of Street Railroads to Cities and Citizens," by Mr. Richard Bacon; "The Press," by Mr. W. W. Armstrong. Mr. Tom L. Johnson and Mr. William Richardson addressed the company, after which the banquet came to an end by all rising and singing "Auld Lang Syne"

PRESIDENT MACKAY

Mr. H. C. Mackay, president of the Street Railway Accountants' Association, has been an active and invaluable member of the organization since being elected to the executive committee at the meeting in 1898. One service of his to the Association would alone suffice to prominently distinguish him; that is the practical suggestion of his paper read before the Chicago convention in which Mr. Mackay advocated the use of the car hour for general comparisons in preference to the car-mile unit. Mr. Mackay is a native of La Salle, Ill., where he was born on October 6, 1869. At the age of 18 he began his railroad career as a clerk in the general offices of the Minneapolis, Lyndale & Minnetonka Ry., and was made paymaster of the company in 1888. He was later ad-



H. C. MACKAY.

vanced to better positions and retained his connection with the Minneapolis lines after they had been absorbed by the Twin City Rapid Transit Co. Mr. Mackay was made chief clerk and assistant auditor after the merger, but resigned the latter position in 1897 to become comptroller and auditor of the Milwaukee Electric Railway & Light Co. Mr. Mackay's election to the presidency of the Street Railway Accountants' Association is perhaps no less a tribute to his ability as an accountant than a fitting recognition of the efficient manner in which he has espoused and promoted the interests of the fraternity.



A. H. STANLEY.

Mr. A. H. Stanley, general superintendent of the Detroit United Ry., although still youthful in years, has had street railway experience equal to many of the veterans in the street railway industry. He commenced work 13 years ago, as a clerk in the office of the Citizens' Street Ry., and has literally grown up with the property. He successively filled the office of time-keeper, bookkeeper, schedule maker, division superintendent, and under Mr. Tom L. Johnson, and later under Mr. Du Pont, he held the office of assistant superintendent of the Detroit United Ry. In March of the present year he was given full charge of all outside work and operation, with the title of general superintendent.

Mr. Wm. W. Donaldson is representing the Gould Storage Battery Co., of New York City. His company's exhibit will comprise various forms and sizes of battery plates and a large single cell which is one of the largest battery cells ever made.

BROAD-GAGED POLICY AT BUFFALO.

By making a general increase of 10 per cent in the wages of its entire force of conductors and motormen, numbering about 1,200 men, the International Railway Co., of Buffalo, has again shown its faith in the belief that the welfare of its employes, and therefore the welfare of the company, can best be subserved by adopting toward them a broad and liberal policy. This is the second increase in trainmen's wages in Buffalo since the first of last year. The action of the company was taken shrewdly as a recognition of the excellent service performed by its employes, and owing to the fact that the company is prosperous, and is therefore able to carry out the desire and intention of the management to make the positions held by its men worthy of their best endeavors and earnest, faithful work.

The following is the letter announcing the increase sent by General Manager Mitten to each one of the employes:

"Dear Sir: The general excellence of the service rendered by our trainmen prompts me to express my appreciation and to take this opportunity of thanking you personally for the part you have taken in bringing about such a gratifying state of affairs.

"Your painstaking efforts have made the present success possible, and in recognition thereof I now advise we will at once materially increase the wages of the trainmen. The new rate is as follows:

"Twenty cents per hour, platform time, for the first year continuous service.

"Twenty-one cents per hour, platform time, after one year's continuous service.

"Twenty-two cents per hour, platform time, after two years' continuous service.

"I would also remind you that the wages paid on the various lines controlled by this system, in March, 1900, ranged from 14 to 18 cents per hour, an average increase of over 5 cents per hour having been made since the date of our meeting in Saint Stephen's Hall. Superintendent C. Oons and his assistants have aided me in carrying out the promises made at that time and as a result the rules have been modified and revised; regular men are not obliged to forfeit their runs as formerly; runs have been so arranged as to make the hours of relief most pleasing to all the men; all high-speed cars have been equipped with air brakes and seats have been provided for motormen of inter-urban lines.

"It is, therefore, apparent that we appreciate your loyal support and intelligent work, and, in consequence, are endeavoring to so improve both the wages and surrounding conditions as to make the positions worthy of your best efforts.

"Trusting that the present happy state of affairs may continue undisturbed and that each man will do his utmost to give this company the reputation of having the most careful and courteous trainmen in the world, I am,

(Signed) "T. E. MITTEN."



VAN DORN-DUTTON AND VAN DORN-ELLIOTT.

The Van Dorn & Dutton Co. and the Van Dorn-Elliott Electric Co., both of Cleveland, occupy a space together at No. 24. The Van Dorn & Dutton Co. will exhibit gears and pinions, an armature lift and a track cleaner.

The Van Dorn-Elliott Electric Co. shows a line of re-wound armatures, armature coils, field coils and commutators, which are attracting a great deal of favorable comment.

The two companies are represented by W. A. Dutton, J. N. Elliott and O. E. Foote.



A shower of sparks from the overhead structure of the Manhattan Ry., N. Y., extending for 25 yards along Bayard street, was caused September 15th by a workman's dropping a bolt on the third rail, and resulted in a panic among pedestrians.

Mr. C. S. Aekley, representing the Sterling-Meaker Co., of New York City, is at the Griswold. Assisted by Messrs. E. B. McLean and E. F. Wickwire, he will exhibit eight different forms of fare registers, brakes and sand boxes.

WHEELING TRACTION CO.

The report, which has recently been confirmed, that options on a controlling interest in the Wheeling (W. Va.) Traction Co. have been given to the president, Mr. Conderman, indicates that negotiations are in progress for the sale of this property and it is believed that eventually the road will be incorporated in a larger system. The Wheeling Traction Co. completes the extensions now under way it will have 70 miles of track and serve 100,000 people.

It is understood that the holders of stock are now asking par and have been offered 97, while less than a year ago the stock was a drug on the market at 40. This appreciation is very gratifying to the owners and reflects great credit on the manager, C. E. Flynn, who has had charge of the property since November, 1901. This is no new experience for Mr. Flynn, however, as the Wheeling Traction Co. is the fourth railway property that he has pulled out of the hole and put on a paying basis.



FILER & STOWELL ENGINES IN DETROIT.

Engineers visiting Detroit will be interested in noting the Filer & Stowell engine installed in Station "B" last fall. This engine, which drives a 1,500-kw. Westinghouse generator, has a number of details not found in engines of similar type, among which may be noted the design of valve gear, the cylinder, piston and crosshead details, the water-jacketed main bearings, and the foundation plates under the cylinders, which extend beyond the valve gear and dash-pots. The frame is of an unusually strong design such as is used in the heaviest rolling mill practice and the bearing and guide sections are comprised in a single casting, this arrangement gives a continuous bearing on the foundation up to the cylinder.

The principal features of the design were suggested by Mr. Thomas Farmer, superintendent of motive power of the Detroit United Railway, and represent the result of his extended experience with electric railway machinery. The orders for the engine now operating and for a duplicate now building by the Filer & Stowell Co., of Milwaukee, Wis., were secured by Mr. Frank Engelhardt, of the Chicago office.

The Filer & Stowell Co. is one of the oldest concerns in Milwaukee, having been in business since 1856, but it is only during the twelve years that the company has been devoting special attention to its engine business. This company has installed some of the largest engines ever built in this country. Among the other electric roads having Filer & Stowell engines in their power plants are the Chicago & Milwaukee; the Union Railroad of Providence, R. I.; the Grand Rapids Ry., of Grand Rapids, Mich., and the Union Street Ry., of New Bedford, Mass.



EMERGENCY STEAM TRAP.

The Wright Manufacturing Co., maker of steam specialties, has its headquarters in Detroit. The Wright emergency steam trap is one of its leading devices. Of this trap Master Mechanic Bryen of the Carnegie Steel Co., Duquesne, Pa., writes: "After a thorough trial of the trap at a place where exceptional high duty is demanded it was found to perform its work in an absolutely faultless manner. The location of the trap in question is at the separator of the 40 in. blooming mill engine, the separator having a 20 in. steam inlet and 18 in. outlet with very much intermittent flow of steam." This emergency trap is claimed to be "in a class by itself." Three steam tight outlet valves are employed instead of one. These valves are placed at the top of the trap. One of the valves is equal to the task of taking care of the water under ordinary conditions, but in event of the water coming into the trap faster than one valve can discharge it the water rises in the trap carrying a float with it and opening the second valve sufficiently to discharge the surplus water, or wide open if necessary, and so with the third valve, if the volume of water coming into the trap be sufficient to tax the capacity of the three valves. The discharge from each of these valves being continuous, is very great. The Wright improved safety water columns are another specialty of this company.

THE "DETROIT" RE-INSULATING MACHINE.

Among the many important exhibits in Exposition Hall will be found the "Detroit" field re-insulating machine and the Allen & Morrison Company's "Composition" brake shoe, adjoining Space No. 52. Two of these machines have been in successful operation for the past three years upon the Detroit United Railway and an opportunity is thus afforded to see it in actual use; it is highly endorsed by numerous other roads. The company's brake shoe is also extensively used. H. Rawstron, secretary of the Allen & Morrison Brake Shoe & Manufacturing Co., and Donald Rawstron, superintendent, are in charge of these exhibits.



THE AUSTIN SEPARATOR.

The Austin Separator Co., of Detroit, has a legion of friends and endorsers, and General Manager F. F. Wormer will be very glad to see all who call. In the Austin separator the steam is given a circular course and all condensation and impurities that may escape the corrugations are removed by the joint operation of centrifugal force and gravity while passing over the separating plate. All steam passing through the separator has an unbroken contact with separating surfaces. It is claimed that this separator removes all grease, oil and every other impurity. The Austin company's new cast iron horizontal receiver-separator is receiving much attention, being designed for high pressure service and where a larger storage capacity is desired than in the regular standard pattern.

In the new pattern the steam on entering is impinged against corrugated surfaces of a baffle plate, on either end of which there are openings, through which the entrained water is projected, and is also led by grooves, assisted by gravity into a receiver through an opening below the inlet. The steam after passing over the top of the baffle is carried to the outlet side where a lip or projection stops any moisture that is left in the steam, which in turn is carried around the outlet opening and drained through a drip hole into the receiver. There is an Austin patent spraying device which is found to be of great value attached to the Austin separator, its invention resulting from the discovery, after careful experimental study, that the successful operation of an oil separator is dependent upon the capacity of the steam for wetting the inner walls of the separating device.



MINIATURE RAILWAYS ARE POPULAR.

The Miniature Railway Co., of 391 Broadway, New York, has issued a catalog giving full descriptions of its various types of diminutive railways and pictures showing them in operation in different parts of the world. These railways are exceedingly popular and no large amusement enterprise is complete without one of the hillputian outfits. Visitors to the recent Charleston Exposition will readily attest that the outfit installed there by the Miniature Railway Co. was one of the best paying features on the grounds. The cars are only 6 ft. long and 24 in. wide and weigh 125 lb. each, while the locomotive and tender have a total length of 9 ft. 6 in., and weigh 1,200 lb.

The Miniature company's exclusive specialty is the manufacture of light steam locomotives of every size and style, adapted to wide or narrow gage track. They can be used for industrial purposes where ordinary locomotives are unsuitable or too expensive. The Miniature Railway Co. has installed logging railroads that annually haul timber enough to denude 500 square miles and are generally in use in the Southern Atlantic and Gulf states, the northern lake districts and on the Pacific coast. The company's catalog will be sent on request.



THE G. B. ESSEX BRASS CO. has a very comprehensive line of specialties that make a visit to its office and works, 480 & 482 Franklin St., Detroit, well worth while. Furthermore, visitors will be very cordially welcomed. Some of the leading specialties manufactured by this house are Essex's "Combination" hand oil pump; the Essex "Standard" sight feed lubricator for stationary engines; the Essex double sight-feed lubricators; Essex's glass body oil pump and Essex's improved all brass oil pump.

ELECTRIC STORAGE BATTERY CO.

The Electric Storage Battery Co., of Philadelphia, has an interesting exhibit in Space No. 25 on the ground floor, where several types of the company's standard cells of "Chloride Accumulator," as used in street railway work, are displayed. There are one cell each of type 17-F, 17-G and 67-G in lead lined wooden tanks and a 15 F cell in a glass jar. Several examples of the

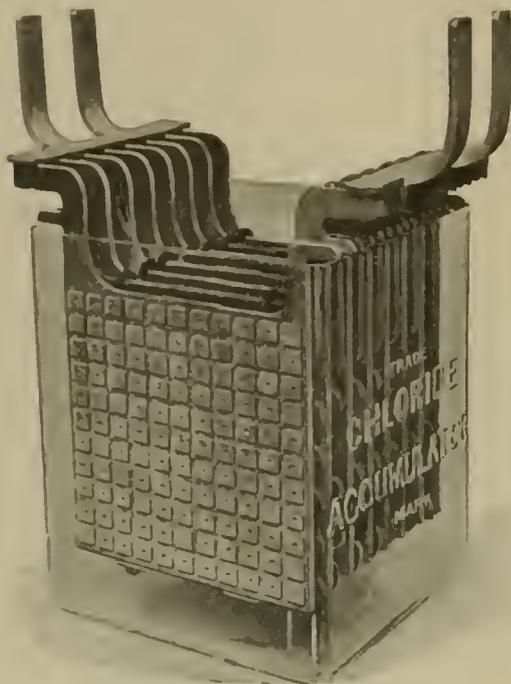


FIG. 1—15 F ELEMENT IN GLASS JAR,

vehicle type of battery are also shown, consisting of types MV-5, MV-7 and PV-9. Two switchboards are exhibited, showing the standard instruments, installed for railway service, one of which is illustrated in Fig. 3. The company is represented by Charles Blizard, manager of sales department; J. Lester Woodbridge, engineer sales department; E. Vail Stebbins, manager Cleveland sales office; R. H. Klauder, manager St. Louis sales office; G. H.



FIG. 2—10-G ELEMENT IN LEAD-LINED WOODEN TANK.

Atkin, manager Chicago sales office; R. B. Daggett, manager San Francisco sales office, and J. E. Lockwood, president of the Michigan Electric Co., the Detroit agent of the Electric Storage Battery Co. The three batteries of the Detroit United Railway will be of special interest to those attending the convention; the first located at the River St. station, opposite the power house, consisting of 276 elements, with a capacity of 2,500 amperes; the second located at the Third St. sub-station, consisting of 250 elements, with a capacity of 2,200 amperes, and the third located at

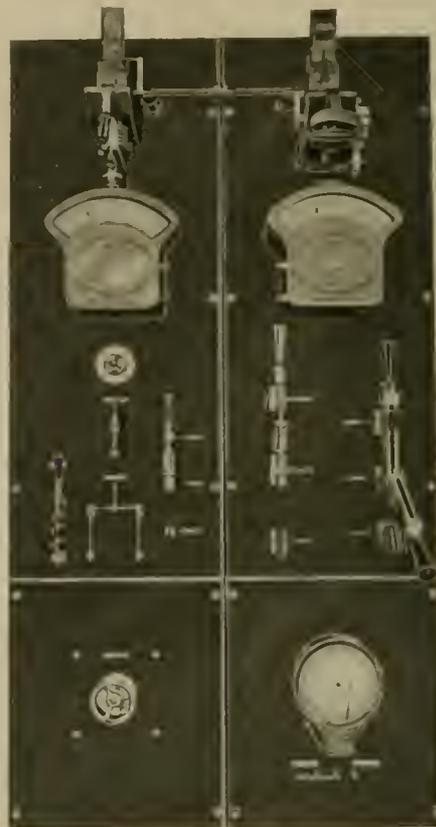


FIG. 3.

located on the Wyandotte Division, consisting of 276 elements, with a capacity of 2,800 amperes. These batteries, together with several other typical railway installations, are described in a booklet which the company is distributing during the convention. They were fully described also in the September "Souvenir" issue of the "Review."



THE H. W. JOHNS-MANVILLE CO.

The exhibit of this company is very complete, there being shown a full line of overhead line material, comprising a number of newly-designed devices, a working display of electric car heaters, and Sachs "Noark" fuse protective devices. Particular attention is called to the newly-designed insulated and metallic crossings and section insulators, which embody new features that, it is claimed, entirely eliminate the trouble experienced with other devices used for similar purposes. The line of subway fuse boxes is believed to represent the largest and most complete line of work ever built of this description, and is very interesting together with the other new features in the fuse manufacture that are also exhibited. Those present at the convention are: J. W. Perry and J. E. Meek, of the New York office; D. T. Dickson, of the Philadelphia branch; S. H. Finney, of the Chicago branch; Wm. A. Buddecke, of the St. Louis branch; also E. B. Hatch and Mr. White representing the Johns-Pratt Co.

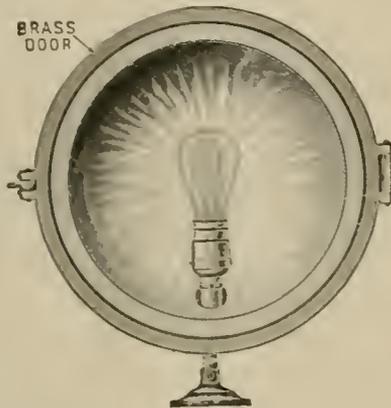


Mr. O. D. Henry, associated with Lorain Steel Co., is in attendance.

The central chandelier at the Armory is lighted by Nerust lamps.

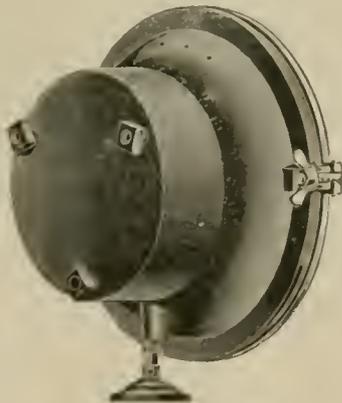
"DON'T CUT YOUR DASH!"

This is the pointed caption that the Smith New York Co. adopts to call attention to its latest improvement in electric car dash headlights. This headlight, the result of many years' experience, has some very desirable features. It is a new departure and is constructed on scientific principles. It is made in



FRONT ELEVATION SHOWING DOOR CLOSED

two sizes. The body is of heavy cast or malleable iron, the reflector of the best bronze metal, heavily plated, and the door of heavy cast brass, with heavy glass imbedded in rubber and held in place by an adjustable cast brass ring. The inside of the door is provided with a 3/8-in. square rubber gasket, which is imbedded in the door and projects 3-16 in. above the surface, making the lamp perfectly weather and dust proof when the door is closed. The whole fixture is bolted on the dash, thus



VIEW OF SIDE AND BACK

obviating the necessity of cutting a hole in the dash. This makes it especially desirable for vestibule cars. Two views of the headlight are here shown. The Smith New York Co. was established in 1849 and is well known the world over for the excellence of its products. Its general offices are at 248, 350 and 352 Pearl st., New York, and at 60 King William st., London, E. C., England



A PHILANTHROPIC IDEA

The J. A. Fay & Egan Co., of Cincinnati, O., and the Lane & Bodley Co., are planning the erection of a building upon the site of their Bond Hill factories for the benefit of the workmen employed. This will be something in the nature of a combined boarding house and restaurant, and the purpose is to so conduct it that it will take the place of the usual saloon and boarding houses which spring up in the neighborhood of large manufacturing establishments. Everything offered by the saloon will be offered here, but in a more attractive way, and it is the intention to offer everything at a price so much less than no ordinary saloon in the neighborhood can compete. The compa-

nies expect to derive a benefit by securing abundant labor of the class which patronizes boarding houses by offering attractive rooms and meals at a cost much less than the workmen could otherwise secure.



DORNER TRUCK & FOUNDRY CO.

This company has on exhibition one of its latest improved high speed motor trucks, the "Reliance" track cleaner which needs only the name for description, and Burke's patent safety switch, a new device, to which the attention of railway men is particularly directed. The features of the Burke switch are that the lock is designed to lock or hold the switch toggle in whichever position it may be thrown; this allows double truck cars to pass through a switch without the rear truck taking the wrong track, thereby throwing car crosswise and blocking the track. The lock is made with a steel rod inside of a steel coil spring and cast steel racks, incased in a water-tight cast-iron box. The claims made are that it is very compact, taking up little room, easily put in, always in working order, needs no repairs or attention, easy to operate. Motormen throw the switch with a switch rod, the same as with an ordinary switch, and it can also be arranged to operate automatically, if desired. The company has a number in satisfactory operation.

The Dorner truck exhibited is designed for high speed, and is built as near the M. C. R. specifications as was practicable in a motor truck. Some of the principal points about the truck are:

The top frame is made of 4x1 in. iron and is continuous, having no splice. The ends of the frame are half turned making them vertical, this form being patented. The transom of the trucks is formed by two 1/2x8 in. steel plates reinforced by 3 1/2x2 1/2 in. angle irons extended across the track and attached to the truck frame proper through the combined transom end and swing hanger pivot. This in turn is secured to the frame and arch bar by means of vertical bolts passing through it. The transom is further braced by gusset plates which are riveted to the frame and to the reinforcing angles of the transom. The lower swing hanger pivot rests under and is attached to the swing plank. Elliptic springs rest upon the bottom spring seat which is secured to the spring plank, and the top spring seat is attached to the iron truck bolster. The truck bolster supports the center plate and side bearings, the top spring seat forming a chafing plate to wear against the 1/2x8 in. plate which forms a part of the transom. The swing bolster and the brake rigging are secured by safety hangers to eliminate the possibility of accident. The spring base of the truck is increased by hanging the equalizer bar underneath the box, thus enabling it to have double helical springs on each side, four more than are generally used. With a 6-ft. wheel base, brakes on the outside of the wheels and the swing hanger in front of the wheels, a large amount of space for the motors is secured. The brake head and shoe are attached by a key, making it a simple operation to remove the worn shoe. The brake leverage can be altered as desired, according to the power required. By removing the pedestal tie bar bolts the truck can be lifted away from the journal box, thus leaving the latter with the equalizer and equalizer springs in their normal position. The journal boxes are of large size, giving ample room for oil and packing, and will take a 1 3/4-in. journal. The axles are 5 in. in diameter. The total weight of the truck is 8,700 lbs. The company has lately made three large shipments of this type of truck and has several other orders under way at its works which have recently been built with special reference to this line of manufacture. Because of its substantial construction, its easy riding and the nominal cost of repairs required, this truck is particularly recommended by the makers for heavy interurban work. H. A. Dorner, general sales agent, represents the company.



The Christensen force is here 20 strong. The company's work-lug exhibit at the Armory is also strong and forcible. Christensen headquarters are at Hotel Cadillac.



"The American Street Railway Convention" sign over the entrance to the Armory is a beauty. The sign on t. > City Hall is also O. K.

A "BRILLIANT" SIGN.

Inasmuch as the old practice of painting the names of routes directly on the sides of cars has gone out of favor a legible adjustable sign has become a very necessary part of every car's equipment. To avoid confusion to passengers and prevent delays through the necessity of conductors having to stop to answer questions of bewildered passengers a car sign should be legible from a distance of at least 500 or 600 ft.; should be as easily readable at night as at day; should be of standard dimen-



NEW BRILL SIGN.

sions and adjustable to any car owned by the company; and should be strong and substantial enough to withstand hard usage.

The J. G. Brill Co. is putting on the market a new sign for which much is claimed. This will be sold under the catchy and appropriate name of the "Brill-iant." The designating faces of the sign are made of celluloid with letters in patented enamel. There are no lights in the sign itself. It is to be placed on the car roof before the end or side transoms, so the light from the interior of the car will shine through the lettering. The sign is of the turn-over variety and can be furnished with double, triple or quadruple faces. A peculiar quality of these celluloid transparencies is that although the different faces of the sign



NEW BRILL CAR SIGN.

may be close together, in the double sign, for instance, there being scarcely an inch of interspace, not a trace of the back face is seen through the front one. The celluloid diffuses the light so that although the lettering on the outward face will stand out or "glow" with great distinctness, the individual characters on the side toward the light do not show the slightest trace on the outward face. The "Brill-iant" sign is adaptable to various style of holders or hangers.



The Wichita (Kas.) Railroad & Light Co. on September 12th gave the inmates and teachers of the Children's Home, of Wichita, a free excursion over all the lines of its system. A special summer car was furnished for the purpose, and a number of stops were made at parks and pleasure resorts in order that the entertainment might be complete. The children and the manager of the Home duly voted thanks to the company.

AMERICAN INJECTORS.

The American Injector Co., with offices corner of Congress St. and Brooklyn Ave., Detroit, is especially well equipped to supply the trade at this time and an inspection of its establishment will be well worth while. This company is the sole owner and manufacturer of the U. S. "Automatic" and "World" (double tube) injectors. Several points of superiority are claimed for the U. S. automatic injector, viz.: It is easy to operate, being started by simply turning on the steam; it starts at a low steam pressure and works at high pressure; it handles hotter water and feeds hotter water into the boiler; the capacity can be reduced to a greater extent; it is automatic, with wide open suction, at lower steam and with throttled suction it is automatic at any pressure sufficient to enable the injector to get the water; it works equally well as a lifting injector or as a non-lifter; it never "breaks" through jarring. A distinctive feature of the U. S. automatic injector is the drip cock, which has special advantages. It drains the injector when not in use, and thus prevents freezing; by leaving it open the injector can be started even though the check valve leaks; by opening, a start can be made with lower steam; by leaving open when not in use it prevents the suction pipe from getting hot; it enables one to take hot water out of a hot suction pipe on a long lift and it is always handy for drawing hot water when the injector is working. The positive or double tube injector is provided with two sets of tubes or jets, one set adapted to lift the water and deliver it to the second set, which forces the water into the boiler. It is better to use the double tube injectors where the feed water is of too high a temperature to be handled by an automatic injector and when a great range of steam variation is accompanied by the condition of a long lift. The American company also makes a full line of ejectors, jet pumps, drive well jet pumps, exhaust injectors, fire plugs, grease cups, brass oil cups and all kinds of jet work for steam, water, oils, acids or chemicals.



STREET RAILWAY DEPARTMENT OF STUART-HOWLAND COMPANY.

The Stuart-Howland Co. has enjoyed a most remarkable growth in its street railway department, and for the last seven months the company reports having sold and delivered 808 miles of complete overhead and pole equipment, excepting wire. This is distributed over a wide area, having gone into 23 states of the Union, four provinces in Canada, and five foreign countries. These equipments have been entirely of the company's own manufacture, with the exception of the wooden cross-arms and pins, which are turned out in immense quantities by a large mill in the South, the entire product of which is controlled by the Stuart-Howland Co. In addition to its own manufactures, the company carries one of the most complete lines of street railway, telephone and lighting supplies to be found in the United States. It also holds many exclusive territorial agencies for valuable specialties, a recent acquisition to this list being the Ham sand box and Ham trolley catcher, for the six New England States and the Dominion of Canada.



GARRIGUS MECHANICAL BOILER CLEANER.

This invention will be shown at the convention, although it is well known and is being used in a large number of the electric railway and lighting plants as well as by the largest corporations in the country in other lines of business. It is claimed that its use shows such a large saving as to make it really indispensable on such plants. The company is represented at the convention by W. R. Mason, western manager, and P. A. Doughty, mechanical superintendent.



All of the double-truck cars of the Detroit United Railway, the Detroit & Wyandotte, the Detroit & Northwestern, the Detroit & Pontiac and the Detroit, Rochester, Romeo, Lake Orion & Flint Ry., operated in and through the city of Detroit, are equipped with Magann storage air brakes.

FLEXIBLE ONE-PIECE RAIL BOND.

The importance of having the ground return circuit as nearly perfect as possible is readily apparent to street railway men. A poor or defective rail return means the same as insufficient copper in the overhead system and materially reduces the efficiency and correspondingly increases the cost of operation of the system.

Among the later types of rail bonds on the market, the "All Wire" bond made by the Ohio Brass Co., of Mansfield, O., has attracted much attention as embodying a new idea in rail bond construction. The mechanical features involved in making this bond were most carefully worked out before it was placed on

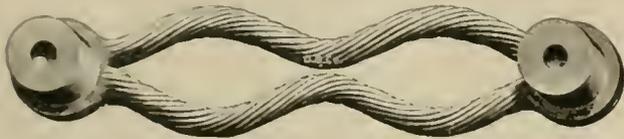


FIG. 1. FINISHED BOND, TYPE B FORM 2.

the market, so that it was presented in a fully developed and perfected form.

As its name indicates, it is made entirely from wire, including the bond terminals, so that the highest conductivity, that of pure soft drawn copper, is maintained throughout the entire length of the bond. The ends of the cable are formed of wire and are cold pressed into shape ready for welding. These terminals are afterward heated to the welding point, and welded between dies under sufficient pressure to weld the strands of wire composing the terminals into a solid mass of copper.

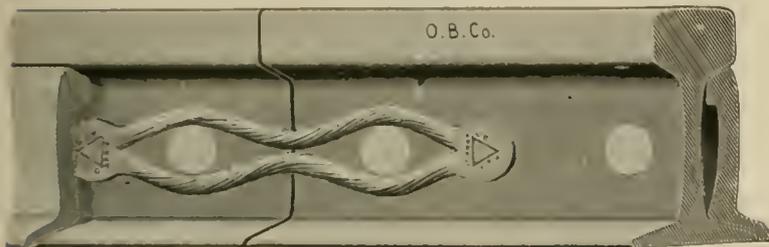


FIG. 2—70 lb. T RAIL BONDED WITH ONE TYPE B FORM 2 BOND

The "All Wire" bonds, some forms of which were more fully described in our issue for March 15, 1902, are made in a great variety of types. One of the loop style is shown in the illustrations. This bond is intended for use either under the fish plate or around it, or under the base of the rail.

CONSOLIDATED CAR-HEATING CO.

The Consolidated Car-Heating Co., of Albany, N. Y., is represented at the convention by Francis C. Green, general manager; C. S. Hawley, New York agent; C. W. Martin, Chicago agent; W. S. Hammond, jr., who is attached to the Chicago office, and Mr. Sprague, who is in charge of the operation of the exhibit. The exhibit comprises samples of the company's different types of heaters; apropos of these heaters it is interesting to note that the company has, during the nine years it has been in business, equipped over 11,000 cars involving the use of 120,000 heating coils, and that equipments furnished in 1892 are still in efficient and regular service.

Among the heaters exhibited are the following: The No. 1431, a panel heater 20 3/4 x 13 3/4 x 5 in., which is similar to those furnished on a recent order for 51 cars for the Metropolitan Street Railway Co. of New York and is now standard on that road. The 118WS heater, slightly longer than the company's ordinary cross-section heater, which is the one furnished on the principal elevated roads in Chicago, and is their standard. The 118W heater, which the company is just sending for 50 cars on the system of the Chicago Union Traction Co.; this type of heater is standard on the Chicago City Ry. to which were recently furnished 75 equipments. The sample Manhattan heater which is standard on the Man-

hattan Ry. of New York City; the contract for the equipment of this road called for 21,600 heaters of this type, making 1,200 equipments of 18 heaters each, which are very nearly completed at the present time. The No. 93 heater, which is the most satisfactory one on the market for chair cars, and which is very frequently used in the express compartment of combination cars.

LEE INJECTORS.

The Lee Injector Manufacturing Co., of Detroit, publishes the following working ranges within which the Lee ball valve automatic injector will operate. Start low, 18 to 20 lb. steam pressure on 4-ft. lift; work high, 150 to 160 lb. steam pressure or over on 4-ft. lift; lift water 20 ft. on 60 to 100 lb. steam pressure; handle hot water 120 degrees to 130 degrees at 65 to 80 lb. steam pressure; handle hot water 110 degrees to 118 degrees at 100 lb. steam pressure; handle hot water 95 degrees to 100 degrees at 125 lb. steam pressure.

The company's latest catalog contains a considerable amount of valuable information relative to injectors, their construction and the principles upon which they work; also a number of tables and considerable data of general interest to steam engineers.

DETROIT LUBRICATOR CO.

The Detroit Lubricator Co., has general offices in the Hodges Building Detroit, and its factory is at the corner of Lincoln Ave. and the Railroad. Its officers will be pleased to welcome visitors at any time and explain to them the reason why the Detroit sight-feed lubricators have been universally recognized for more than 20 years. It has always been the aim of this company to keep in the lead in improvements in design and quality of workmanship. During the past year it has added a number of specialties to its line, which now includes sight-feed lubricators, plain lubricators, brass and glass oilers, brass and glass oil pumps, multiple oilers, oiling devices, grease cups, boiler oil injectors, low water indicators, throttle valves, globe valves, steam and hot water valves, etc. More than half a million of the sight-feed lubricators have been sold. Their operation depends upon the action of natural laws, so unless some part is injured or defective, or some mistake is made in attaching or operating, they must work positively. The officers of the Detroit Lubricator Co. are: President, H. C. Hodges; vice-president and manager, C. B. Hodges; secretary and treasurer, F. W. Hodges; assistant secretary, A. B. Wetmore.

HAROLD P. BROWN.

There is no more regular attendant at the conventions than Harold P. Brown, manager of the Edison-Brown plastic rail bond, and his exhibits are always among the most interesting ones in the hall. This year Mr. Brown is located at Space No. 8 where he is operating a large testing plant and showing bonds of different types applied on rail joints and carrying current up to 3,000 amperes. He also exhibits his bonding tools, the Brown hand power grinder with flexible shaft, and the Brown portable track drill. The testing plant, which is the most complete one of its kind in the country, will be placed at the disposal of any railway engineer or official who desires to test the conductivity of any type of rail bonds, switches, circuit breakers, fuses, etc. Besides Mr. Brown, James Hollowood, superintendent; J. Maxwell Coote, electrician; Wm. Temple and S. H. Dalley are at the convention.

HOLDING THE FRANCHISE.

The story is told in California that in the town of Garvanza, a few miles from Los Angeles, a railway promoter who began construction in order to hold his franchise, laid a piece of track one rail long, the rails being supported on six ties and in order to keep this from being stolen buried the whole track some two feet under the surface of the road.

Messrs. C. E. Nicol and C. K. Freeman are looking after the interests of the Armspore Manufacturing Co., of New York City.

USEFUL IN RAILWAY WORK.

The success of the "Wells Light" (Wallwork and Wells' patents), has been immediate and remarkable, both in the United States and abroad. There are more than 17,000 of them in use. It is really a wonderful invention, the more so because of its simplicity, and its adaptation to railway uses is marked. It is a portable light, obtained from oil, of from 800 to 5,000 candle power, and neither engine, boiler, compressor nor fixed plant is required to operate it. It is strong, safe and reliable, continuous in action, unaffected by weather, steam or smoke, and it is also cheap.

The light is produced by passing kerosene oil through a heated burner, where it is generated into gas. Oil is forced into a tank by a pump until it is two-thirds full, compressing the air already in the tank to about 25 lbs. pressure. The burner is heated by turning a little oil in a dish at its base, the heat being concentrated around the burner tubes by a chimney. When the burner is sufficiently heated a valve is opened and the oil from the tank is forced by the air into the heated burner, where it is converted into gas, which issues from a jet mixing with sufficient air in a cone where it may be ignited. The chimney is then removed and the flame passing through the rings of the burner maintains the heat and gives a clear white light free from smoke or spray.



THE LIGHT IN ACTION.

A few strokes of the pump every few hours will renew the pressure and oil or air may be pumped into the tank while the light is burning. It uses kerosene oil from 110° to 150° fire test and throws no unconsumed oil spray about. The special features in the lamps and burners are protected by over 50 United States and foreign patents. The "Wells Light" is a valuable aid in track laying and repair work generally. It is also used for tire expanding by many railroads, and it is invaluable for water works. By its use lead joints may be quickly burnt out, saving 90 per cent of the lead, it is claimed. A list of the users of the light would include many of the leading railways, engineers, mines and contractors of the world. For instance, more than 100 are in use on the Chicago drainage canal. Mr. Edward Robinson is the sole proprietor of the "Wells Light." The business is conducted under the style of The "Wells Light" Manufacturing Co., 41 and 46 Washington st., New York.



The Bidwell Telephone Co., of Grand Rapids, Mich., which had secured space and intended to make an extensive exhibit of its car telephone system, has unfortunately been obliged to abandon this exhibit on account of the illness of Mr. Benson Bidwell.



Mr. Albert Eastman, of the Detroit United Ry., in addition to his duties of traveling express agent, will hereafter represent the company as its traveling passenger agent, his title now reading traveling express and passenger agent. Mr. Eastman represents the Rapid Railway System as well as the Detroit United Ry.

DUFF MANUFACTURING CO.

The Duff Manufacturing Co., of Allegheny, Pa., has on exhibit a complete line of Barrett lifting jacks, comprising both automatic lowering jacks and trip or track jacks, for car use, work in the barn, track construction and repair work. These jacks shown have lifting capacities ranging from one to fifteen tons, varying in sizes and dimensions. There is also exhibited, for the first time, the company's new Barrett motor armature lift for removing and replacing armatures. This armature lift is constructed throughout of iron and steel and the truck is provided with either flat or flanged wheels as desired, arranged for a track of 24 in. gauge. There is a side adjustment of 6 in., which is a feature very essential under many conditions. The jack used is our well-known "Barrett" automatic lowering jack, having a cradle top with wood rolls, but a flat of special top can be used if desired. This lift is light, strong, durable and easily operated and it can safely carry a load of three tons. It is designed to meet the demand for a first-class armature lift at a reasonable price and is adapted in every way to the purposes for which it is intended. The principal dimensions are: Width, 29 in.; length, 33 in.; gauge, 24 in.; height, bar down, 36 in.; raise of bar, 21 in. The company also exhibits the Barrett automobile jack, which has just been placed on the market during the past year, and which has been pronounced the best adapted jack for



BARRETT MOTOR ARMATURE LIFT

all automobile purposes, now on the market. It is also adapted to light machine work. The Barrett jacks are so well known that no description of them is needed here. The company advises us that these jacks have been adopted as a standard by all the leading street railways and steam railroads in the United States, and that it now supplies nearly every street railway in the country with Barrett jacks. The merits claimed for Barrett jacks are efficiency, excellent design, practicability, quickness and ease of operation, good material and workmanship. The company is represented at the convention by T. A. McGinley, treasurer, and George F. Freed, superintendent.



ALLIS-CHALMERS CO.

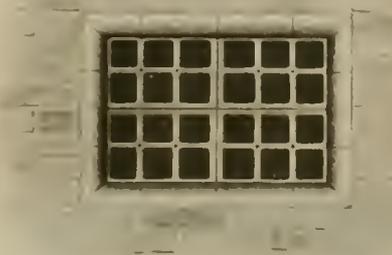
Among the engine sales of the Allis-Chalmers Co. for August are the following. Armour Institute, Chicago, one 9 and 18 by 24 in. 1890 cross-compound Reynolds-Corliss engine; Pawling & Harnishfeger, Milwaukee, one 18x36 in. 1890 frame Reynolds-Corliss engine; Interurban Construction Co., Ottumwa, Ia., one 18x42 in. 1890 Reynolds-Corliss engine; Denver Tramway Power Co., Denver, Col., one 32 and 68 by 60 in. 1890 cross-compound condensing, and one 30 and 64 by 48 in. 1890 cross-compound condensing Reynolds-Corliss engine; Southern Electric Light & Power Co., Philadelphia, one 42 and 86x60 in. combined vertical and horizontal duplex compound condensing Reynolds-Corliss engine.



Mr. Bertram Berry is at the Cadillac. The Heywood Bros. & Wakefield exhibit at the Armory will be exceptionally fine.

CONDUIT TERMINAL FRAMES.

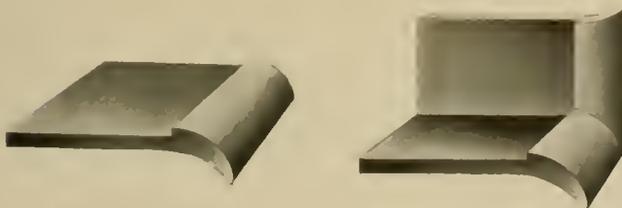
The accompanying illustrations show an adjustable terminal frame for ending underground conduit in manholes which serves not only to give the work a more finished and neater appearance, but also allows a better arrangement of cables as the cables can be placed closer to the walls without kinking the lead sheath and without being damaged by sharp corners. The common practice



FINISHED MANHOLE, WITH GEST'S CONDUIT TERMINAL.

in ending conduit in manholes has been to bring the ducts flush with the face of the wall, thereby causing a sharp corner which is encountered when drawing in cables and is liable to cut or scrape the lead cable sheath so as to cause serious injury. In shaping the cables to the walls a good arrangement can not be obtained without kinking the sheath where the ducts are flush with the wall.

The adjustable terminal frame is a radical improvement over the old method and being smooth and having no sharp edges or



SECTION OF FRAME

CORNER PIECE.

corners offers no obstruction to the drawing in of cables. The frame is adjustable to a run of any number of ducts.

This adjustable terminal frame is one of the many specialties now being placed on the market by G. M. Gest, the expert subway contractor of New York and Cincinnati, who is treating conduit construction from a scientific standpoint and is solving the problems in an artistic manner.



SMITH HEATERS IN DETROIT.

The falsity of the proverb, "A prophet is not without honor save in his own country," is clearly shown in the case of the Peter Smith Heating Co. and the street railways in and about Detroit. The heaters made by this company are used by seven of the Detroit companies, there being 50 equipments on the Rapid Railway System, 12 on the Detroit and Flint division, 12 on the Detroit, Rochester & Romeo, 11 on the Detroit & Pontiac, 12 on the Detroit & Northwestern, 12 on the Detroit & Wyandotte Rv. and 12 on the Detroit Shore Line, a total of 120.



THE SUPERIOR GRAPHITE CO. of Detroit, recently received orders in the same mail, for its "Superior" graphite paint, from Manila, P. I. and from San Juan, Porto Rico. The company has two machines working constantly putting up new machinery, and the factory is working to its fullest capacity and overtime in taking care of current orders.

ON THE SPOT.

Part I.

As I stepped onto the car platform a few evenings afterwards, No. 89 stood in the far corner of the vestibule and, with one finger on his lips, motioned me with the other hand to go inside. I went in much mystified and found the only occupants to be a mildly intoxicated Irishman and a clerical young gentleman in spectacles intently engaged in reading a book. After a while No. 89 came inside, sat down near the door and, taking a lot of tickets and transfers out of his pocket, laboriously thumbed them over. He then counted his change, figured for a few minutes with a well-sucked pencil on the back of his trip-report and then slowly rang up five fares, and—after a little more figuring—he rang up four more. This done he resumed his place on the platform and when, soon afterwards, the clerical young man got off he beckoned me out.

"Thought I was crazy, didn't you?" was his greeting. "Saw that laddie with the specs that just got off? Well, he's a spotter. New one. Boys just put me up to him an' I didn't catch on to him when he got on the car to-night down in the city an' as I had a fair crowd on when I started I thought I might 'a missed rugin' up some fares."

"I see."

"Yes, an' sure enough, I had! Lucky he stayed on long enough for me to find it out an' rect'fy it where he could see it, wasn't it?"

"Very! 'Conductor No. 89 is honest but careless about ringling up fares.' Is that the way you think the report will go in?"

"That's it, sir, to an allspice. Guess you must 'a been in the biz."

"How did the boys plek this young man out as a spotter?"

"Oh, that's dead easy. First of all he's a new reg'lar rider an' them's always suspicloned. Then he always looks direct at th' register soon's he comes in. Then he changed to th' Avenoo line onc't an' didn't ask for no transfer—paid fare on both lines. Then he always reads the same book an' turns over a page most every time a passenger comes in. Then he purtends to read, but all the time he's watchin' the conductor. Oh, there's dozens o' ways you can tell what he is an' that he's new at th' biz, an' now he's located he won't do any harm—makes him a livin', keeps a better man out o' th' way, pleases th' comp'ny an' amuses th' boys—we ain't got nothin' against him!"

"Then you believe in spotters?"

"Certain! 'f I was runnin' a road this size I'd have 'em every time or I'd soon have to go out o' business. It's diff'ent in a small road where you know yer men an' all about 'em an' even there there's knockin' down, but here 'n the city you get all kinds o' men to run the hind end 'f a car, careful men an' honest men an' men as isn't ether an' you've gotter have spotters!"

"Do they do any good?"

"Aw—say, you're kiddin'! Do good? Why there's men conductin' on this road that'd own it in a year 'f it wasn't for the spotter!"

"But they don't stop it?"

"Course not—not entirely, but they stop a lot of it—or the fear of 'em does. Stop it? Nothin' 'll stop it entirely but 'savin' grace'—as th' preachers call it—an' you don't get much o' that included for twenty cents an hour an' stand all the passengers an' Comp'ny does to you! Stop it? Why it's just this way, you see there's some as 'knocks-down' for their tobacker, an' some fer their beer an' some for their other small spendin' money—them's not the kind as hurts an' they'll average up their stakes, spotters or no spotters. It's th' kind as steals, takes all they c'n lay their hands on, makes a reg'lar biz of it—it's them as I'd spot for."

"Then you think there's a difference between 'knocking-down' and stealing, eh? Which do you do?"

No. 89 grinned sheepishly.

"Well, I guess that's what o' Johnnie useter call 'a distinction 'thout a difference! But you know what I mean, sir there's some men as 'd steal 'f they was gettin' fifty cents an hour, an' have no conscience 's to how much they took—them's th' kind as I say 'steals' but what little some o' the rest of us

takes never hurts th' comp'ny an' we makes it up 'n other ways."

"Ah, I catch your point of view, but does the company look at it your way?"

Again there was a grin.

"Guess not, from what I've seen an' heard—it's all distinction an' no difference with them," and there was a contemplative silence for a minute. "But, Lor', talkin' about knockin' down, there ain't any of it now t' what there was in th' old days. Don't know whether th' boys is gettin' honest or what, but in them days a man could make a stake. Soon after Bill Hendricks died—he was my driver—somethin' happened as scart me away from here so I quit an' went to Philadelphia an' got a job conductin' there. Say! But that was a cinch! Seven cents single fare an' four tickets for a quarter; blue cents for an 'exchange' (that's Quaker for a transfer), bell punches, different colored trip-slips to punch for different fares an' a way o' gettin' around every one on 'em! An' that wa'n't th' best of it; instead o' cardboard tickets they had little round red an' black rubber checks with th' name o' the road on 'em an' a hole in the middle so's you could carry 'em strung on a leather shoe string! Oh my, but they were easy; reg'lar 'legal-tender' in the stores all around the barns for a plug o' tobacco, a seegar or a glass o' beer, an' they come in might handy at a little game o' draw-poker—five cent ante an' a quarter limit! But it didn't last—it was too good a thing an' such fellers as I was talkin' about got hoggin' it an' spoilt it all! Why, some of 'em built 'emselves houses an' bought 'emselves hosses an' the balance of us as wasn't makin' more 'n our tobacco an' beer, got th' benefit o' their doin's—so I come back to th' city. You see 't was too swift a pace for a slow town an' th' directors was beginnin' to get next! This street's your's sir."



SCENIC RAILWAYS.

The United States Scenic Railway Construction Co., 90 Griswold St., Detroit, is coming to the front very rapidly as an amusement purveyor and its attraction is one of the best money makers a city upwards of 20,000 inhabitants could have. Street railway managers have come to feel that it is profitable for them to open and maintain parks, and what to place in the parks to please the general public has been an important question. The scenic railway possesses peculiar adaptability to the requirements of street railway pleasure resorts. Changes can be made in the attractions of the tunnel, illusion devices and electrical effects and the attraction is always new. It is the aim of the United States company to organize a company in every important city in the United States and erect one of the roads in all large centers of population. These roads are built under the Welsh single track system, which is claimed to be the only single track system in practical use in the country.

The officers of the United States Scenic Railway Construction Co. are: President and general manager, C. W. Moore; vice-president, A. A. Schantz; acting secretary, F. J. Peddle; treasurer, William E. Reilly.

The company has built one of its scenic railways at a pleasure park near the Belle Isle bridge and this now forms one of the chief attractions in Detroit.



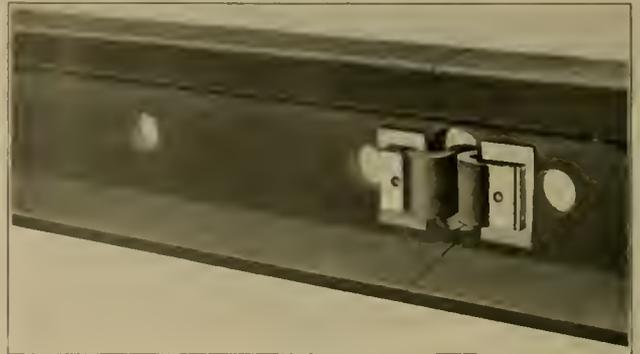
THE THOMAS RAIL BOND.

Among the railway materials exhibited for the first time is the Thomas rail bond—which is presented as something new in the way of "under the fish plate" bonds. It ingeniously utilizes the space between the fish plates and is designed to avoid entirely any pinching of the bond between splice bars and rail.

The Thomas bond consists of a series of flat strips of soft rolled copper, soldered to one another at the ends, but having a central flexible portion where the strips are unattached; the ends form flat feet which are soldered to the rails, while the flexible part is bent into a loop which projects through an opening punched in the rails at the point of meeting. The flexible part of the bond occupies that part of the space between the joint plates where the distance is greatest, and no part of the flexible part of the bond extends to the narrow space at the head and foot of the rail. A soft copper strip is placed under each end of the bond

and extends to the head and foot of the rail, giving a large contact area between the bond and the rail. For convenience in installing the bond and as an additional element of strength in the attachment of the bond to the rail, a small cap screw is put through the web of the rail and tapped into the foot of the bond; this serves to draw the bond into close contact with the rail, and in addition to relieve the solder of much of the stress which comes upon it in service. Since the cap screw becomes soldered both to the rail and bond in the process of attaching the bond, it is impossible for it to become loose. The construction of the bond and its application to the rail are shown in the illustration.

The punching of the necessary opening at the ends of the rails may be accomplished at the rail mills or at the point of use, but the work will preferably be done after the rails are laid and the track is surfaced by a hydraulic punch of sufficient power to punch both rails at one time. The rails are then drilled for the cap screws and ground with an emery wheel, where the bond is



THOMAS RAIL BOND.

to be attached, until the surface is bright. The bond is then placed in position and held by the cap screws, and the rail and bond brought to a soldering heat by gasoline heater. When the solder in the feet of the bond is thoroughly melted, enough is added with acid to ensure the complete filling of the space under the foot of the bond, and the cap screws are turned up hard, drawing the layers of the bond together and pulling the bond as a whole into intimate contact with the rail. The rail and bond are then allowed to cool slowly.

The advantages claimed for this bond are that it is very short (but $4\frac{1}{2}$ in. between centers even for double bonding), that the rails are punched at the extreme ends, and that but little metal is removed from the rail web. Shop tests are reported to show a long life both under horizontal bending, such as would occur because of the expansion and contraction of the rails, and under vertical deflection such as would result from a loose joint.

The Thomas bond is made by Edward G. Thomas, 4 State St., Boston, who is prepared to undertake the installation of these bonds under contract.



THE DEACON RODE HOME.

At the time the Middlesex road was built in Boston, many years ago, there was by no means a unanimous opinion as to the morality of Sunday cars, as illustrated in the following.

A good deacon had visited Boston one Sunday, presumably making the journey from his Charlestown home on foot. As he was about to return he caught sight of a Middlesex car, and the day being inclement he pocketed his moral scruples and entered it.

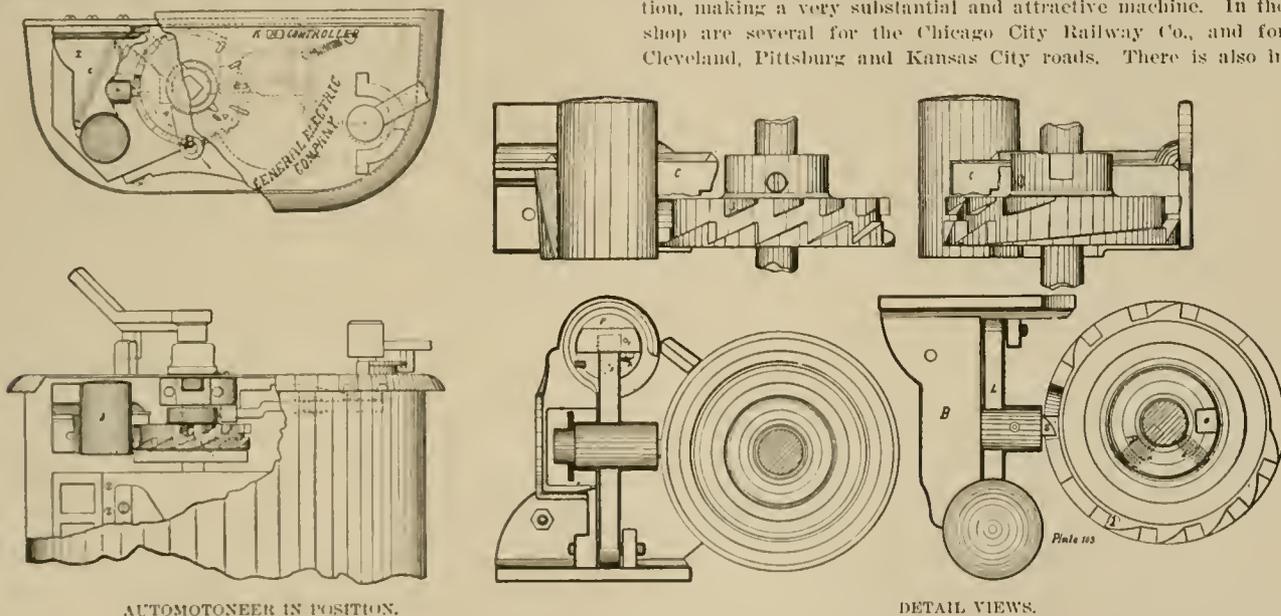
When comfortably seated in the car he said to the only other occupant, a prominent citizen of Charlestown: "What's this car doing over here on the Lord's day?" Being informed by the citizen that it was the intention of the company to run its cars regularly on Sundays as on other days, but little more was said until the car had proceeded some distance, when the deacon, who, no doubt, had been mentally debating the moral aspects of such a course, suddenly exclaimed: "Well, I must confess it's mighty comfortable!"

THE AUTOMOTONEER.

The exhibit of the Garton-Daniels Co., of Keokuk, Ia., which is located in the space of the Ludlow Manufacturing Co., No. 54, is a particularly interesting one, this being the first time that the great majority of the convention delegates have had an opportunity to see the "Automotoneer" in its present form. Our readers are doubtless all familiar with the object of the automotoneer—a mechanical device placed in the car controller for fixing a predetermined time limit for the rate at which the controller can be advanced from one point to another. The device acts only as current is being turned on, and the current can be turned off just as if the automotoneer were not attached.

In the "Review" for Aug. 15, 1902, a number of half-tone illustrations of the automotoneer were published, but the accompanying line drawings serve to better show the mechanism in its relation to the controller.

The wheel marked A is put on the controller shaft in place of the usual notched plate. It has a zig-zag groove cut in its periphery with the points in the groove corresponding with the points on the controller. A spawl which enters this groove is raised every time the controller is advanced one point; (this spawl, S, is shown projecting from the small cylinder.) It is mounted on a lever, one end of which is pivoted at the back of the controller



and the other end of which is attached to a piston working in a dashpot.

Movement of the controller handle forward, to turn on current, raises the dashpot piston, driving the air out of the dashpot through an automatic relief check valve. Once the dashpot piston is raised, air begins to flow into the dashpot through an adjustable opening, allowing the piston to fall back to its original position in a time depending on the amount of opening allowed for the air to flow through. As soon as the dashpot falls back to its first position the spawl, which is on the same lever, falls so that it does not engage a tooth in the zig zag groove and the controller can be advanced another notch. The spawl being constructed on the well known principle of a door catch with one edge beveled off, allows the controller wheel to be revolved so as to shut off current without engaging any of the teeth. It works in a cylinder, as shown, and is held out so as to enter the groove by a solid spring which allows it to retract when the controller is thrown off so that the point of the spawl does not engage. There is no binding or side strain on the dashpot piston that could make it work hard, because the end of the lever is allowed more lateral movement than it ever could require in the slot which it enters on the end of the dashpot piston. There is a cover for the moving parts which prevents tampering by unauthorized persons.

The claims made for the automotoneer are that it will stop wasteful methods of car acceleration, so reducing coal bills; that

it will insure smooth starting of cars and so do away with a great source of discomfort, and even danger, to passengers; that it will tell the motorman just how fast he should advance his controller, relieving him of the necessity of judging; that it will prevent abuse of motor equipments and make armature and fields last longer; that it will reduce voltage fluctuations and line losses better than more feed wire in many cases; that in reversing for an emergency stop, it prevents the excited motorman from reversing too far, and so opening the circuit breaker; that it is cheaper and better than buying more generators and more copper to carry the load peaks due to improper controller handling.

The Garton-Daniels Co. is represented by J. V. E. Titus, secretary of the company.



McGUIRE MANUFACTURING CO.

The McGuire Manufacturing Co., of Chicago, has added a new wood-working shop to its plant this summer, which is especially intended for the sweeper business. The company reports the largest sale of sweepers it has had for years. Among the recent orders is one for five sweepers for the Union Railroad Co., of New York City, which differ from the others in that the side sills and end sills, and indeed the whole platform, is of steel construction, making a very substantial and attractive machine. In the shop are several for the Chicago City Railway Co., and for Cleveland, Pittsburg and Kansas City roads. There is also in

the shop a 4,000-gallon sprinkler mounted on double trucks, for Hampton, Va., where the railway company is to sprinkle the streets. (Two of these large sprinklers were shipped to Durban, Natal, South Africa in September.) The tank has a compressed air compartment, which is charged by an electric air compressor, and the machine is guaranteed to throw the water 50 feet on each side of the track, the compressed air forcing the last gallon of water from the tank to the same distance as when the tank is full. The whole sprinkler is of very substantial construction, and is intended to be used as a locomotive when not in use as a sprinkler.

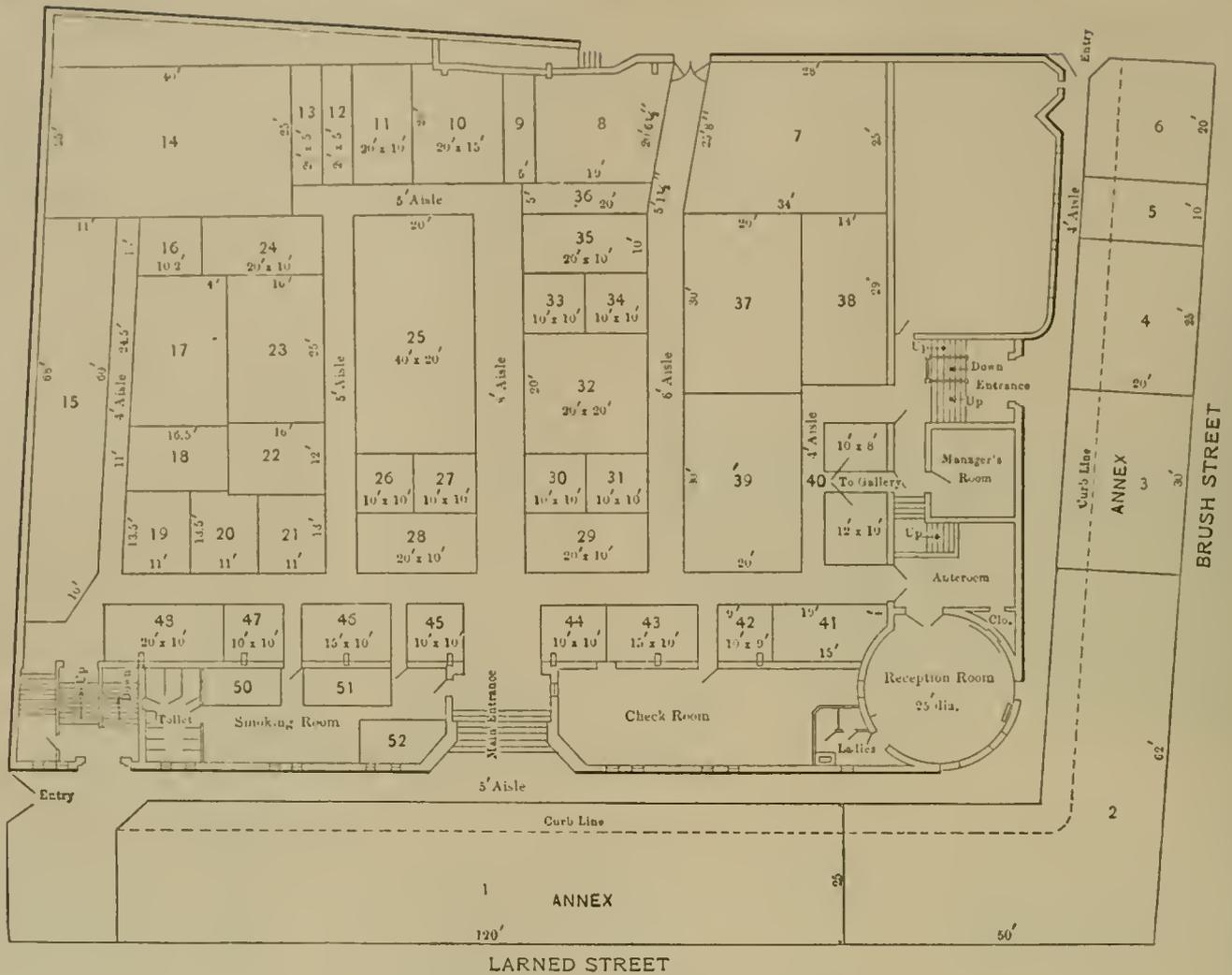
The McGuire company is also very busy in the truck building department, among the orders being 20 for Bangkok, Siam, and 175 for the Union Traction Co., of Chicago. One of the Union Railroad sweepers and the pneumatic sprinkler, with other samples of the company's product, are on exhibition at Detroit.



The Port Huron people think Superintendent Wood, of the Rapid Railway is a natural born joker because he claims that none of his patrons ever find fault.



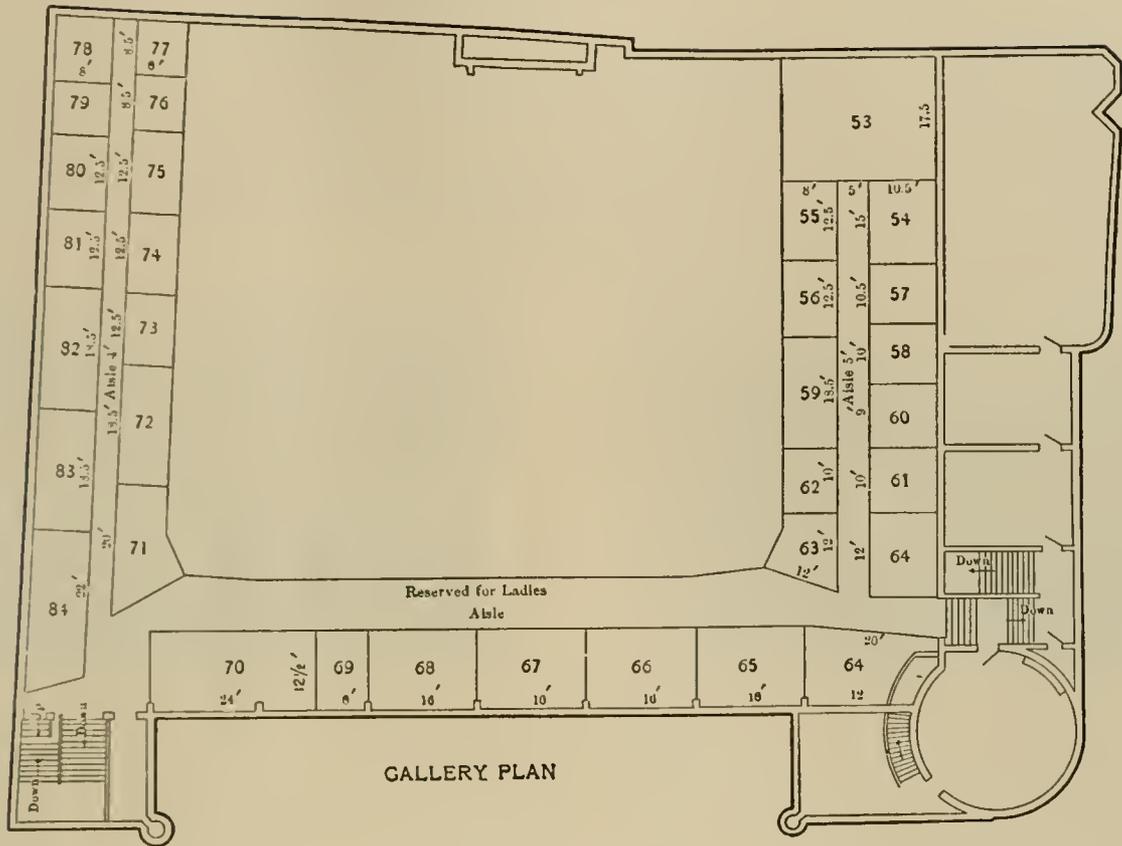
Telephone service at the Armory is free to exhibitors and delegates.



GROUND FLOOR PLAN OF THE CONVENTION HALL.

LIST OF EXHIBITORS AT THE A. S. R. A. CONVENTION.

Name.	Space No.	Name.	Space No.
Adams & Westlake Co., 110 Ontario St., Chicago, Ill.	68	Creaghead Engineering Co., Cincinnati, Ohio.	11
Amerlean Brake Shoe & Foundry Co., Mahawa, N. J.	45	Curtain Supply Co., 93 Ohio St., Chicago, Ill.	67
Amerlean Car Seat Co., 18 Guernsey St., Brooklyn, N. Y.	42	Camp Co., H. B., Aultman, Ohio.	Smoking Room
Amerlean Machinery Co., Grand Rapids, Mich.	36	Dearborn Drug & Chemical Works, Rialto Bldg., Chicago, Ill.	66
Amerlean Railway Supply Co., 21 Park Place, New York.	33	Duff Manufacturing Co., Pittsburg, Pa.	56
Amerlean Steel & Wire Co., Chicago, Ill.	10	Detroit Trolley & Manufacturing Co., Ltd., 1306 Majestic Bldg., Detroit, Mich.	78
American Track Barrow Co., Lowell, Mass.	Ante-room	Dorner Truck & Foundry Co., Logansport, Ind.	Trackage
Atlas Railway Supply Co., 1523 Manhattan Bldg., Chicago, Ill.	35	Electric Storage Battery Co., Philadelphia, Pa.	25
American Electric Switch Co., Pittsburg, Pa.	6	Garlon Daniels Co., Keokuk, Ia.	54
Allen & Morrison Brake Shoe & Manufacturing Co., Chicago, Ill.	Smoking Room	General Electric Co., Schenectady, N. Y.	2
Armspear Manufacturing Co., 447 West 53d St., New York, N. Y.	75	Globe Ticket Co., Philadelphia, Pa.	62
Bishop Gutta Percha Co., 420 East 25th St., New York, N. Y.	81	Gold Street Car Heating Co., New York, N. Y.	48
Baldwin Locomotive Works.	Trackage	Gould Storage Battery Co., 25 West 33d St., New York, N. Y.	31
Brandean, George F., 4 Oak St., Utica, N. Y.	58	Griffin Wheel Co., Chicago, Ill.	18
Brady Brass Co., 95 Liberty St., New York, N. Y.	65	Hale & Kilburn Manufacturing Co., Philadelphia, Pa.	70
Brill J. G. Co., Philadelphia, Pa.	3	Harrington, C. J., 15 Cortlandt St., New York, N. Y.	6
Brill, J. G. Co., Philadelphia, Pa.	Trackage	Heywood Bros. & Wakefield Co., Wakefield, Mass.	12
Brown, Harold P., 120 Liberty St., New York.	8	Hunter Car Sign Co.	67 Larned St.
Christensen Engineering Co., Milwaukee, Wis.	15	International Register Co., 124 West Jackson Boulevard, Chicago, Ill.	72
Conant, R. W., 28 Williams St., Cambridge, Mass.	44	Jewett Car Co., Newark, O.	Trackage
Consolidated Car Fender Co., 39 Cortland St., New York, N. Y.	37	Johns-Manville Co., H. W., 100 Williams St., New York.	41
Consolidated Car Heating Co., Albany, N. Y.	47	Kalamazoo Railway Supply Co.	61
Continous Rail Joint Co of America, Newark, N. J.	9	Kellog Switchboard Co., Chicago.	80
Crane Co., Chicago, Ill.	43	Knell Air Brake Co., Battle Creek, Mich.	23
		Kuhlman Car Co., C. G., Collingwood, Ohio.	Trackage
		Knowles, C. S., 7 Arch St., Boston, Mass.	59



GALLERY PLAN

Name.	Space No.
Kinnear Manufacturing Co., Columbus, O.	5
Le Valley Vitae Carbon Brush Co	59
Loraln Steel Co., Lorain, O.	7
Ludlow Supply Co., Cleveland, O.	51
Lumen Bearing Co., Buffalo, N. Y.	63
Maltby Lumber Co., Bay City, Mich.	52
Magann Air Brake Co., G. P., Detroit, Mich.	38
McGuire Manufacturing Co., Chicago.	Trackage
McLaughlin Car Coupler Co., 1621 North 9th St., Philadelphia, Pa.	76
Morris Electric Co., 15 Cortlandt St., New York, N. Y.	53
Merritt & Co., 1621 Ridge Ave., Philadelphia, Pa.	59
National Carbon Co., Cleveland, O.	61
National Lead Co.	30
National Lock Washer Co., Newark, N. J.	34
Newcomb, F. H., 136 Flatbush Ave., Brooklyn, N. Y.	73
New Haven Car Register Co., New Haven, Conn.	83
Northern Electric Manufacturing Co., Madison, Wis.	25
Nuttall Co., R. D., Pittsburg, Pa.	22
Nernst Lamp Co., Pittsburg, Pa.	1
Ohio Brass Co., Mansfield, O.	39
Olmer Car Register Co., Dayton, O.	71
Pantasote Co., 29 Broadway, New York, N. Y.	60
Pennsylvania Steel Co., Philadelphia, Pa.	11
Peckham Truck Co., 312 Electric Bldg., Cleveland, O.	Trackage
Ridlon Co., Frank, 290 Summit St., Boston, Mass.	40
Root Track Scraper Co., Kalamazoo, Mich.	61
Sherwin-Williams Co., Cleveland, O.	19
Smith Heating Co., Peter, Detroit, Mich.	16
Spear Carbon Co., St. Mary's, Pa.	57
Standard Friction Brake Co., New York, N. Y.	1
Standard Underground Conduit Co.	61
Standard Varnish Works, 29 Broadway, New York, N. Y.	21
Stanley Electric Manufacturing Co., Pittsfield, Mass.	25
Star Brass Works, Kalamazoo, Mich.	60
Sterling Menker Co., Newark, N. J.	84
Sterling Lubricator Co.	20
Stephenson Co., John, 312 Electric Bldg., Cleveland, O.	Trackage

Name.	Space No.
St. Louis Register Co., Security Bldg., St. Louis, Mo.	82
Street Railway Journal, New York, N. Y.	29
"Street Railway Review," Chicago, Ill.	28
Scarlett Car Seat Works, 805 North Main St., St. Louis, Mo.	51
Springfield Manufacturing Co., Bridgeport, Conn.	67
Standard Pole & Tle Co., The, 41 Broad St., New York, N. Y.	37
Standard Patent Co., 100 Williams St., New York, N. Y.	64
Taylor Electric Truck Co., Troy, N. Y.	4
Thomas, Edward G., 4 Tate St., Boston, Mass.	79
Tramway & Railway Works, London, England.	26
Union Stop & Signal Co., Fall River, Mass.	74
United States Steel Co., 145 Oliver St., Boston, Mass.	17
Universal Sanitary Cuspldor Co., Worcester, Mass.	50
Van Dorn & Dutton, Cleveland, O.	24
Van Dorn-Elliott Electric Co., Cleveland, O.	21
Weber Railway Joint Manufacturing Co., 1615 Old Colony Bldg., Chicago, Ill.	13
Western Electrician, Chicago, Ill.	27
Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.	1
Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.	Trackage
Westinghouse Air Brake Co., Pittsburg Pa.	1
Wharton Jr. & Co., Wm., Philadelphia, Pa.	32
Wheel Truing Brake Shoe Co., 106 Miami Ave., Detroit, Mich.	16

Mr. Pinckney J. Balaguer, secretary and auditor of the Charleston Consolidated Railway, Gas & Electric Co., of Charleston, S. C., is stopping at the Normandie. Mr. Balaguer reports street railway matters at Charleston and through the south in general in excellent condition. Many of the southern roads now equal the finest of the northern roads in point of equipment and operation.

POSITION WANTED.

First class armature foreman, wants position. Extensive experience. Seven years in charge of armature department of one of the largest roads in the west. Well acquainted with all types of Westinghouse and General Electric motors. Call at "Street Railway Review" Booth.

MACPHERSON SWITCH & FROG CO.

The MacPherson Switch & Frog Co., of Niagara Falls, N. Y. is represented at the convention by Chilton P. Conger, general manager of the company, who is making his headquarters at the Hotel Cadillac, where he has on exhibition a large working model of the patented MacPherson switch and frog, which will be examined with great interest by the railway men who are not already familiar with this device.

The object of the MacPherson switch and frog, which has been manufactured for the American market only since January 1st,



MACPHERSON SWITCH SET FOR SIDING.

is to solve the problem of making an absolutely clear main line and at the same time provide a safe and practical use of a switch and frog in the track when needed. The company states that the device has attracted wide attention and that some five or six years ago the Canadian Pacific placed two or three of these switches and frogs in its tracks at little used outlying sidings



SWITCH SET FOR MAIN LINE CLEAR.

in order to test the device, placing them where it thought the least harm would be done if there was anything defective in the device. Today it has between seven and eight hundred in use on the main line, and between Ottawa and Montreal, where a very high rate of speed is attained, every switch and frog is of the MacPherson pattern.

It is also used on the Adirondack division of the New York Central, the Cape Breton road of Nova Scotia, the Canada Atlantic, Portland & Rumford Falls, the Southern Pacific, Chicago, Milwaukee & St. Paul, Pennsylvania, Grand Trunk, Intercolonial, Junction Railway and other roads, while such roads as the Illinois Central, "Big Four," New York, Ontario & Western, the Rutland and other roads are preparing to place the device in their tracks with a view to testing its merits.

The main points of advantage claimed for the device are that main line trains, when not taking sidings or crossovers, do not touch the switch rails and frogs thus saving about 90 per cent of wear and tear on the two most expensive and most dangerous points in the track; also saving the breaking of wheels and other accidents caused by switch points and frogs to trains when running at a high rate of speed on main line over the present switch and frog, as when not in use both the MacPherson switch and frog are entirely clear of the main line track. The advantage which follows from this is obvious.

The desideratum in modern railroading is to eliminate all unnecessary parts. The facing point switch and the frogs set in the track, no matter how perfect the device is, are and always will be the danger point in railroading, and if such can be eliminated from the main line track when fast trains are running over such track, and something put in their place which will accomplish the purpose for which they are intended, namely, for use only in passing to a siding or crossing over to the parallel track, such a device, if safe and practicable, warrants the careful attention of all men interested in the operation of a railroad. In this device the main feature is that when the switch and frog



MACPHERSON SWITCH SET FOR SIDING

are set for the main line, both main line rails are continuous at the passing point of switch and frog. All parts of the frog and switch are well clear of main track rails. Accidents, which are sometimes caused by broken or foul switch rails or contact with parts of frogs, cannot therefore occur with MacPherson switch and frog.



SWITCH SET FOR MAIN LINE CLEAR.

The parts of the frog are simple, being composed of two rails, one 7½ and the other 9 feet long, with two connecting rods, 1¾ or 2 in. thick, and the pipe line which throws both the frog and the switch with one movement from the switchstand.

ONE LIFE SAVED.

That buying Providence fenders, as made by the Consolidated Car Fender Co., of New York City, is a profitable investment, is attested by the following clipping taken verbatim from the Springfield (O.) Sun of Sept. 18, 1902: "A practical demonstration of the life-saving tendency of the simple and in no wise costly street car fenders recently placed on local cars was held yesterday at Limestone and Main streets, when Harry Rosenberg, a messenger boy, was saved from being crushed to death. The boy is employed by the Western Union company, and rides a wheel. He was riding along Limestone street, and in attempting to turn out of the way of a car his wheel slipped on the rail and he was thrown to the ground. He was picked up completely by the fender, and carried until it was found that with the exception of a few bruises he was all right. Without the fender he would have undoubtedly been killed. His home is 247 Gallagher street."

MEETING OF THE EXECUTIVE COMMITTEES.

The executive committee of the American Street Railway Association was held at the Cadillac Tuesday afternoon. Only three members were absent, those in attendance being H. H. Vreeland, Charles W. Wason, Elwin C. Foster, H. M. Sloan, D. B. Dyer and T. J. Nicholl, all of whom were among the early arrivals yesterday. Secretary Penington had been in Detroit since Saturday giving the final touches to the arrangements of the Association. Mr. Penington presented his report as secretary and treasurer and the usual business of the executive committee was transacted.



The executive committee of the Accountants' Association met at 8 p. m. yesterday, the members present being President Mackay, C. L. S. Tingley, Irwin Fullerton, D. Dana Bartlett and Secretary Brockway. The regular business preparatory to the convention was transacted.



DELEGATES REGISTERED YESTERDAY.

- Augusta Railway & Electric Co.: D. B. Dyer, president; A. J. McKnight, auditor.
- Boston & Northern Street Railway Co.: E. C. Foster, general manager; D. D. Bartlett, auditor.
- Old Colony Street Railway Co., Boston: Robert S. Goff, general superintendent; Geo. W. Palmer, electrical engineer.
- Charleston Consolidated Railway, Gas & Electric Co.: P. J. Balaguer, auditor.
- Calumet Electric Street Railway Co.: H. M. Sloan, general manager.
- Chicago City Ry.: T. C. Penington, treasurer; C. N. Duffy, auditor; Richard McCulloch, assistant general manager; M. O'Brien, master mechanic; C. E. Lund.
- Cleveland, Painesville & Eastern R. R.: C. W. Wason.
- Denver City Tramway Co.: Geo. L. Rice, Jas. L. Adams, J. B. Hogarth.
- Grand Rapids, Holland & Lake Michigan Rapid Ry.: H. P. Strong.
- Grand Rapids Ry.: G. S. Johnson, general manager; B. S. Hauchett, Jr., secretary; J. C. Modigan.
- Hamilton Electric Light & Cataract Power Co., Hamilton, Ont.: C. K. Green, general manager; T. B. Griffith, superintendent.
- Hartford Street Ry.: E. S. Goodrich.
- Johnstown (Pa.) Passenger Ry.: H. C. Evans.
- Montreal Street Ry.: W. G. Ross, controller; D. Robertson; T. W. Casey, purchasing agent.
- Union Street R. R.: E. E. Potter, general superintendent.
- Interurban Street Railway Co., New York: H. H. Vreeland, president; H. A. Robinson, collector; J. F. Daly; H. E. Vreeland; Frank Wells; R. W. Mead.
- Consolidated Traction Co., Pittsburg: W. B. Carson, secretary; C. S. Mitchell, auditor.
- United Traction Co., Pittsburg: C. W. Lepper, purchasing agent; F. Whlenhart, chief engineer; H. P. Clark, master mechanic.
- Peoria & Pekin Terminal Ry.: L. E. Myers, N. C. Draper.
- Rhode Island Co., Providence R. I.: A. E. Potter, superintendent transportation; W. E. Elliott.
- Rochester Railway Co., Rochester, N. Y.: T. J. Nicholl, vice president; J. W. Hicks, superintendent; C. T. Chapin; A. Greep, master mechanic; J. H. Stedman.
- St. Louis Transit Co.: C. A. Moore, chief engineer.
- Worcester (Mass.) Consolidated Street Railway Co.: J. W. Lester, treasurer.



Mr. Frederick V. Green, representing the Standard Traction Brake Co., of 26 Cortlandt Street, New York City, is at the Cadillac. Mr. Green will be glad to talk brakes with anyone interested, and has a fund of information on the subject that will be valuable to street railway men who have the brake question under consideration.

LADIES REGISTERED YESTERDAY.

- Mrs. W. Bunting.
- Mrs. J. W. Oliver.
- Mrs. J. F. Dixon, Jr.
- Mrs. F. N. Root.
- Mrs. H. W. Frost.
- Miss Maltby.
- Mrs. Peter Conway.
- Miss G. White.
- Miss M. E. Greene.
- Mrs. D. D. Bartlett.
- Mrs. R. S. Goff.
- Miss Penington.
- Mrs. C. W. Wason.
- Mrs. J. B. Hogarth.
- Mrs. G. S. Johnson.
- Mrs. F. B. Black.
- Mrs. H. C. Schwable.
- Mrs. G. A. Harwood.
- Mrs. M. de F. Yates.
- Mrs. H. E. Bush.
- Mrs. Willis M. Anthony.
- Mrs. W. S. Berry.
- Mrs. J. Heil.
- Mrs. P. J. Sylvester.
- Mrs. Jas. Leidenger.
- Miss Ludlow.
- Mrs. N. C. Keeran.
- Mrs. Edgar S. Nethercut.
- Mrs. W. J. Richards.
- Mrs. Geo. S. Hastings.
- Mrs. E. S. Miller.
- Mrs. W. Porter.
- Mrs. C. K. Green.
- Mrs. T. B. Griffith.
- Mrs. H. H. Vreeland.
- Mrs. H. A. Robinson.
- Mrs. J. F. Daly.
- Mrs. H. E. Vreeland.
- Mrs. Frank Wells.
- Mrs. H. P. Clark.
- Mrs. A. E. Potter.
- Mrs. F. B. Hall.
- Mrs. C. J. Harrington.
- Miss McGuire.
- Mrs. L. A. Parshall.
- Mrs. J. W. Fraser.



THE WABASH SPECIAL.

The Wabash A. S. R. A. special from Chicago, in charge of N. C. Keeran, was in on time last evening with 80 street railway men on board, including representatives from Los Angeles, Salt Lake City, Omaha, St. Louis, Minneapolis, and other western points. Among the passengers on the special were C. G. Goodrich, vice-president and general manager of the Twin City Rapid Transit Co.; W. B. Tarkington, general superintendent Omaha & Council Bluffs Railway & Bridge Co.; Geo. W. Knox and wife; J. G. McMichael and wife; William Walmsly, general manager South Chicago Street Ry., and wife; E. S. Nethercut and wife; L. E. Myers, general manager Peoria & Pekin Terminal Ry., of Peoria.



Mr. E. H. Chapin, representing the Rochester Car Wheel Works, of Rochester, N. Y., is as usual distributing a neat little souvenir. This year the favor takes the form of a handsome pocket match safe. Mr. Chapin is registered at the Cadillac.



The Lumen Bearing Co., of Buffalo, N. Y., has issued a pocket edition of the official program for the convention. The pamphlet gives the names of the officers, executive committee, etc., and the papers to be presented at the various sessions. It also calls attention to the good qualities of "Lumen" bronze, which is a composition metal that is said to be extensively replacing phosphor and other high grade bronzes for use in machinery bearing of all kinds. Lumen has a specific gravity of 6.93 and is about 20 per cent lighter in weight than brass. The tensile strength, compressive strength and electrical conductivity of "Lumen" are greater than those of brass, and it has an extremely low coefficient of friction.



Major H. C. Evans, agent for the Lorain Steel Co., is at the Cadillac. No street railway convention would be complete without the major.



Mr. W. T. Van Dorn, of Chicago, is at the Brunswick. The Van Dorn automatic couplings are standard on several hundred electric railways in this country and are performing service ranging from comparatively slow city speeds to the heaviest work on high speed interurban roads and the elevated roads of Boston, New York, and Chicago.



Mr. R. E. Belknap, of the Pennsylvania Steel Co., has headquarters at the Cadillac and also at the Russell. The Pennsylvania company has a large staff of representatives on hand who may be found either at the two hotels mentioned or at the company's fine exhibit at Convention Hall.

THE NICHOLS-LINTERN COMPANY,

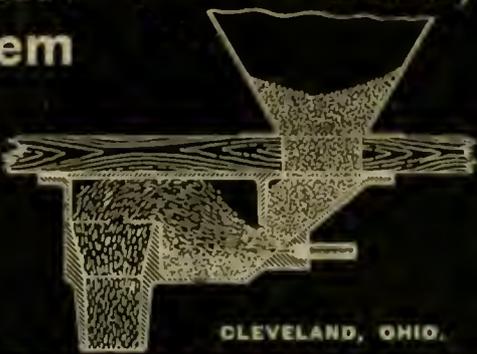
Track Sanding System

Saves

EQUIPMENT CURRENT

TIME AIR SAND

PREVENTS ACCIDENTS

ELECTRIC BLDG.,

CLEVELAND, OHIO.

THE TROLLEY IN THE HOLY LAND.

A company has been formed at Cleveland to build trolley roads in the Orient. Lines are now in operation through the Holy Land, and it is proposed to build others from Cairo to Mount Sinai and Mecca, with branches extending to Damascus, so that hereafter the followers of Mahomet may travel by rail in making their annual pilgrimages to the prophet's tomb. A network of trolley lines centering at Jerusalem is projected.—News Dispatch,

The trolley car goes whizzing on the shores of Galilee,
And the ass that used to amble through those districts, where is he?

O'er the sacred hills they hurry, going down to Jericho,
Waving kerchiefs from the cars or playing euchre as they go;
From Jerusalem to Joppa, once a long and tedious trip,
People travel now by trolley, reading novels as they zipp.



Through the lands where Moses tarried, where he smote things
with his rod
And received for Israel's children sacred messages from God,
They will string the copper wire and put down the flattened ties,
While the camel and the donkey rest and watch through sleepy
eyes.

And anon the cars from Cairo and Damascus and Kerak
Will go whizzing down to Mecca, maiming things along the track,
Where they once went down to Egypt out of sacred Palestine
They will bridge the crooked ways and equip the trolley line;
Up along the highway traveled by the Good Samaritan
They will keep the trolley humming from Beersheba to Dan;
And where Joseph once trudged slowly and with weary, aching
feet.

The gay tourist'll fit, lolling with his heels upon a seat.

They will substitute the trolley for the old-time caravan,
With its picturesque attachments, just as quickly as they can;

Then the ass and eke the camel may lie down to rest serene
While the yellow cars go rumbling over many a storied scene,
As they take the unwashed Moslem down the Red Sea's sandy
shores

To the prophet's tomb and get him home in time to do the chores.

If there still are bulls of Bashan browsing on the hills, some day
They may holst their tails and bellow as the cars whiz out that
way.

Down along the ancient highways leading from Jerusalem
The natives hear the rattle of the cars and shy at them;
Oh, the trolley poles are standing where the Jordan gently flows,
And the tourist zips through Hebron, smoking stogies as he
goes.

—S. E. Kiser in the Chicago Record-Herald.



NEWS OF THE STRIKES.

As a result of renewed activity by the striking employes of the Hudson Valley Electric Railway Co., at Glens Falls, N. Y., last Sunday, the militia was again called out, after having been dismissed on Thursday. The strikers and their sympathizers virtually took possession of the city of Glens Falls for four hours, defied the police, seized street cars and stoned the company's power house and other private property. The militia charged the mob and after wholesale arrests had been made some semblance of order was restored.

At New Orleans the first attempt of the railway company yesterday to move cars was followed by violence and rioting. The first cars out, manned by police, were stoned and finally totally destroyed, the small police force on hand being powerless to protect the company's property. Last night's evening papers announced that in all probability the militia would be called out to take charge of the situation.



Mr. Alfred Johnson, electrician for the street railway company of Quincy, Ill., is telling about his new reliable trolley harp which was described in the last issue of the "Review."



Mr. C. K. King, of the Ohio Brass Co., is at the Cadillac. The Ohio Brass will be represented at the convention by over 20 of its representatives from various parts of the country.



The American Brake Shoe & Foundry Co. is represented by F. W. Sargent, J. S. Thompson, W. W. Gardner and Arthur Gemunder, who are all at the Oriental Hotel. The company's exhibit this year is finer than ever.



Ask Mr. W. J. Cook for one of his souvenirs. The souvenir is known as a handy lady's purse.

DAILY STREET RAILWAY REVIEW

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Application made for entry as second-class matter.

VOL. XII. Thursday, October 9, 1902. No. 2

All the association meetings and entertainments are held on Detroit city time which is 28 minutes faster than central standard time.



Inquire at the manager's office in Exhibition Hall for mail and telegrams.



The following numbers of the "Daily Review" are consecutive with the regular monthly issue, and all four "Dailies" should be preserved for binding.



The "Daily Review" is mailed regularly to all our subscribers.



The weather predictions for to-day are partly cloudy and cooler with brisk southwesterly winds.



In concluding his annual address yesterday morning President Vreeland admirably defined the field which the American Street Railway Association now covers, and while taking a conservative attitude in regard to changing the name, the facts he presented are a strong argument for such action. The electric railways which do not operate in streets have become very numerous within a few years, and the question of adopting electricity is receiving much attention from steam railways at the present time. The natural affiliations of electric railways of every character are with the American Street Railway Association, yet such a company as the New York, New Haven & Hartford, which was one of the pioneers in electric third rail work, is only indirectly represented in the A. S. R. A. by an officer who is also president of a street railway company. The association should change its constitution so that it might admit to membership all companies that are interested in the field which the association covers.



HAIL TO THE SUPPLYMEN.

This is "Supplymen's Day," an institution that has been growing in importance ever since the plan of settling apart one of the intermediate days for examining exhibits, instead of postponing it until the very last. Street railway men are always anxious to see what is new at the conventions, and settling apart Thursday for this purpose gives them ample opportunity.



The carriage ride around Belle Isle, which will be given by Berry Brothers, Limited, to the ladies of the convention, will be this afternoon. Carriages will leave the Cadillac Hotel at half-past two (city time) and ladies will be admitted to the carriages upon showing their badges.



Secretary Pennington announces that the registration yesterday was larger than at any other previous convention with the exception of New York and that by to-day the total registration may even exceed that of New York. Over 2,100 badges were distributed yesterday.



For other special announcements see page with engraving of Convention Hall.

A. S. R. A. PROGRAM.

THURSDAY.

No business session will be held on Thursday.

FRIDAY.

"Discipline of Employes by the Merit System"—Metropolitan Street Railway Co., of Kansas City, by W. A. Satterlee, general superintendent.

"The Steam Turbine: Its Commercial Aspect"—E. H. Sniffen, of Westinghouse, Church, Kerr & Co., New York.

"Signals for Urban and Interurban Railways"—Old Colony Railway Co., Boston, by G. W. Palmer, jr., electrical engineer.

"The Adjustment of Damage Claims"—Chicago City Railway Co., by M. B. Starring, assistant general counsel.

The papers have not been assigned to the different sessions, but other details of the program are as follows:

Report of Committee on Rules for the Government of Employes: J. C. Braekenridge, general manager Brooklyn Heights R. R., chairman; E. C. Pester, general manager Old Colony Street Railway Co.; T. E. Mitten, general manager International Railway; W. E. Harrington, general manager Camden (N. J.) & Suburban Railway Co.

Report of Committee on Standards: N. H. Heft, president Meriden (Conn.) Electric R. R., chairman; E. G. Connette, vice-president and general manager, Syracuse (N. Y.) Rapid Transit Co.; C. F. Holmes, Kansas City; John I. Beggs, president and general manager Milwaukee Electrical Railway & Light Co.; E. A. Newman, general manager, Portland (Me.) Railroad Co.; R. T. Laffin, general manager, Worcester (Mass.) Consolidated Street Railway Co.; Will Christy, vice-president Northern Ohio Traction Co., Akron, O.

Election of officers.



PROGRAM OF ACCOUNTANTS' ASSOCIATION.

NO SESSION ON THURSDAY, OCT. 9, 1902.

FRIDAY, OCT. 10, 1902, 10 A. M.

Chart of Street Railway Blanks, suggested by G. E. Tripp, general auditor, Stone & Webster's Co.'s, Boston, Mass.

Annual report of Standardization Committee.

Afternoon, 2 o'clock.

Report of Committee on Standard Form of Report for Electric Railways.

Report of Committee on Nominations.

Election of Officers.

Report of Committee on Resolutions.

Installation of Officers.

Adjournment.



ENTERTAINMENTS.

THURSDAY.

The entire day will be devoted to the examination of exhibits at Convention Hall.

Thursday evening there will be a theater party at the Detroit Opera House to see "When Johnnie Comes Marching Home."

FRIDAY.

A trolley ride will be given for the ladies on Friday morning, leaving Hotel Cadillac at 10 a. m. for Mount Clemens, via the Rapid Railway and Gratiot Ave., returning via the Shore Line to the Country Club, Grosse Pointe, where luncheon will be served at 1 o'clock. The return to the city will be made at 4 p. m.

The banquet will be held at Hotel Cadillac at 8 o'clock, at which the installation of the officers elect will be held.



THE BLANKS DIDN'T COME.

Secretary Brockway advises us that the trunks containing the exhibit of blanks usually made at the conventions have in some way unaccounted for been delayed in transit. He hopes they will show up before the convention is over, as telegraph tracera have been sent out over the route.

TWENTY-FIRST ANNUAL MEETING
AMERICAN STREET RAILWAY ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

TUESDAY MORNING SESSION.

President Vreeland called the Convention to order at 11:15 o'clock a. m. and said:

Ladies and Gentlemen: The first thing on the program this morning is an address of welcome to the delegates of this convention to be made by the Hon. Wm. C. Maybury, mayor of Detroit. The delegates to the convention from the city of Detroit require no introduction to their mayor. Those from the other sections of the United States who have read an account of the events connected with the social, financial and political history of this section and other sections of the country, also need no introduction to the Hon. Wm. C. Maybury. Ladies and gentlemen, I have the honor to present Mayor Maybury, of Detroit, who has kindly consented to address the convention.

ADDRESS OF WELCOME.

Mr. President, Ladies and Gentlemen: Your good president has said that I have consented to deliver a few words of welcome to you upon your visit to this good old city; but I beg the privilege of changing that word consent by saying that I have craved the privilege of welcoming you to this city. To say welcome, to ladies and gentlemen like you, is not a matter of consent, it is a privilege; and I have been waiting for several months for this privilege, and I am glad that the time has come when I can avail myself of it.

It is not a question of telling you that you are welcome, it is rather the privilege of thanking you because you have come. The favor is all on your part, because no convention can assemble for the purpose of bringing men of your standing in the business world together that is not a favor to the city of Detroit, but to its people. The conventions that are held in this city every summer, and throughout the year, form a sort of academic course for our people; and you will appreciate, if you will reflect for a moment, the privilege that you give us of learning of those things, whereof we would be in ignorance were it not for your coming. Thousands of our people will come and learn from the exhibition of appliances in the hall above and on the street. They will learn things that they never knew before, by an object lesson, given to them by your most admirable exhibition of railway appliances. Through the discussions of this convention we shall learn more and know more of the operations of the great systems of street railways, both city and suburban, throughout this God-favored land. Therefore, when I say to you welcome to Detroit to-day, we thank you because you come; and you will appreciate the warmth of that welcome.

Now, my dear friends, you occupy a very close place in the relations which bear upon the comfort and convenience and well-being of our people. Conventions often assemble here the local interest in which is confined largely to those who assemble and discuss things which are important to them; and the importance to us, the public, is very indirect, and oftentimes hardly to be appreciated, but in your case, the operation of the street railways of the country, which is the life work of the gentlemen who are assembled here this morning—in your case you come very near to the comfort and well-being of the people; so we are particularly interested in your convention, and your discussions become a part of the history of what we want to know. Therefore, for that and for other personal reasons which we are glad to consider, you are doubly, yea, thrice doubly welcome, to this good old city of Detroit.

We have here a city that is so laid out as to be peculiarly

adapted to street railway service. Here we have a converging of all lines from the suburbs into one center, practically, and that also is the plan of the city itself; for it was laid out about a century ago after the plan of the city of Washington, in fact, the plan was brought here and as far as it could be made applicable to the new city of Detroit, you have a reproduction of the capital itself. If you will take the city hall as the capitol, the radiating streets and avenues are identically the same as in Washington; but the persons who laid out the city, the territorial governor and judges, had little knowledge of what Detroit was to be. Perhaps, I ought not to say that, as they gave us a good city, yet, they laid out the city with the streets radiating for a distance much less than a mile from the center, and from that point the plan is discontinued. Now, I say that you come close to the well-being of our people, and in the city of Detroit the conditions are most favorable for the prosecution of your particular business. Our avenues are wide; our people ride in the cars, and they want to get the best conveniences in the matter of transportation that are possible, and we believe we have them. We are after the best and do not want anything less than the best. Not alone that, but we have no hills to contend with. Aside from the slight rise from the river, which is scarcely to be considered, Detroit is practically almost flat, just rising enough towards the north to give fair drainage; but in every other way



Hon. W. C. MAYBURY,
Mayor of Detroit.

I think the conditions in Detroit are peculiarly favorable to the successful operation of a street railway. I desire to say, in spite of the modesty of our railroad management in Detroit—for you know anything managed by Mr. Hutchins would be managed modestly—that we point with pride to the splendid operation of our street railway, to the cleanliness of our cars, to the gentlemanly conduct of those in charge, and everything that goes to make the operation of a street railroad substantially successful and complete.

My dear friends, the notable thought that comes to us in a convention like this is the fact that the world is growing so catholic and so broad. You may say the men upstairs who have inventions and apparatus to display are here for commercial reasons. I grant you that the inventor is worthy of a proper

return for his genius, as the laborer is worthy of his hire; but in the broadest sense those exhibiting appliances that are meant to make the operation of the cars safer, more rapid and to insure greater comfort and cleanliness in them are inspired by other reasons. These men give these things to you and to the world, actuated not alone by commercial considerations, but in order that the cult which you are connected with shall be a great success. For it is a grand thing to stand up in the race of men, as some individuals do, like mountain peaks that are themselves above the ranges about them; and it is a pleasure for most of us to belong to something in this world, some organization or association, that we are proud to say, for example, "I belong to the cult of railway operators, the men who supply the railway appliances and the railway systems in the great cities of this country." You are proud to say that you belong to such an organization; you are proud of it because the connection with such an organization is one which places honor on any man; and a measure of any man's usefulness in this world, is not what he can do for himself alone, for the meanest man you can think of is the man who has some secret that belongs to the world and yet he tries to hide it. This world of ours has been rich and poor a thousand times;— why, because in the providence of God, as I believe, there are times when men are singled out here and there, in the palace and in the cottage, in the humble walks of life, as well as those of the learned, some man is singled out who seems to have a gift. In medicine it may be a man who has the gift of curing some peculiar disease; in mechanics it may be a Tesla who discovered the power of looking through space or an Edison who from day to day beholds the wonderful propositions which appear before his eyes and which he puts into practical use. Had these men lived hundreds of years ago, they would have had no idea of the stewardship reposed in them by the discoverer which they had been inspired to make, they would have had no thought of giving them to the world, but would look upon them only as something they could turn to their own individual advantage. Years ago almost every neighborhood had some old person who had the secret of the mad stone, but it was effective, and could cure rabies. If you asked him, "Will you give me that secret?" he would answer, "No, I have it from my father and will transmit it to my son." Possibly he died and the secret dies with him. Could Pasteur do that to-day? Could he wrap himself up in the secret of his art, and say, "Bring to me the children threatened with rabies and I will cure them"? No, the world would take hold of him and say, "No, if you have this, give it to the world and the world will pay you. You will be paid a thousand fold in the honor that will surround your name, far above any reward in money." It is so in every art that is discovered. It is discovered for the world. If Edison should die to-day, there are hundreds who are on the line of his discoveries. If Tesla should die to-day, there are thousands considering the things which he discovered. In every branch of medicine, every art we know of, there is no man who wraps the secret up within himself and says, "I am going to keep it." No, he must give it to the world and recognize the stewardship which God has put upon it.

These conventions are significant of the age in which we live, and the world will not be poorer, but richer, because, once discovered, inventions are committed to the children of men for their good and go on for all time. The world will continue to be enriched as long as the children of men dwell upon its surface. At a recent exhibition of our State Fair at Pontiac recently I saw something that struck me as a peculiar invention. I am now trying to give you an illustration of my idea, when I say that the measure of each man's usefulness is what he does in the world, not only for himself but others. I passed the plow department at the Fair and saw a man, evidently a farmer; you could see by his general appearance and his hard hands that he had held the plow many a day, and he stood there exhibiting a device whereby, with the movement of a lever, the plow could be turned at the end of the furrow. I could not but think of the relief in the use of this device to the plowman as he came to the end of the furrow. Instead of following the old way, of pulling the plow around with the horses, and the feet of the horses becoming entangled in the traces, causing the little cuss words that steal out, here was an invention which did away with all this cause of trouble. I thought to myself that here was a man who has done something for the world, something of practical

value, of every day need, who contrived by a simple arrangement of a lever to enable a man to easily turn a plow. I felt that this man had done his share of the world's work, I wish that I could do something as plainly for the good of the children of men as you have done, was my thought, and I felt that there was a man who had accomplished something of real value, whose useful invention would confer benefits upon mankind after his name had been forgotten. So it is in all avenues of life, where men are constantly striving to produce that which will make existence better for us all.

Coming with such thoughts and purposes, why are you not welcome to Detroit. We have not a very abundant supply of coal, but possibly after the convention of to-morrow we may have a good deal more. Now do not think of the cold; talk. I believe many of these things are as we think they are. Just imagine that it is warm. It is not October; it is July; and reach out, wrap yourself with a blanket of the hospitality of these good people of our city, and you cannot be cold, coal or no coal. You come, my friends, to a peculiar city; old, and yet new. I said to you a few moments ago that the city was laid out on the plan of the city of Washington about 100 years ago; but that was not the beginning of its history. Detroit was founded in 1701, and a year ago we celebrated the 200th anniversary of the founding of the city. For the first hundred years Detroit was, allow me to say, a French city, where the French language was spoken and where all the simple ways of the courteous people were exercised in all their refinements and higher attributes. Indeed, in my own lifetime, and I will say for the ladies present that I am not as old as I look, and that being a bachelor I never lose any opportunities—even in my boyhood I remember the scenes along the river were such as would remind you of the opening lines of Longfellow's "Evangeline," where he describes beautiful Arcadia, the old French homes, the era of plenty, with happiness and buoyancy and cheer everywhere, and the doors wide open, or perhaps a latch string hanging out, easily pulled, with a disposition to give comfort to the stranger and to make hospitality almost a part of religion. I sometimes think that the blessings that have come down to this goodly city, and its exemption from pestilence and disease, is consequent upon the blessings bestowed upon the early founders; for you will not dispute the fact that Detroit is the gateway of the civilization and christianization of the great northwest. Some had passed up the Mississippi, like the followers of De Soto, and some through Illinois; some were missionaries who were led mainly by the zeal of the cause, and in other cases they were adventurers led by the story of springs and rivers filled with golden sands; but those who came to Detroit were settlers and came with packs on their backs, and they brought with them implements of industry, the farmer, carpenter, cobbler, all came to make a community and landed within a stone's throw of where you are assembled this morning. Their first act was not one of savage onslaught on the Indians, who watched from behind a tree to see what the white settlers would do; the Indian discovered that one of the first acts of the new settlers was an act of worship, with no temple save that which is always above us, no canopy save the trees which grew beautifully on the river shore, no witness save the wild animal and the bird, and when the Indian peered through the bushes, what did he see. He saw a kindly invitation to come in and kneel down in quiet thankfulness to God that he had cast the lot of the settlers in such a beautiful place, and that the homes which they were about to build should be happy and prosperous. For fifty years no Indian blood was shed, so kindly were the people and the Indians that they brought the amity of Bethlehem with them. The white settlers treated the Indians fairly and for fifty years they lived on terms of peace and good will, and our city was founded amid such blessings as those.

My dear friends, if it requires anything more to add to the warmth of your welcome in Detroit, you must certainly see it in the bright sunlight of this morning. I do not know but it is in answer to the prayers of those who looked for your coming. The skies for the last week have been very dark and heavy, and perhaps in answer to their prayers they have broken away and given us this glorious sunshine this morning. You will find a welcome in the broad streets and walks; hospitality is marked in this city; and as you go along you do not feel you are elbowing

someone. We built our city for the accommodation of the stranger and are lonesome when we have not guests. You must feel that the streets were laid out on the broad scale that you see them, for the accommodation of the friends who might be with us. I hope your stay will be in every way enjoyable. The streets of the city are laid out in a somewhat irregular manner, and even those who are natives and to the manner born occasionally, when the night is dark and the lights somewhat dim, do not always find their way in the most direct route to the place for which they are bound; and if any such fate should overcome you, and it is possible that it may, permit us to mention that you will notice on the street corners here and there gentlemen who in other cities would be denominated policemen. They are not known as such here. They are guardians for the stranger. Do not pay any attention to the belt around the waists of these gentlemen. They never draw the little clubs which they have in these belts. They are used to frighten the children. If this confusion as to your whereabouts should overtake you at any time, step up to one of these gentlemen and tell him that you are attending the railway convention, and you will be wafted to the haven you desire.

The President: Mr. Mayor, on behalf of the officers and members of the American Street Railway Association, I tender to you our hearty thanks for your very cordial address of welcome. We represent a body of practical, hard-working men; our industry has more to do with the comforts and conveniences of the daily lives of the seventy millions of people of the United States than is represented in any other industry. We have to carry this great mass of people safely over the cities' streets to the suburban areas; to the home and school; and we are most important factors in the social and business life of every community in the country. The stores, the manufacturing industries, in fact, all of the daily life of the city, is dependent upon the regular and orderly conduct of our business; and if our systems are interrupted it means inconvenience and loss to every city.

The next order of business is the calling of the roll. The registration at the door will be taken in place of the roll call, and that will be passed.

On behalf of the executive committee and the officers of the Association, I desire to express our thanks for the large and representative attendance we have this morning on the opening exercises of the convention. This is certainly a larger attendance at this hour of our first day's meeting than I have ever seen in the many conventions I have attended. It devolves upon the president each year to deliver what is known as the president's address. For the first time in addressing a body of railroad men I am going to read that address. There are some points connected with it that are rather novel in connection with the work of a street railway association. There will undoubtedly be selections made from it by the press, without the context in some cases, to shade some of the points, and I want to be careful in what I say, as a gentleman who is connected with the press in a large way, who happened to read my address the other day said, "If you ever expect to run for governor of the State of New York or president of the United States, do not read that address."

PRESIDENT VREELAND'S ADDRESS.

It is exceedingly appropriate that the twenty-first annual meeting of the American Street Railway Association should be held in the beautiful City of Detroit, for, while the city street railways of the country have not been idle during the past year, the greatest development in electric railway work since our last convention, and, in fact, for several years has been in the direction of interurban electric railways, and in this class of road Detroit railway enterprise has always been prominently identified. Radiating from this city can be found some of the largest and most modern of interurban railways, and Detroit ranks with Cleveland, Indianapolis, Cincinnati and Dayton as the important centers in this country of the interurban railway industry. It is connected by high-speed electric railways with Port Huron on the north and Toledo and Cleveland on the south and east, while the lines to the west extend with only a slight break as far as the eastern shore of Lake Michigan, and will probably before long find entrance into Chicago.

The interurban railways have long since passed the stage when

they could be considered simply as suburban extensions of city lines. They are doing a through business, which is constantly growing, and the later and more ambitious examples of roads of this class are built with a track construction inferior in no respect to the best practice of the steam railroad companies. They operate usually for the greatest part of their distance over private rights of way, and attain speeds which enable them to compete successfully with their steam-railroad rivals for nearly every class of traffic except long-distance passenger and freight business. This extension of the electric railway has introduced new problems of discussion, such as fares, transportation of freight, etc., into the operating department, as well as the exercise of the most advanced electrical engineering methods, not only in the transmission of the power at high voltage necessary to operate the cars, but in the car equipment as well. Up to the present, direct current has been used on the trolley wire or third rail, but if the experiments with single-phase motors, which it is announced are soon to be tried, prove successful, the possibility of the direct application of alternating current to railway work will remove some of the inconveniences which now exist in the present system.

I will not take the time of the convention to give the statistics showing the advances made in street railroading during the last year. Some of them will be brought out in the papers to be read, and statistics on the subject are published in the technical press from time to time. It is interesting in passing to note, however, that eleven years ago there were about 1800 miles of electric railways in the country, while to-day there are between 24,000 miles and 25,000 miles, and that against an investment eleven years ago in street railways of about \$75,000,000, the total capital invested to-day is in the neighborhood of two billion dollars. These figures show that the time has come when we should no longer apologize for our existence, but should take a stand individually and as an association for the protection of our rights as a corporation.

It is a venerable saying that corporations have no souls, and, perhaps, the credit that has attached to this aphorism accounts for the evident belief of the public that they have no feelings. We are here as members and managers of a class of corporations which is more intimately related than any other to the comfort, convenience and success of the people who live in cities and towns. Upon the orderly operation of a street railroad depends substantially everything else that goes on in a thickly settled community. It is true that what we are operating is a valuable privilege granted by the public, but its value depends chiefly upon the sufficiency with which the public is served, and the public was moved to grant it solely from considerations of its own comfort and interest. The contract between the public and the street railroads, therefore, is a contract of partnership and the interest of the partners is identical. What the public wants is the best possible service, and only by giving the best possible service can we obtain the largest possible returns for our money.

And yet, despite this close association of interest, it is the experience of all of us that there is scarcely any limit to the impositions which the public will permit, and rather cheerfully permit, to be laid upon street railway corporations. Legislatures and boards of aldermen seem to regard street railroads as fair game to be hit as often and as viciously as anybody chooses, and the public newspapers, so far from taking into account the service we are rendering and protecting us against the schemes of demagogues, are rather inclined to regard injuries so inflicted with amused indifference, if not with positive favor.

In every other form in which property manifests itself, except in shares of corporate stock, it has well defined rights and valuable privileges. One thousand dollars invested in bank notes or government bonds, or even in real estate mortgages, are surrounded with legal safeguards to maintain their value, and if the hand of the despoiler for one moment seems to menace them everybody begins to talk about the sacred rights of property. That is just as it should be. But money lent to the government at a comfortable rate of interest is no more directly employed upon the public business than that which is represented by the stock of a street railroad, and it is no answer to the claim that it ought to have fair treatment, that it ought not to be the object of special prejudice and attack to say that it is particularly valuable. Its value is strictly measured by the public service it renders. The

contract, of which our charters and certificates of incorporation are the witnesses, authorizes us, as the universal law of business authorizes every one, so to employ our abilities and resources as to obtain from them the greatest possible results to ourselves, and if, in recent years, street railroad shares have been especially good income earners, it is because the street railroad companies are meeting the public ends for which they were organized, because they have studied and facilitated the public interests and needs, because they have put themselves in advance of the development of the cities and towns they run through, because at vast expense they have introduced new methods, new machinery, swifter, more frequent and improved accommodations, and it has never been laid down by the courts that a contract could be broken and new conditions imposed because either of the parties to it had done better than was anticipated, and certainly not because both had. And yet the contracts between the public and the street railroad companies are being continually intruded upon by the imposition of new taxes and new requirements, and it has come to be considered almost an impertinence for a corporation so injured to offer ever so mild a protest.

In the theory of the law a corporation is an individual, but apparently only for the purpose of enabling it to be got at. It has all the obligations of individuals, but of their rights few. The politicians of all parties talk themselves hoarse with eloquent protestations of their love of individual liberty and individual rights, and so well have their laws justified these pretensions that no man in this country is so idle, so worthless, so bereft by his own acts of character, property or position but that if he contrives to keep out of prison he has a vote and the opportunity of making his equal influence felt in the determination of public questions. But a corporation, even such a corporation as is organized to serve the public convenience, may neither vote nor in any other way participate in making the laws by which it must be bound. The proposition before the public on which an election is to be held and a policy defined for future legislation, may be one which vitally concerns the interests, even the life, of a corporation, but if it were to undertake to express its views from a public platform or to influence the votes even of those persons who derive their means of livelihood from its operations, the very foundations of social order would seem to be attacked. It must stand by on such occasions in submissive silence. It must affect an attitude of indifference, and if it does not actually proclaim to its employes their title to vote as they please it becomes at once the object of suspicion and prejudice.

Wars have been fought and governments formed to vindicate the principle that there shall be no taxation without representation, but if a corporation should ask to be represented in a public body that had the power of taxation and was proposing to exercise it upon corporations, its action would be observed with indignation and amazement. Even in the courts its standing is prejudiced, and before a jury sworn to render an impartial verdict upon the facts, its first and constant care is to remove from the minds of the jurymen a frankly admitted antagonism.

It is not remarkable that in this situation the law should discriminate against corporations. The failure to assert rights when they are threatened is always taken as a confession that they do not exist, and encroachment follows encroachment with ruthless certainty. Timid counsels have so far prevailed among the street railroad companies in the adjustment of their affairs with the public that in many states there is a gross discrimination in the taxing laws against such corporations. When by Federal legislation it was proposed to tax the incomes of individuals, although a limit was placed which protected the poorer classes, public protest made itself felt so powerfully that the Supreme Court of the United States, after holding that an income tax was lawful, proceeded to reverse itself and to find constitutional objections that absolutely killed the income tax law. And yet an income tax upon the earnings of corporations is found upon the statute books of many of our American commonwealths, and corporations with which a state has made definite contracts fixing and limiting the obligations on either side are required, notwithstanding these contracts, to pay other and additional taxes upon their gross earnings.

When money is invested in a public franchise upon terms and conditions expressed in a charter or a certificate of incorporation

under a general act, the shareholders have a moral, and it ought to be a legal, right to understand that what they are to pay and to do in making their franchise effectual is nothing more than or different from the conditions of which they had notice and to which they agreed. The rule that there can be no impairment of the obligations of a contract is to be found in the fundamental law of the United States and of every state, and in controversies between individuals no constitutional guarantee is more carefully protected by the courts. And in a contract between the state and a corporation there is no trouble about holding the corporation. If it violates its contracts, or if it does not give the promised service or duly make the promised payments, the attorney-general is authorized to institute proceedings for its dissolution. But the rule of performance does not work both ways. It appears to bind only the corporation. The state can pass new laws imposing new conditions and the corporation will have its pains for its protest.

I look forward to the day when the shareholders in street railway corporations will stand up for their rights as shareholders in the same sturdy spirit which they would at once bring to the defense of their rights as individuals. The great street railway properties of this country, and even the little ones, are no longer in the hands of a few rich men. They are distributed in hundreds of thousands of shares ranging in par value from five dollars to a hundred dollars among a countless body of the people. The heads of these properties are no longer in any material degree their owners. They are, and are coming more and more to be, simply the salaried employes of a great number of shareholders. They conduct the business of these properties as a trust, and they have nothing to do with the stock market. Their one concern is to earn a dividend for their shareholders and pay it where it belongs. Every shareholder is as much interested to protect the property against unjust discrimination in the laws and to protect its reputation as a business organization as are any of us who are placed for the time being in charge of the property. It is no less their duty than it is ours to insist that public officials shall treat these corporations equitably and honestly.

It will not be denied that inasmuch as our opportunity to earn money proceeds out of a public privilege we should pay to the public a fair return for what we get. But what we give in the way of service and what it costs us to give it are elements just as much entitled to consideration in the making of the contract as any other; and when the contract is once made it ought to be as little subject to repudiation or change as any other contract. The faithful discharge of our obligations requires a continually increasing investment, the constant incurring of new risks. It is not enough that we shall meet the demand as it exists from day to day; it is necessary that we should anticipate it. And if the profits upon our investment prove in the end to be considerable, that is the reward to which intelligent foresight, courage and good management are always entitled. The spirit that seeks to confiscate anybody's legitimate earnings is unfair and reprehensible, and honest-minded men should be strong to oppose it.

This association has served an honorable and useful purpose for 20 years, but the time may be at hand when the scope of its usefulness can be materially increased. I have already pointed out the injustice which is done corporations by municipalities and the need for public enlightenment, not only on the equity of their cause, but also on the service which they are rendering the public. There is one other point to which, however, I would like to direct your attention, and that is in connection with the broader field of electric railroading which this country will certainly see during the next decade.

I have already referred to the immense mileage of interurban electric railways which has been built during the last few years, especially in the Middle West. Many of these roads are hauling freight, and it is a matter of great importance, not only to these roads themselves, but to the cities and towns which they serve, that the facilities which they should enjoy as regards the interchange of freight with the steam railroads should be as free as those between the steam railroads themselves. The first point requisite to this end is to have convenient connections with the neighboring steam railroads, so that the freight cars can be passed from one to the other. The right of the electric company

to demand this has only recently been decided in New York State in a case which was contested between the Hudson Valley Railway Co. and the Boston & Maine Railroad Co., in which the Court of Appeals reversed the decision of the Appellate Division and rightly decided that an intersection and connection of the electric road and the steam road should be made in the interests of the local shippers. This right should be of great advantage to the electric railroad company, but the full benefit to the local shippers will not be derived until the full privileges of an interchange of freight cars between the two systems shall be as universally recognized as they now are between steam railroads, so that freight can originate on either the steam or electric road. Heretofore, in many cases, the steam railroad companies have shown an unwillingness to interchange freight with the competing electric roads, on the plea that the latter were not responsible in the same degree as the steam railroads, and by this means considerable freight transportation has been diverted from the electric railroad.

The points just mentioned indicate the broader problems which are being forced upon the electric railway interests of the country, through the large increase in interurban electric railway companies, which naturally look to this association as the exponent of their interests. This is only natural because while these lines do not operate upon the streets, the electrical equipment problems connected therewith, as well as many of the other questions which arise in connection with their operation are the same as those which interest "street railway" managers proper. And while it may appear inadvisable to change the name of the American Street Railway Association to accord with the broader field of electric railroading in which many of its members are engaged, it should be understood that the association is not merely a street railway organization, but its scope covers the entire field of electric railway transportation. More than this, it may seem desirable to welcome the participation of all companies engaged in electric railway transportation, for the reason that there is no organization in the country which has accomplished so much, or at its annual conventions and exhibitions can afford anywhere near the same opportunity for instruction to those interested in electric transportation in its different phases. Heretofore no manager or engineer of a trunk line company which is contemplating or has installed a system of electric traction could join this association except as a representative of some street railway company; but in view of the interest which is being taken in electric railway equipment by some of the large trunk line interests and the undeniable future which electric power will have for such transportation, especially for terminal and suburban work, the question will arise in the near future, if it has not already done so, whether the benefits which this association can confer are available for companies which are not now eligible to membership.

I will not attempt to suggest an answer to this question, but all signs indicate that it will be an important one during the next few years, if it is not so already.

Mr. N. H. Heft, Meriden, Conn.: I move that the thanks of this association be tendered to our president for his able and courteous address, that it be spread upon the minutes, and that the secretary be instructed to have the address printed, and that each member of the Association be furnished with several copies.

Secretary Pennington put the motion which was carried.

President Vreeland: Gentlemen, I thank you for that expression, on behalf of the Association. Those of you who are connected with electric railroads in the eastern section of the country have heard expression of such sentiments from me a number of times and to that point. I felt that it was a duty I owed to the street railway interests of the United States to take a stand on this question as I did in the east a few months ago. The problem we have confronting us, as I have indicated in the address, is not the problem it was ten years ago; it is not the problem that confronted the managers of street railroads ten years ago. The man who ran a street railroad at that time usually owned a large part of the capital stock and dictated its policy with his hand on his pocketbook. The policies of the street railroads of to-day are dictated by men who are technically and scientifically educated in the methods of management and control and operation of these large corporations. The character of the service which is ren-

dered to the public throughout the country, the development going on in the hands of men who have nothing to do with the financial questions connected with the property is what has brought the electric railroad properties up to their present state. The electric railroad system has no history back of it. The man who works in this field is a pioneer, whether he is an operating manager, or the electrical engineer or mechanical engineer. He has no literature to go to from which to gather information relating to the operation of these systems; all experience in connection with this work must be obtained by hard work, and the hard knocks that come from the actual operation of these properties. That electric railroading has advanced to the stage in the world's transportation that it represents today, particularly in the United States and Canada, is an evidence of how hard we have worked and how well directed our efforts have been, and how ably we have been supported by the great electrical and mechanical equipment companies in this country. They have spared no expense and no pains in the developments which have had to do with the success of our industry, and it is but fair to them to say in the convention that they have had just as much to do with placing the electric railway in the high pinnacle of advancement it occupies to-day as any distinctly operating or mechanical men in the country. Gentlemen, I thank you.

REPORT OF EXECUTIVE COMMITTEE.

The secretary read the report of the Executive Committee, which consisted, as in past years, of the minutes of the several meetings held during the year, showing what has been done by your committee. Our readers are already familiar with the action taken at the meeting of the committee in February last.

The special meeting of the Executive Committee yesterday was called to order at 12:30, with Messrs. Vreeland, Wason, Foster, Sloan, Dyer and Nicholl and Secretary-Treasurer Pennington present.

After approving the minutes of the last meeting, the secretary and treasurer submitted his report, which was accepted.

Other business transacted at this meeting was as follows:

The president appointed Messrs. Foster and Nicholl a Committee on Memorials.

On motion of Mr. Nicholl it was voted that the Local Committee be supplied with banquet tickets in appreciation of the work the committee has done and the courtesies extended by the committee.

On motion of Mr. Sloan it was voted that the thanks of the committee be extended to the Detroit Club for courtesies shown the committee.

On motion of Mr. Foster it was voted that the thanks of the Executive Committee be extended to the Local Committee for the efficient manner in which they have performed the work incident to the arrangements for the present convention.

On motion the report was accepted.

REPORT OF SECRETARY AND TREASURER.

The secretary and treasurer then read his report, which showed the present membership of the association to be 191, there having been a net increase of 12 during the year, although nearly 25 companies withdrew by reason of consolidation.

The treasurer's report showed a balance Oct. 1, 1901, of \$10,128.63; receipts, \$8,378.85; expenses to Oct. 1, 1902, \$8,530.50, cash in bank Oct. 1, 1902, \$9,948.03.

On motion the report was accepted.

The President then read letters of regret at their inability to attend the convention from Hon. H. C. Payne, Milwaukee; Capt. Robert McCullough, Chicago; and Charles S. Sergeant, Boston.

Mr. E. C. Foster, of Boston, presented the report of the committee on memorials, which was as follows:

REPORT OF THE COMMITTEE ON MEMORIALS.

J. Bannister Hall.

J. Bannister Hall died in the city of Baltimore, on Feb. 4, 1902, in his 66th year. He was secretary and treasurer of the Charleston Railway, Gas & Electric Co. He was born in Baltimore in 1837, of Irish descent. Mr. Hall for many years was a member of the Corn and Flour Exchange, of Baltimore, and later was the Maryland manager of the Massachusetts Mutual

Life Insurance Co. He subsequently became one of the original members of the board of directors of the Charleston Railway, Gas & Electric Co., and was elected to the office of secretary and treasurer, which position he held at the time of his death. Mr. Hall was highly esteemed for his estimable qualities of character, and is survived by four children.

C. C. Howell.

C. C. Howell, general manager of the Knoxville Traction Co., died May 7, 1902, at Phoenix, Ariz., where he had gone in the hope of improving his health, which had been in poor condition for some time. Mr. Hall went to the West at an early age, and laid the foundation of his useful career and comfortable fortune. He went to Knoxville in 1895, and was the main mover in the consolidation of the competing electrical interests, having consolidated the street railway and electric lighting properties. He was a member of the Knoxville Chamber of Commerce, vice-president of the City Hospital, and an ex-member of the State Legislature, as well as a director of many financial enterprises. He left a wife and two daughters.

Dell H. Goodrich.

Dell H. Goodrich, secretary of the Omaha Street Railway Co., died at his home on May 11, 1902. Mr. Goodrich was born at Brandon, Vt., May 13, 1818. His early business experience was gained in the employ of Bradstreet's Mercantile Agency. He afterwards went to St. Louis as a representative of the R. G. Dunn Co., and in 1876 went to Omaha as the manager of that commercial agency. Later he was superintendent of the city water company. In 1887 Mr. Goodrich was one of the organizers of the Omaha Cable Tramway Co., and when that company was consolidated with the Omaha Street Railway Co., he became secretary of the consolidated company. Mr. Goodrich is survived by a widow and three children, to whom in his lifetime he was a devoted husband and father.

Winfield Scott Stratton.

Winfield Scott Stratton, president of the Colorado Springs Rapid Transit Co., died September 14, 1902. Mr. Stratton was a man of very large wealth, which he had accumulated in mining operations. He was born in Indiana in 1818, and was educated in the schools at Jeffersonville, in that state. He had varying experiences in life until 1891. In that year he located a "claim" which netted him sufficient means to develop the mining properties under his control, and his vast wealth, estimated at \$20,000,000, thereafter accumulated very rapidly.

Walter V. Crouch.

Walter V. Crouch, secretary of the New Orleans & Carrollton Railroad Co., of New Orleans, La., with which company he had been connected for 27 years, died May 16, 1902.

The President: The next order of business is the discussion of technical subjects. Before taking up these papers, I wish to say, for the information of those who are not connected with the executive committee, who happened to be here yesterday, that President Hutchins of the Detroit United Railway, who has done everything in his power, assisted by his able staff, to make this a successful convention and to add to the comfort and convenience of the Association as well as its guests, has been quite ill the past week, confined to a hospital. He was able to come out for a few minutes yesterday, and I see this morning that his doctor has again allowed him to come to this session of our convention. I told him yesterday that in view of the condition of his health we would fully understand his absence and the causes of it if he did not appear. I am glad to know that he is so far improved as to be able to be with us this morning. You must not expect any response from Mr. Hutchins to what I am saying. I only wish you to know he is here and to know the reason why he is not personally greeting you this morning. He is not in a condition to do any talking, but I know he will appreciate my sentiments, as well as those of you gentlemen who are directly connected with the work of the Association. (Loud applause.)

Mr. Hutchins bowed his acknowledgments.

The President: The first technical paper is on the subject of the "Registration of Transfers." This is an important subject to the members of this Association as evidenced by the many letters I have received within the past year, asking our practice in New York regarding transfers and the opinion of the management of

the company on this question. It was considered by your executive committee as one of the important questions. It was a very hard matter to get anyone to write the paper, and it has been absolutely impossible to get anyone who would open the discussion on it. Some gentlemen who have written to me within the last year and asked an expression of opinion from me on this question have flatly refused to write or speak on this topic. I did not know but what this question occupied the same position as some of the larger questions I indicated in my address. Certainly, nothing in connection with the practical part of the business is as necessary to decide as the method in which the revenue of the company shall be cared for. If any of our members have views on this subject, they should be certainly willing to express them. That is one subject I have had more experience with than anything connected with the practical operation of railroads. I asked Mr. C. D. Meneely, of the Brooklyn Heights company, to prepare this paper, and he has done so, but it is impossible to be present at the convention. There is no necessity of reading it as a whole, for the reason that we have succeeded this year in getting all of our papers very early, and the secretary has distributed them at an early date, and they should be in the hands of every delegate. The purpose of having the papers prepared in advance is to do away with the reading of the paper as a whole, as the discussion is fully as valuable as the paper. Mr. Meneely treats of the subject of transfers under two heads, first discussing the question, Does non-registration divest the transfer of its cash value? The second subdivision is under the head of the Registration of Transfers and takes up the practical questions connected with that subject. The points are pretty fully covered in the paper.

I have been requested by a number of gentlemen, that, owing to the paper being short, they would like to have it read. Mr. Robinson, who is a good reader, will read the paper.

Mr. H. A. Robinson, of New York, read the paper as follows:

REGISTRATION OF TRANSFERS.

By C. D. Meneely, Secretary and Treasurer Brooklyn Heights R. R.

Regarding the registration of transfers there is wide diversity of opinion in the street railway world. While there is a large contingent which advocates the registration of transfers, there is a numerous body which strenuously opposes it, and many who have studied the problem have been unable to reach a definite conclusion concerning it.

No mathematical solution of the problem has yet been offered, nor will I attempt any, but will here briefly outline for discussion the chief arguments for and against the registration of transfers with a view to determining, if possible, the weight of evidence from which to draw a conclusion.

Those who advocate the non-registration of transfers place great stress upon the contention that this course divests the transfer of its cash value, and focuses the attention of the conductor on the collection and registration of the real revenue, namely, the cash fares.

On the other hand, the advocates of registration are equally insistent that the non-registration of the transfer does not eliminate its cash value, except to the extent of preventing trading between conductors, and the consequent substitution of transfers for cash fares.

First, does non-registration divest the transfer of its cash value?

Undoubtedly, the fact that the transfers of other lines cannot be turned in at a cash value prevents the conductor from obtaining fraudulently, either directly or through an intermediary, the transfers of intersecting and transferring lines and converting the transfers so obtained to his own dishonest gain. Nevertheless, while the non-registered transfer may not be used by the conductor in this particular manner, its value has not been one whit diminished to the travelling public, to whom the conductor may, within limits determined by the accounting, either sell or give away rides on the company's cars, which would otherwise go to swell its earnings; for no accounting method has yet been devised which will accurately check the issue of transfers on a large system without undue expense.

Moreover, the non-registration of transfers renders so easy the appropriation of cash fares by conductors that many conductors, who would otherwise be indisposed to take the risk of open stealing, become dishonest. This has been forcibly illustrated on the Brooklyn Rapid Transit Co.'s system. In the summer of 1900, during the months of May, June and July, conductors were instructed to discontinue the registration of transfers. On August 1st of the same year the registration of transfers was resumed, and, coincidentally therewith, a large number of supposedly reliable conductors, long in the service, were detected stealing the company's revenue. The increase in the number of old conductors, previously possessing excellent records, who were at that time discovered appropriating fare was so marked as to lead to the conclusion that during the preceding three months the ease and safety with which the company's revenue was plundered had tempted these men to steal, and, that upon the resumption of the registration of transfers, the exercise of the habit then formed proved too strong to be deterred by the added chances of detection.

Second, as to the registration of transfers.

It will be conceded, I think, by all practical street railway men that the ideal method of obtaining revenues, assuming one uniform rate of fare and a sure method of preventing transfer trading, would be to register all fares and transfers upon a single register.

Under the above noted assumption the advantages of such a method are obvious. The query naturally arises, do these advantages more than compensate for the loss occasioned by transfer trading? On the Brooklyn Rapid Transit system we think that they do.

By taking transfers out of the hands of conductors and placing transfer agents at points where cars from the same depot intersect and transfer, thereby preventing conductors from trading directly with each other and compelling the use of an intermediary, we endeavor to keep this evil in check and supplement it by the vigilant watchfulness of our inspectors and secret service operators. Our system of stationing uniformed register inspectors between all practical terminal points and the first transfer intersection practically protects the revenue between the outer transfer and terminal points, and enables us to concentrate our secret service in the central portion of the system to locate register shorts and detect transfer trading.

To further limit the risk of trading to the day of issue we introduced and, I believe, were the first to use a daily dated transfer ticket, which has since been adopted by many of the principal systems in the country.

Doubtless, a further check upon transfer trading is provided by the turning in of transfers by trips and the subsequent checking of line exchanges by the Accounting Department.

Were it not, however, for the lottery law and a certain demoralizing effect that distribution of property by chance has upon the community by inculcating the gambling spirit, it would be possible to offer such inducements to street railway patrons as would absolutely check the cash fares received and the transfers issued. Such a governing inducement would be, to offer cash prizes of a large amount monthly, which would yet form in the aggregate only a small fraction of the amount which is now diverted from the company's revenue by conductors.

In addition to carrying a pad of transfers the conductor would be provided with a pad of numbered cash-fare receipts, each one of which receipts would bear on its face an injunction to hold until the end of the month, when the bearer might be entitled to any one of a number of prizes, determined impartially by a drawing; the prizes consisting of a capital sum, together with lesser sums graded down to a large number of small premiums, which would distribute the cash prizes as far as possible.

The operation of this plan would involve the issue of a transfer only for a cash fare. In practice it would work as follows:

A passenger, boarding a car, would be asked by the conductor, upon payment of fare, if he wished a transfer. Upon receiving an affirmative reply, the conductor would issue a numbered transfer to the passenger from his pad, and upon turning in his pad would have to produce one cash fare for each transfer ticket detached from his pad.

All passengers who desire transfers are sure to get them, as they are needed for a ride on the transferring line, and conductors would, therefore, not be able to again issue detached transfers.

On the other hand, if a passenger, upon paying his fare, stated that he did not wish a transfer, it would become the conductor's duty to detach a cash fare receipt and hand same to the passenger. For every cash fare receipt so detached the conductor would also be held accountable for one cash fare. The inducement for a passenger to take a cash fare receipt would be even stronger than in the case of a transfer ticket, as it might mean a large sum of money in case the number of the ticket drew a prize, and when a passenger, ignorant of its possible value, refused to accept his fare receipt, others would eagerly seek its possession. Assuming that both transfer tickets and cash fare receipts were taken by passengers for all fares paid, the stubs returned by the conductor would accurately indicate the number of fares collected and would insure the turning into the treasury of all the revenue collected on the cars. Several marked advantages would follow from the adoption of this plan, as, for example, the reduction in the number of transfers used, since many persons, who would ordinarily take a transfer for a short ride after a long one, would prefer the chance offered by the cash fare receipt and decline the transfer, which carried with it no chance for a prize.

Moreover, the number of short-riders would, probably, be increased to an extent that would realize a larger sum than the aggregate of the prizes offered, and again, the trading of transfer tickets between conductors would be rendered absolutely impracticable, and he would, therefore, be debarred from substituting mean a corresponding cash fare to be turned into the company's treasury, and he would, therefore, be debarred from substituting transfers from other lines for cash fares.

While according to the opinion of counsel, the operation of this plan would not violate the letter of the lottery law, inasmuch as no consideration is asked or received for the cash prizes distributed, yet the decisions under the federal lottery law, which absolutely prohibit the circulation of notices of drawings through the mails, in the opinion of counsel renders the operation of the plan inadvisable.

While, perhaps, the adoption of this plan might stimulate a speculative spirit in the community, it is unfortunate from the point of view of street railway companies that some similar scheme for the absolute protection of revenue could not be devised that would not contravene state or federal laws.

So long as street railways continue to operate there will be more or less dishonesty on the part of conductors, which no mechanical appliances can wholly prevent; but while the careful choosing of material; fair and considerate treatment and the encouragement of a spirit of honesty and integrity will always be the best safeguards for the protection of revenue; at the same time the study of improved methods of protecting the revenue by mechanical, or other means, should not be neglected, for, though perhaps an uncomplimentary commentary on human nature, it is none the less true, that many men remain honest only because of the fear of detection, and to such it should be our object to minimize the opportunity by all means in our power.

Mr. Root, New York: I partly agree with Mr. Meneely when he says that the non-registration of the transfer does not eliminate entirely its cash value, but that the non-registration of transfers eliminates their cash value to such extent as is possible; in other words, there still remains the possibility of the conductors giving away tickets to other conductors or to their friends, which possibility still remains if you register the transfers. Eliminating that point, it seems to be the only thing to be decided in the question of this registration or non-registration is the question whether the cash value, which I think all admit is given a transfer by its registration—whether that balances the possibility of the difficulty which the secret service men had in detecting the non-registration of transfers. It has been our experience in New York, which is contrary, apparently, to that which Mr. Meneely has had in Brooklyn, that the non-registration of transfers does not make the conductors steal the cash fares—it has not that tendency, and on the other hand it does not in any way confuse our

secret service men. This is perhaps peculiarly so in New York, on account of the great number of short riders. With us our secret service men pay absolutely no attention to whether the number of passengers on the car corresponds with the number of passengers indicated on the register, for the reason that a car starting at any terminal of the road may take on ten passengers, five of whom will get off within a half mile. This is more so in New York, on account of the great number of short riders, than in any other city in the country, probably, and for this reason more than any other we are very emphatic in our opinion that the non-registration of transfers is the best for our system; but I personally am of the opinion that for any interurban or suburban road, where they carry passengers for long distances, and have few riders, and check to a large extent the honesty of their conductors, through a comparison of the number of passengers in the car as against the number registered, and the registration of transfers in that case may be advisable. But for a city service like New York I am emphatically opposed to the registration.

Mr. W. E. Harrington, Camden, N. J.: We had been operating for some years up to last summer without registering our transfers. We had reason to believe there might be some trouble in connection with it, and we started to register the transfers last summer and did it for three months. Our secret service department showed such a wholesale trading in transfers that we stopped it, and since that time we do not allow them to register the transfers. We are not registering our transfers, and are of opinion that we are pursuing the right course.

Mr. H. M. Sloan, Chicago: It seems to me if transfers are to be registered at all, it should be done by a double register. My company was one of the first to put in the double register, and at the time we put the double registers in I was anxious about the outcome. I thought the conductors might register the cash fares on the transfer register; when they collected a cash fare they would ring up the transfer side, and the inspectors were given particular instructions to watch that point, which they could easily do on our road at the transfer points. I found to my astonishment that there was very little of it. It seems to me that the only scheme for registering transfers on the same register with the cash fares is to introduce some such system as they have in St. Paul. They have a very elaborate system there, and I believe a paper was read on the subject some years ago, I think at Niagara Falls, explaining the system in detail, and the system was described as having the cars come to a given point, and when a conductor gets off the car his transfers are taken from him, and when he gets on they are given back to him, and following this up they have an elaborate system of checking in their office, and in that way they are able to eliminate all stealing of transfers.

Mr. E. G. Connette, Syracuse, N. Y.: The conductors of the Syracuse Rapid Transit Ry. Co. are required to register transfer tickets. It occurs to me that a non-registration of the transfer ticket only eliminates the value of the ticket to the conductor. It does not prevent the conductor from giving away transfer tickets to people along the road, or to agents at the points where they may be sold at a reduced price. The registration of transfers, of course, gives them the same value as a 5-cent fare; and we use as a rule a single register, because we have not yet received an explanation of the advantage of a double register that would justify a separate register for 5-cent fares and also a register for transfers. The advantage in registering the transfers as we have discovered was that if there is any speculation on the part of the conductors it occurs to a great extent when the cars are crowded and when inspectors are on the cars it is a very difficult job for them to detect whether the passenger pays his fare with a transfer or with coin, but it is not difficult to count the number of passengers that the conductor has on his car, and by that means at least get a check on the carload of passengers. The trading of transfers can, to a large extent, be detected without very much expense by proper clerical help. If there is any wholesale trading between the conductors, the conductors are bound to maintain the sequence of time in which the tickets are issued, and from time to time we check the transfer tickets that are turned in with a view to seeing whether or not the time limit on the tickets is punched with regard to the sequence of time, so if there is any trading between the conductors, they must observe

the sequence of time in which the tickets are issued, otherwise they can be detected when the tickets are checked up.

Mr. John I. Beggs, Milwaukee: I thoroughly believe the necessity of giving to the transfer, and every other evidence of a right to ride on the cars, all the value that is given to a 5-cent nickel paid on the car. Under our system the transfers are deposited in boxes at the terminals of the lines every trip. The conductor does not keep them until the end of the day, but they are placed in envelopes and dropped at the terminal points. He likewise does not keep his pad of transfers, but turns it over to the man who takes his run when he exchanges cars. If transfers are to be registered, I believe it should be done upon a double register; that does not necessarily mean two registers in a car, but a double dial. In our own practice some four years ago we adopted a double register which showed the number of passengers carried on any particular trip on one disk. We are at the present time, after a use of four years, arranged for an exchange of registers which will show the two classes of fares gathered on each trip, as well as the two totalizers, and it is surprising to what extent the public does note the character of fare that they have paid as indicated on the dial, not at all times, nor all people, but many people do, and we believe it does have a restraining effect upon the conductor. We have some 50 transfer points on our system—50 points at which transfers are given and to which they are given, consequently I do not believe it would be possible for any inspector to detect whether a passenger, particularly at the crowded hours, had paid his fare with a transfer or whether he had used one of the various types of tickets we have. As Mr. Root said, the system in New York is peculiar because of the large number of short riding passengers, and the small amount, I presume, of anything but nickel fares. Our system, controlling all of the interurban lines, centering in the City of Milwaukee, has ten or twelve possible commutation rate points, the tickets of which are given on our city lines to carry the passenger out into the suburbs, the tickets being sold to represent the commutation rate. Instead of two straight fares of 5 cents each, we may have a combination fare of 7½ cents, the passenger getting a transfer beyond the first fare point; consequently, on one of the disks which come up on the register there are transfer tickets and 5-cent fares, that comes up with a light-colored disk, and when the 5-cent fare there comes up a red flag, and in this way the public is to a certain extent a detective as to whether the conductor is ringing up the class of fare which has been paid. We believe it facilitates the checking of a conductor, and I would not consider disregarding the value attached to a transfer. To our trained men it has all the value of a cash fare and is treated as such. They never know when a particular line may be checked up; as the lines are checked up either in regular order, or if there is some suspicion, the transfers are brought in, messengers bringing in the transfers at various times during the day, and we may take one line or another, make a thorough checking on a day, or series of days, each following the other. Therefore, I am thoroughly convinced in my own practice, for the ordinary road, outside of roads like New York City, that it is necessary to give to the transfer the same value that attaches to a cash fare or a regular 5-cent ticket sold by many roads.

Mr. W. B. Tarkington, Council Bluffs, Iowa: We have also registered transfers. We cannot understand why anyone should ride and present something for his fare which the conductor is not required to ring up. We require every passenger who crosses the bridge from Iowa into Nebraska over the Missouri River to pay 10 cents. If he has paid 5 cents on the local line and given a transfer, we want the conductor to ring up that transfer. If the passenger has a commutation book which entitles him to a ride for 5 cents, we want the conductor to ring twice for that 5 cents, if the passenger crosses the bridge. If the passenger has a ticket to a summer resort that costs 25 cents, we require the conductor to ring twice for the coupon which carries the passenger over the bridge or vice versa. We are thoroughly convinced that it is to our interests to have the conductors ring up for every class of ticket which they accept. We have upon the advice of Mr. Sloan put in a double register, and our experience has been that the passengers themselves take an interest in noting what class of fare the conductor rings up and the bells of the register have different tones. The men who do the checking are enabled to tell by the tone of the bell what class of fare

is rung. This is a matter which affects the revenue of the company, and we want to find out what is the best way to handle it.

Mr. Connette: I would inquire, if the transfer has the same value as a 5-cent piece, what advantage there is in ringing them up on separate registers, or double registers; and even if the passengers do know that a conductor makes a mistake and rings a transfer for a 5-cent fare or vice versa, what is the difference?

Mr. Sloan: That is rather a difficult question to answer. The line of demarkation as to whether it is better to register a transfer or not, is so fine that it is oftentimes only a matter of opinion; but my conclusion, after having put the system in and used it for four or five years is that the transfer is registered very accurately, and that a conductor very seldom collects a nickel and rings up a transfer. I watch this matter very closely. Sometimes conductors believe that the passenger is watching him and he will ring the correct fare even though he might be tempted not to do so. A register is a monitor. If the conductor supposed that nobody but an inspector was watching a register, the peculations from the company would be very much increased. There are many passengers, as all of us know, who have an interest in the operating department, and a conductor will say that so and so is a spotter. I like to have the conductors believe that such persons are spotters. I look upon the register as a monitor which reminds the conductors that the passengers are watching him.

Mr. N. H. Heft, Meriden: I am willing to admit this is one of the subjects upon which I have spent considerable time racking my brain as to whether to register or not to register transfers. We have tried the system of not ringing the transfer and also the system of ringing the transfer, and we are using now on our system the "Duplex" transfer which is printed in pads of one hundred, numbered consecutively, and these pads are charged to a conductor when he goes out on his run, and he is required to punch the transfer, tear off the Duplex, and return the original in his envelope, and pass the other to the passenger, punching in the time limit. When the passenger boards the car to which he is transferred, the conductor of that car is required to punch the time that he received the transfer, and we have been unable to find more than one way by which the conductor could successfully beat this transfer ticket and that would be at a transfer point where he had an understanding with the meeting conductor, who would punch up about the number of transfers he thinks the conductor would sell for cash fares on the other car. That is a risky piece of business, because the spotter on the car would detect it very quickly, and with that system it does not seem possible for the original conductor to part with the company's transfers unless he turns the cash fare into the company, and with our system of blanks it is very easy to keep track of the transfers and to make a complete accounting of them with that system. We are just introducing the system on one of our other lines, and we think very well of it so far. As a general proposition I believe that every ticket received by a conductor as an evidence of fare should be registered.

Adjourned till 2:45 p. m.



TUESDAY AFTERNOON SESSION.

Called to order at 3:15 p. m.

The President: I have received a letter and telegram within the last half-hour which undoubtedly you will be interested in. The kind invitation of the Association through you to be present at this Detroit meeting is acknowledged. I had hoped I could attend, but urgent business prevents. In presenting my sincere regrets, please assure the members of my esteem and best wishes for the most successful meeting in the Association's history. I cherish my honors from the Association as one of the most delightful episodes of my life. With thanks and highest regards for yourself and my former associates, Walton H. Himes."

"I regret very much that I will be unable to attend the convention on account of the Board of Arbitration being in session this week, and where I am in daily attendance. I expected to be present and avail myself of the benefits of this convention, which are of great importance in conducting large enterprises similar to those in which most of us are engaged. Hoping that this convention will eclipse all former conventions, I am, yours truly, J. M. Roach."

We closed the discussion on the Registration of Transfers prior to our adjournment. The paper on "Steam Turbines" has been laid over until Friday, at the request of the writer and some two or three gentlemen who desire to discuss it, but could not possibly be here today.

The next regular paper is by Mr. Root, of New York City, on "The Street Railway Mutual Benefit Association." I will ask Mr. Root just in a general way to present some of his points without reading the whole paper, and then we will take it up for discussion.

Mr. Oren Root, Jr.: Mr. President, the points are rather short and you can yourselves glance over the paper itself and get the gist of it probably as quickly as I can tell you. But as a preliminary statement to this paper, as I have stated here, through the instigation of President Vreeland some four or five years ago, this subject and others were taken up; and at that time this mutual benefit association was put into effect and has been worked out as I have described in this paper. About the same time or shortly after the Association was formed there was another subject which is very closely allied to this to be taken up, and that is the Pension System. It has occurred to me that it might be of some interest to this convention to have a brief statement made of a pension system which has been adopted by the Metropolitan Street Railway Co. of New York, since this system was so closely correlated with the workings of the Mutual Benefit Association and is really supplementary to the work which I have briefly described in this paper. The employes who are retired under the Pension System which has been adopted in New York may be divided into two classes. First, all those employes who are 70 years of age and who have been 25 years in the service of the company. Second, all those employes of the age of 65 to 69 inclusive who have been 25 years in the service of the company. All those employes who are 70 years of age are retired by the limit—by the age limit itself. That is compulsory. And all those employes between 65 and 69 are retired at the discretion of the trustees of the Pension Fund, if they are found in the opinion of the trustees to be incapacitated for active work. The allowance as paid to these retiring employes is divided into three classes. If service has been in the company for 35 years or more, these retiring employes are paid at the rate of 40 per cent of their annual average wage for the previous ten years. If service has been for 30 years, they are paid 30 per cent of the annual average wage for the previous ten years; and if their service has been 25 years, they are paid 25 per cent of their annual average wage for the previous ten years. This fund from which each of these allowances are made is appropriated solely by the company and the employes contribute in no way to it. The object in establishing this Pension Fund is to step in where the Mutual Benefit Association leaves off and to preserve the welfare of the aged and infirm employes and to recognize loyal and efficient service. We believe that all the employes who are now and who will hereafter enter the company, unless they should be subjected to very unusual periods of illness, that both they and those dependent upon them will be taken care of if they remain in the service of the company from the time they enter the service of the company to the time of their death. We, of course, do not intend that all our employes, for instance men who are engaged in the operation of the cars as motormen and conductors, should continue in such positions until they are 65 years of age, at which period they are eligible to retire under the pension, but we do believe that on the average, a conductor or motorman, for example, can properly operate his car up to, we will say, 55 years of age. And from that time to the time when he is 65, when he is eligible for a pension, we expect to take care of him in such positions as that of transfer agents, switchmen, flagmen, messengers, etc., which positions a man in that time of life can, we think, perform with satisfactory efficiency and without any hardship to the man himself. It is scarcely necessary for me to say that our employes and their families have deeply appreciated the establishment of this Pension System. You might consider or think at first blush that the allowances paid, that is, 40 and 30 and 25 per cent of the annual average wages, which I have spoken of before, is not a material sum; but if you will stop and consider that for every man who retires under the 40 per

cent clause of the Pension System he is practically having held in reserve for him the sum of ten thousand dollars from the time he retires under this system to the time of his death. In other words, if a man has been earning an average of a thousand dollars a year and retires under the 40 per cent clause of the Pension System, he will receive \$400 a year, or 4 per cent on \$10,000; which is a half of 1 per cent more than the savings banks pay in New York City. This brings about a situation that any employe who enters the service of the Metropolitan Street Railway Co., of New York, to-day can say to himself when he reads over the Pension System, that if I stay in the service of the company for 25 years, or until I am 65 years old, with 25 years of service, I can have placed at my disposal from that time until the time of my death, \$10,000. Where is there in this country any other similar situation or where is there a company or a business where a man with the same amount of skill or with the same ability that we require in the street railway work—where is there such a situation that a man, eliminating this pension situation, can, if he enters the service of any concern at, say the age of 25, during his entire life save and have the amount which the Metropolitan Street Railway Co. to-day says that they will place at their employes' disposal after they are 65 years old, with 25 years of service behind it. We do not wish our employes to consider and we do not consider ourselves that we are going to pay these men this amount in any spirit of charity, but we feel and we believe that they will feel, and do feel, that we are merely paying to them something which they have themselves earned through their years of service and their loyalty to the company. I have made this statement outside of the paper, because, as I say, it is so closely correlated with the work of the Association, and is merely fulfilling President Vreeland's idea which he had when he originally promoted the Metropolitan Benefit Association—that is, when this Association was formed through his instigation.

STREET RAILWAY MUTUAL BENEFIT ASSOCIATION.

By Oren Root, Jr., Assistant General Manager, Metropolitan Street Railway, New York.

While the purpose of this paper is to discuss mutual benefit and assessment insurance associations as applicable to street railway employes, it will be well, before treating of that special subject, to say a word on the general topic of mutual benefit associations and assessment insurance, the main features of which must be embodied in any plan intended to benefit the class we have under consideration.

The history of assessment insurance, when extended beyond a single and continually recruited class, is not encouraging, and insurance practice demonstrates it to be, at its best, more expensive and uncertain than ordinary corporate insurance by strong companies. Assessment insurance, however, when applied to particular crafts, which in the very nature of things must be continually recruited, has shown phenomenal results, especially when accumulated surplus has been invested for the benefit of the insured and not dissipated in executive salaries.

I take a street surface railroad in a growing community to be in the indicated class where assessment insurance can be, so far as the beneficiaries are concerned, profitably applied, as is evidenced by a case in point—the Metropolitan Street Railway Association of New York, with whose workings I am familiar and concerning which some details may be of interest.

This association was organized in the spring of 1897 by the employes of the company at their own suggestion, and was so planned that any employe between the ages of 21 and 45, who had been in the service of the company three months, was eligible for membership upon the payment of an initiation fee of one dollar and dues of fifty cents per month.

In return for these payments, the association guarantees to its members:

1. In case of sickness, the payment of one dollar a day for a period not exceeding ninety days in any one year.

2. In case of death, the payment of \$200 to any beneficiary named by the insured.

3. The free service of a physician who devotes his entire time to the members of the association.

4. The use of reading rooms which are supplied with weekly and monthly papers and magazines, technical journals and a library consisting of over 2,000 volumes.

5. Use of ten pool tables, for which one cent per cue is charged.

6. Free monthly lectures and entertainments during the winter months at the association rooms.

7. Eligibility for pension under the pension regulation of the Metropolitan Street Railway Co.

The association started with 30 members and from that time it has steadily grown until to-day it has a membership of over 4,500.

The association is operated with absolutely no expense beyond the stipulated salary of a physician, as all the officers of the association are officers of the company and their services to the association are given gratuitously. The association rooms are given rent free by the company; the library and pool tables were donations from individual stockholders and directors.

This plan, which I believe with slight modifications, is applicable to almost any railroad property of considerable size, has worked out, in its financial details, some surprising results; for instance, we found that the amount of the tax, fifty cents per month, is a trifle more than is necessary to pay sick benefits and supply life insurance of \$300, but it is so small, in each individual case, as to make an exact adjustment both inconvenient and impossible, and hence there has grown up in this association a practice of investing the surplus in the securities of the property on which the members are employed. And so we have in this association the unique feature of each member contributing monthly, in an infinitesimal way it is true, to a proprietary interest in the property he helps to operate.

Before going further into the details of the workings of the association and discussing the beneficent results it has accomplished for the men and owners of the property, I must, in order to be thoroughly understood, say a few words about certain human agencies, account of which can not be taken in any written rules of practice.

The success of the Metropolitan Street Railway Association is primarily due, not so much to its sound economic features as to the personal relationship established and maintained between the responsible head of the railway company and its employes.

All of us who have to do with masses of men are aware of the fact that it is not always easy to induce them to do that thing which is obviously for their betterment, whereas experience shows that when their sympathies are stirred and their feelings appealed to they can be and have been induced to the most suicidal courses.

The phenomenal success of the Metropolitan Street Railway Association is due primarily to an intelligent, sympathetic relation fostered and encouraged between the manager and his men who early realized that they were under the discipline of a man who was in thorough accord with them as a class and whose life experiences had been along the very lines they themselves were travelling.

The fusing influence of this relationship, which is as active to-day as at any time since the formation of the association, has welded the membership into a body, the tremendous force of whose loyalty has been frequently tested in critical emergencies.

The impetus thus given to this association is great enough to assure its permanence beyond the accidental loss of the influence of the individual who is responsible for its present energy.

I have said this much in order that I may not be misunderstood as imagining so vain a thing as that the mere formulation of a beneficent plan is sufficient to secure its success. In the application of social benefits, as in everything else of human devising, some vivid personal influence is necessary to success, and this success, believe me, can not be achieved by mere formal approbation or endorsement. If you want to make a concern of this kind go you must give it your time and thought and above all you must be convinced at bottom that it is the right thing to do and that it will succeed.

If I might presume, before proceeding to further discuss the

results of associations, to make a suggestion to those contemplating an experiment in this direction, it would be to avoid patronizing the men. Many good things are spoiled by being overmagnified, and it is my experience that among American and Americanized working men there is a resentment of official patronage. The quickening influence of the idea that you and your men are engaged on the same job but in different capacities, when once fixed, is surprising. It would be well, too, not to lose sight of the fact that the benefits arising from helping your men to take care of themselves are not all one-sided.

This thought brings me to a consideration of the benefits arising from associations.

These benefits may be divided into two classes: First, those derived by the employes, and second, those derived by the employer. There is nothing which appeals more strongly to the large majority of people, certainly to those who have worked for a living, than those things which yield a direct or indirect financial return. No one can fail to see the great benefit which the distribution of from \$20,000 to \$50,000 a year means to the men who are working for wages, and without reserves to draw upon in cases of sickness or other disaster. The services of a physician, the free use of a library, the opportunity to play pool or billiards in a well lighted and well ventilated room at a nominal cost, are the financial benefits as well as pleasures which are assuredly appreciated by any body of intelligent workmen, such as are employed by street railway companies. There is a benefit not so apparent but equally real in the creation and strengthening of a common spirit—"esprit de corps"; a realization of common interest in a work of many details but of common end. The gain is the greater as all employes are included, from the helper to the manager. The perfection of army organization is where the soldiers have entire confidence in the leader, and the leader absolute trust in the soldiers. When something of the strength of all goes into the work of each, tasks are more easily done; there is more careful attention to details, a common interest taking hold beyond the working hours gives heart to labor, when the time comes. A street railway touches the public at numberless points; the work of its employes is at each of these points; work with something of heart in it is easier and better than mere hand and head work.

When one remembers that in such a scheme as I suggest there is no demoralizing taint of official charity and that the men are gradually realizing that in truth they are doing all the help-work with their own money, he will realize that the moral uplift far exceeds any of the material advantages.

The benefits of the second class from these associations—those to the employer or stockholder—are not so tangible as those received by the employe, but, nevertheless, exist to a large extent and are apparent to those who are in close touch with the workings of such associations and their bearing upon the management of the company's affairs. It may be difficult to demonstrate to an outsider, or to put your finger upon particular cases where the use of the library or the association rooms or the pool tables accrues to the advantage of the company. It is unquestionably true in my mind, however, that all of these things create a certain sentiment in the mind of the employe favorable to his employers, and which in times of labor troubles, when the misguided and unscrupulous agitator attempts to cause dissatisfaction, crystallizes into a feeling of loyalty toward the company which could not have been gained in any other way.

At the monthly meetings of the Metropolitan Association, which are held in the association rooms and at which men of prominence and officers of the company speak to the men, the employer, as represented by the officials of the company, is brought into a personal relation with his employes, not as employer and employe, but as man and man, and in this way there is established a personal relation between them and a feeling of friendliness which certainly, in a large company like the Metropolitan, is not possible in any other way. I believe, as illustrated in the late trouble in Ohio which a large manufacturing company had with its men, that it is possible to overdo this kind of work. When you begin to wet-nurse and patronize workmen, you are offending them and making trouble. The idea is to teach them to help themselves.

As an illustration of what opportunity for amusement means

to working men one of the pool rooms located at 50th St. and 7th Ave., takes in on an average of \$45 per week. Several games of pool, at a cent a cue, must be played in the course of a week to make receipts \$45.

There are, to my mind, three dominant problems in the handling of a street railway property. First, is the relation of the management to its employes; second, its relation to the public and the press; and third, its relation to the state and city officials. Of these, the relation of the management to its employes is of the greatest importance. Fair, considerate treatment of men's natural rights, the establishment of friendly and harmonious relations between it and its employes, is a railway company's most valuable asset. The great successes in the street railway world have been made by ability to successfully handle men.

However unjust it may be to the responsible head of any street railway property, how often has it been the case that the faithful and efficient work of years has been practically forgotten and nullified by differences which have arisen with the company's employes. The fact that a manager has been able to operate his road at a less cost than ever before and has brought the standard of equipment and the roadbed and the entire physical condition of the property to a higher level, is apt to be overlooked by the company's directors and stockholders in case serious labor difficulties arise. The stockholders of a property not only look to the management for a return upon their investment but value once established they look for their stability and permanence. To assure the stability and permanence, moral forces must be set to work and carefully fostered until they gradually become traditional with the concomitant result of loyalty and efficiency of service.

I believe that the interest the employes take in a financial investment of 50 cents a month in an association and the enjoyment of the opportunities afforded by the libraries, pool rooms, and entertainments, etc., together with the personal contact between the employes and management, bring about a relation between them similar to that which the millions deposited in the savings banks bring about between citizens and their government. I think, with rare exceptions, that there will be found among savings bank depositors but few anarchists, socialists, or those dissatisfied with existing conditions. The millions of savings bank depositors are among the strongest influences toward the proper government of the country, and I believe that the financial and other interests of employes in a street railway company through their association are equally strong influences for good.

We are living in an age in which no industry has made more rapid strides than the street railway. What was considered ten years ago a liberal policy on the part of street railway companies toward their employes would be considered penurious today. The methods of ten years ago cannot be used effectively at the present time.

The relation of capital and labor as represented in street railway properties has undergone a radical change in favor of the condition of labor. The betterment of labor conditions has been just and fair, and, in my opinion, any street railway management will do well to recognize it and meet it with liberality. There is no better way of keeping abreast of this movement than the encouragement and fostering of mutual benefit associations.

There are many things that are necessary to establish proper relations between the management of a company and its employes, but I believe that the most potent factor of all is the benefits received by the employes through a voluntary association and the relations which the social side of such an association establishes between the management and its men.

The President: Gentlemen, the paper is before you for discussion; on any social points connected with it, Mr. Root is very familiar with the facts of the management in connection with the Association and with the Pension System. I know he will be very glad to answer any questions that may occur to you. And you, gentlemen, quite a number of you, who have written me letters about this, can get your letters answered now. I will ask Mr. Connette, general manager of the Syracuse Rapid Transit Co., to open the discussion.

Mr. Connette: The Mutual Benefit Association of the Syracuse Rapid Transit Co. was organized in 1898. The admission fee is \$1.00. The monthly dues are 50 cents. The joining of the association is entirely voluntary on the part of the employe. The association has paid out in the last two years, according to their financial statement, in sick claims, \$1,915.50. In death claims \$900, making a total of \$2,815.50 paid out in two years. Upon September 1st this year the association had to its credit \$952.17, \$500 of which was invested so that it was getting an interest return. They also have as a special fund, as a contingent fund, for the purchase of such things as they may need to make their rooms more pleasant and agreeable, \$319.48, which they have secured by holding entertainments from time to time. They have rooms equipped with pool tables, card tables, reading rooms with all the weekly and daily periodicals where the men can rendezvous at times when they are not on duty and enjoy themselves. The association is entirely controlled by the employes. The board of trustees being composed of members of various departments of the system and membership is not only limited to the employes but the heads of the departments and the officers of the company are also members of the Mutual Benefit Association. We have a meeting once a month, and we not only have a meeting of the employes, but the heads of departments and the officers of the company meet with the men. We not only discuss matters pertaining to the Mutual Benefit Association, but from time to time we take up subjects of interest to the railroad company, such as accidents, for instance, and we have the employes participate in discussing those subjects and the best methods of avoiding accidents and things of that sort. We bring out what is in the minds of the employes themselves. You will find, or at least we have found, that this benefit association does not wholly result in the discussion of the sick and the afflicted and the bereaved families of the employes; but it results in a friendly relationship between the employes, the subordinate officers and the management of the company; and by reason of that close relationship which is brought about by the intermingling at the meetings of this Association we learn to know each other better. We learn to feel an interest in each other's welfare, in the management of the property; and it has been impressed upon the employes that the success of the company does not depend entirely upon the management, but that every employe imparts his share to the success of the enterprise. It has been a means of bringing about a co-operative feeling between the management and its men, and we feel that the Mutual Benefit Association, so far as our company is concerned, is a great success. The fees are deducted each month by the auditor of the company when the men are paid off; and the amount then is turned over to the treasurer of the Association and deposited to its credit by him. All checks that are payable for sick and death benefits have to be approved by the general manager of the company before the checks can be paid by the bank, so that there is no possible way for any defalcation or for any diversion of the funds of the Association. The board of trustees, which is composed of the employes of the company, are allowed one-half day each month on pay to assemble in the association rooms to discuss matters in connection with the management of the association, and to arrange for its monthly meetings. The secretary, who is one of the conductors on the road, is allowed two days each month on pay for the purpose of arranging his books and making up his checks to pay death and sick benefits, etc. Altogether we feel that the Mutual Benefit Association of the Syracuse Rapid Transit Company is a success from every standpoint.

Mr. Haggerty, of the Michigan Traction Co.: I would like to ask the gentleman in case an employe is a member of the association and then leaves the company's service, what procedure it takes in regard to his membership?

Mr. Root: As soon as a man severs his connection with the company he severs his connection with the association, and does not get any return for the money he may have paid in.

The President: The question asked by that gentleman is a question that has been asked very frequently, and the answer is the same as made by the Pennsylvania R. R. Relief Fund. The Pennsylvania R. R., which you know by its relief system handles over \$200,000 a year puts every case in a question and answer form and the proposition is that it is exactly the same as

to buy a traveller's insurance policy for 25 cents to protect you 24 hours, and you get that 24 hours' protection. They have done their duty and you get your returns for your money. The Pennsylvania road has one of the oldest associations and largest in the United States. The theory of it is a man pays 50 cents for a month's protection in the association, and all that goes with his protection. If a man leaves on the 15th of the month he gets 25 cents back that he has paid. If he leaves the 20th he gets a proportionate amount. In a word, the idea is that a man is not paying for anything but one month's protection when he pays under the system under which it is conducted.

Mr. Beggs: I would like to ask Mr. Root what policy the Metropolitan company pursues as to the care of the fund that takes care of this pension expenditure, which naturally will grow greater as time goes on and more men because of length of service in the company become entitled to the benefits of the pension system. I would like to ask, as a matter of finance, whether the Metropolitan company has made an appropriation to its Pension Fund, or revenue from which will meet these pension demands as they accrue. Or whether it has made an annual charge against operation. I ask this because I am myself interested at the present time in formulating the rules for a similar pension fund. I would like furthermore to know what the experience of Mr. Root is with the Metropolitan company, and likewise Mr. Connette, as to men laying off a day or so in order to obtain sick benefits. I ask this more particularly for the reason that many years ago I gave a great deal of time to a number of beneficial organizations in the State of Pennsylvania, among which was the Odd Fellows and Knights of Pythias and kindred organizations for quite a number of years. I held a prominent position in those organizations, and gave to them a great deal of time. I believe they would have been wrecked ultimately had it not been for the principle adopted by us about twenty years ago, whereby a man had to be incapacitated from work a certain length of time before the weekly sick benefits began to accrue to him. I was wondering whether in these organizations any experience of that kind had been encountered. Whether there were, as there is in nearly every body of men, a certain number who feel they must get square with the organizations to which they are paying funds. Whether or not it has shown any tendency to have men lay off a day or so each month or at periodical times, in order to know that they had a certain amount which they would receive any how. I would like, furthermore, to ask what is the rule when a man is possibly injured in the company's service. We, in our organization, usually deal with each of those cases individually. If incapacitated by injury in the proper performance of the company's service, we usually make him an allowance of his wages. Half sometimes and sometimes more than that, dependent upon the circumstance in which the injury occurred. I would like to ask whether it is considered by these two companies which are running this beneficiary organization that the dollar per day acquits the company from any further obligation to the employe?

Mr. Root: As to the first question I will say that the directors of the Metropolitan company have authorized the officials to go as far as \$50,000 to pay above this pension allowance. There is a provision in the regulations themselves which permits the Board of Trustees at any time, when they consider a payment under this system excessive, to make a revision of the ratio of payments, so that they are not bound by anything they do to-day or a year from now. In fact, when they consider it to be excessive they can revise the ratio at which the employes who retire under this Pension System are paid.

Mr. Beggs: You have struck just the point I wanted to get at. Aren't you running them somewhat upon the plan of a great number of these assessment associations that have been formed throughout the United States in the past two years; that in the early stages they were well able to meet the amounts payable, but as the number of members increase, as they will 25 years from now, these men that remain in your service a considerable length of time, if then an effort is made to reduce the amount that you have paid to employes before that time, will that not be a source of dissatisfaction and a feeling of injustice, that if they had been able to retire a few years earlier they would have received 40 per cent, whereas you may be compelled to reduce the

amount that they will receive to 20 per cent or some other figure or something much lower than their fellows receive? That like wise raises an important point in my mind and you have touched upon it very well in your paper. Indeed, whether it would not be well to exact from them, let the amount be very small, but some amount, I don't care whether it is one cent a week or two cents a week during the time they have been in your service, to be paid into this permanent pension fund, and that be invested and kept, the revenue from which would provide and guarantee the payment of these amounts in the years after your men had grown old in your service. That has been the complaint against many organizations that have been attempted in this country with very good purposes, but which were found to be impossible to carry along. I, myself, belonged to a number of them for a considerable length of time. I raised this same warning cry twenty odd years ago, in the order of the United Workmen and the Royal Arcanum, where we were compelled very greatly to increase the amount that they exacted from their members. There should be rules standardized to govern the employees and to standardize these beneficiaries of the companies, and which I think is for the benefit of their employees. I throw out these questions more particularly for the purpose of arousing a spirit of inquiry among those who are charged with the very serious responsibility who operate these public utilities throughout the country.

Mr. Root: I do not consider that that condition of overrunning the allowance by the length of service is apt to arise, because I believe if their employees get to that condition where the payments shall be greater than the amount that we have now appropriated that the benefits the company have received through their length of service will be proportionately greater, and that the company can in that same proportion fairly pay them at the same rate as they do now. That was merely put in as precautionary, because this thing has not been worked out. We are, I think, the pioneers in the street railway world. The Pennsylvania, I believe, is the first one to adopt it. I think it was about two years since it was established, and we have got to fall back on some precautionary measure, so that if we do get into trouble we can avoid it, but we do not anticipate that we will. We have got a good deal of precedent from Germany and England, where they have done a great deal of this pension work, and they have found there that where the superannuated body contributed themselves, it has not been as satisfactory as where the government has taken the thing entirely in its own charge. This is a matter, however, which only time can work out. We have not the experience, but we are going into it now and making such regulations as we deem proper. When these things arise ten or fifteen or twenty years from now, as they may, as Mr. Beggs suggests, we will have to work it out on those lines then. As far as the association itself is concerned, about the men attempting to defraud the association through laying off when they are not sick, our regulations provide that any employe may receive \$90 in one year, that is, at the rate of a dollar a day, but his benefits do not begin until he has been sick for seven days, unless he is injured in the service of the company. If in the service of the company, it begins from the day on which he was injured. There can be very little question about a man when he is injured in the service of the company, whether he is injured or not. The association's physician is a man, of course, who is very reliable, and upon whose judgment we place entire confidence; and there is no one who receives any benefits from the association unless he makes a prompt application to the secretary and is examined by the association's physician. Even if a member elects to have his own physician, he is not paid any benefits from the association until the association's physician himself makes an examination and reports to the secretary that he is entitled to this benefit for which he has made a claim.

Mr. Beggs: I do not think the seven-day clause appears in your paper.

Mr. Root: I think that is an amendment which has been passed and perhaps is not in the regulations as originally printed.

Mr. Beggs: I think it is a very important one to have brought out here. It did not appear in your paper, but it covers the point I am getting at. I am very glad indeed that this has been brought out for the benefit of anyone who intends to establish a system of this kind. You will find men that will lay off, but

Mr. Root's amendment, which does not appear in his paper, is a very important one.

Mr. Root: I shall be very glad if any of the members of this convention desire our regulations, which enter more into detail, to send them to them.

Mr. Conette: As far as our Association is concerned, the by-laws specifically state that the benefits do not commence until a member has been disabled for seven days. Furthermore, the association employs its own physician, and when a member is sick that physician must wait upon the member, and the association pays the doctor bill.

Mr. Harkness, Connell Bluffs: The laws of the state of Iowa are very stringent in regard to assessment insurance companies. An organization has been organized in Iowa, and the laws of the organization follow the points brought out by Mr. Beggs. The Modern Woodmen and those assessment companies which have a very rapid growth and have no reserve fund are now confronted with a possibility of a great deal of trouble by not having anything to pay claims with. The new company provides a reserve fund from the beginning. If you join at the age of 25, and die at the age of 31, your expectancy of life would be based upon the tables of the old line insurance companies and you would be required to pay the assessments to the limit of your expectancy, which perhaps might be 55 years; so that out of the amount of money which you would receive, if it were \$1,000, they would deduct the amount from 31 to 55 years, the assessments for all those years, and lay it aside as a reserve fund the accumulation of which it is believed will take care of this.

Col. Heft: I would like to ask a question of Mr. Root; if I understand him right, he said when you organize your pension fund, you set aside the sum of \$50,000, believing that to be adequate to take care of the pension. I would like to ask if that sum has been set aside now and is at interest; or is it an assessment against the operating expenses of the corporation to be taken care of at the time that you are called upon to pay these pension amounts?

Mr. Root: Mr. President, I intended to say that the board of directors authorized the officials to expend that much money, \$50,000 in any one year in payment of these allowances, and that will be considered as an operating charge and will be charged up just as if these men were working in their regular duties which they had been before they were retired under the pension. It does not become a charge against the operating expenses of the corporation until such time as you are required to make payment. We have retired men already under the pension. It is not retroactive, but it goes into effect on July 1st; and any employe who was 65 years old and who has been 25 years in the service is eligible for retirement and some have been retired.

Col. Heft: How can you treat him as being 25 years in the service when your corporation is only some four or five years old?

Mr. Root: There is a provision in the pension articles which says that it refers to any constituent company, either prior or subsequent to the requirement by the Metropolitan Street Railway Co.

The President: Anything further on this paper, gentlemen? If there is nothing further to be said on this, we will order this discussion closed and proceed to the next paper.

Mr. Lang, of Toledo: I desire to ask the attention of this convention for a moment. I would like to offer a resolution at this time, in order that the matter may get to the ears of as many of our members as possible, and there seems to be a good representation here, and there may not be later in the session. I have a motion to make following the reading of this resolution which may be of interest to everyone: "Whereas, The American Street Railway Association in convention assembled has learned with much gratification of the extensive plans that have been made by the Louisiana Purchase Exposition for the proper presentation at the exposition of the American street railway interests; Resolved, that this Association extends to the transportation and electricity departments of this international exposition assurances of its hearty interest in the work they have undertaken, and its hope that the plans will be brought to a full realization."

NEW SPRING SHOP AT BRILL PLANT.

The J. G. Brill Co. has lately added to its extensive works in Philadelphia a spring shop in which has been placed the very latest patterns of furnaces and machines for making high-grade coil and flat springs of every description. The spring shop was instituted primarily with the idea of making all the springs used in the construction of Brill single and double trucks, but the company is now in position to supply springs not only for its own

that can be obtained. The entire force is in charge of an expert spring-maker of long experience. Special care is taken in the inspection and testing of the entire output of the spring department. To insure absolutely faultless work, samples from each lot of springs made are first placed in the testing machines and destroyed in order to determine the capacity limit, and each spring of each lot is then tested individually to insure that it comes up to the specified standard. The company buys all its material in the rough, and is therefore able to over-see each indi-



EXTERIOR OF THE SPRING SHOP OF THE J. G. BRILL CO.

purpose, but also for sale in the open market as well, and orders are solicited for all the standard sizes and forms of springs, and also special springs for special purposes.

The new spring shop is housed in a brick building near the office building of the Brill works. The shop equipment for carrying on the various processes of cutting, tempering, shaping and finishing coil and plate springs include the following: Two fitting furnaces, two coil furnaces, two punching machines, one punch and rolls machine, one back machine, two coil machines, two testing machines, one banding machine, two double shears, four dressing tables, four fitting tables, one lathe, one eye back, three

visual process in the work of turning the rough stock into the finished product.

All the machines in the shop are driven by a 50 h. p. motor. Adjoining the spring shop is a new forge shop built to take care of the overflow work from the main forge shop of the company. In this room have been placed two 2,000-ton hydraulic presses, one 1,500-ton steam hammer, and several furnaces and forges. This new department will be occupied almost entirely in forging the side frames of Brill trucks.

These additions to the plant are in line with the general policy of the Brill Company to keep its plant strictly up to date, and to give its customers the advantage of every possible improvement in the various processes entering into the making of Brill cars and trucks. In this same direction the company is continually expending much labor and time in making new and improved dies and forms to enable it to turn out truck parts in a manner in keeping with the high standards aimed at. New and heavier machinery has been added in all the departments, and both the quality and quantity of the output thereby kept up to the requirements of the business.



CHRISTENSEN ENGINEERING CO.



A CORNER OF THE BRILL SPRING SHOP

oil tempering tanks, and one bending machine. This equipment is to be increased by the addition of one tapering hammer for tapering steel bars, and a steam hammer. The furnaces are the latest oil burning type, capable of giving the very best results.

A feature of this branch of the business is the high class labor employed, each workman in the shop being the best of his class

The Christensen Engineering Co. has an interesting exhibit, including a Christensen straight air brake set of equipment and a complete automatic equipment for a two-car multiple-unit train. Both these equipments are shown in operation. In the school-equipment the general arrangement of all the apparatus is the same as used on a car, but the motor driven compressor, engineer's valve, and other parts are all mounted so that they can be easily examined while in operation, and the function of each device can be readily understood.

The remarkable growth of this company's business is indicated by the large list of patrons mentioned in the handsome booklet the company is distributing; this also shows cars of different type upon which the Christensen air brakes are installed and several

interior views of the company's works, which indicate the illustrations of excellent facilities for the manufacture of its product.

The company's interests at the convention are well cared for by representatives of the sales and engineering departments, including F. C. Randall, manager of sales; J. H. Denton, J. T. Cunningham, J. F. Dixon, jr. and J. J. Nef, of the New York office; W. W. Power, Philadelphia; H. N. Ransom and O. N. Leet, Cleveland; J. E. Ekdred, jr. and C. P. Tolman, Chicago; W. A. Granten, Pacific Slope; W. L. Waters, C. D. Knight, J. C. James, R. J. Sutton, W. J. Richards and F. L. Hutchinson, of the home office, Milwaukee.

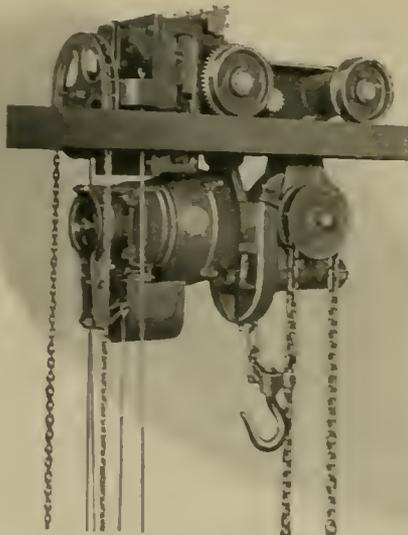


A NEW ELECTRIC HOIST.

Various attempts have been made to design an electric hoist capable of handling heavier loads than come within the range of hand hoists, and not requiring the heavy and expensive supporting structures necessary to carry the large amount of dead weight of ordinary travelling cranes. The Sprague Electric Co. has lately placed on the market a machine of this character which is claimed will stand the use and abuse to which all such apparatus is subjected, and will effectually fulfill the requirements of modern shop practice.

This hoist is designed to transfer light work rapidly around shipyards, factories, etc., and when supplied with trolley carriage, geared hand cross travel and bridge travel motor, to take the place of small traveling cranes.

This hoist has many advantages. It has a high efficiency and is small and light. It consists of few parts, all of which are interchangeable. It is easily adaptable to all types of runways and bridges, and the sizes range in maximum capacities from 1,500 lbs. to 10,000 lbs.



SPRAGUE ELECTRIC HOIST.

The smaller sizes can be equipped with a trolley arranged to run on a single rail, or 1 beam, and if so arranged will take curves of a reasonably small radius.

In designing this apparatus the manufacturers have carefully kept in view the fact that it would be subjected to rough usage. All parts are made of great solidity, and of the highest grade material and all bearings have been made self-oiling, requiring but trifling attention at long intervals.

All the different movements necessary for a traveling crane, namely, hoisting, lowering, cross-travel and bridge travel, are controlled by a simple pulling of the chains and cords connected to the mechanism, and which can be operated by the ordinary workman in the machine shop, factory or other place where the hoist may be used. This is a unique feature to which especial attention is called. No special crane operator or cage is necessary.

The motor and hoisting mechanisms can be hung from a strap if only a hoisting and lowering motion is desired, or they can be attached to a trolley carriage arranged for cross travel, either by pushing the load, or by a geared hand traverse motion. A bridge travel is also provided, the controller for which is mounted on the end of the trolley carriage, as shown in cut. This controller is operated by cords, the handles of which are located near the work. The bridge-travel motor itself is mounted in some convenient position on the crane. The bridge-travel motion is reversible, and in practice it is possible to obtain a very short movement in either direction.

The motors furnished with this equipment are the Sprague Electric Co's. round type motors entirely enclosed and the hoist can be operated out of doors without being affected by the weather. The resistance plates for the bridge-travel controller are of the enclosed type, and have a very large overload capacity.

The Sprague Electric Co. makes and furnishes the complete hoist as shown, consisting of hoist wheels and chain, worm and spur gear, gear cases, hoisting motor and attached cylindrical switch, trolley carriage, geared hand operated cross-travel of trolley carriage, and motor and controller for bridge-travel of crane. The hoist and motor can also be furnished complete without trolley carriage or with trolley carriage and geared hand cross-travel, but without bridge-travel motor and controller.

The Sprague Electric Co. does not make cranes, but will equip them complete with this apparatus, including wiring. A very complete description of the hoist is given in Bulletin No. 8200 which may be obtained by addressing the Sprague Electric Co., New York.



WM. WHARTON, JR. & CO., INC.

The tastefully-arranged exhibit of Wm. Wharton, Jr. & Co. shows a number of samples of special track work for street railways manufactured by this concern, particularly their "Manganese" steel hard center work, which has proved such a great success in the more than six years that it has been in use under the heaviest traffic. A worn-out frog of girder rail construction with Manganese steel center, attracts great attention; it was exhibited to prove that the manganese steel centers which the Wharton & Co. use, actually do out-last the adjoining rails. Some of their samples of new work exhibited show the details of the construction, and the peculiar manner of fastening the centers, which is so secure that even under the heaviest traffic the centers remain perfectly tight and do not become loose. At the same time, the method of fastening is such that the centers could be renewed should necessity arise, but the Wharton & Co. state that in all their experience this has been limited to only a very few centers which developed some hidden defect, and the claim made that it is not necessary to renew their manganese steel centers on account of wear. This is apparently shown by the worn sample above referred to.

The Nichols protected heel switch exhibited, while it had been shown before in its general features, embodied a number of improvements, one, in particular, being a new method of tightening up the bearing of the tongue pin, and a new simple fastening device for the manganese steel cap which protects the heel of the tongue, and by which this cap can easily be removed should it become necessary to take out the tongue on account of some accident to it. This type of tongue switch has proved a most marked success. The construction prevents the tongue from throwing between wheels or between trucks of cars, and the heel of the tongue does not knock down. The standard tongue switch of Wharton & Co., also shown, had already, to a great extent, overcome the two troubles mentioned, but the protected heel switch, although more expensive, is regarded as well worth the difference on account of the greater efficiency in regard to these two points.

The manganese steel construction for standard T-rail work, of which samples were included in the exhibit, represents a comparatively new departure, and has been greatly improved by Wharton & Co. within the last few years. The special pieces in

this track construction are made of solid manganese steel cast-lugs. The abutting rails are joined to these pieces by means of fish plates and wings extending from the manganese steel casting, making an exceptionally solid joint. This class of work is extensively used where permanency, rather than saving of first cost, is aimed at.

Although no samples are shown, Wharton & Co. report extensive use of the manganese steel on steam railroad tracks and elevated roads with most phenomenal results, the manganese steel frogs on the Pennsylvania Railroad having out-lived as many as ten ordinary frogs, and being still in use. They also have recently furnished rails cast out of manganese steel, in curves for the Boston Elevated road, which promise to exceed all expectations in regard to their wearing qualities. Photographs exhibiting various pieces of track work manufactured by Wharton & Co. show that their trade extends to all parts of the world—Europe, Australia, South and Central America and South Africa.



CONANT TESTING INSTRUMENTS.

The improved testing instruments exhibited by R. W. Conant, of 28 William St., Cambridge, Mass., are attracting much attention, especially two of the latest designs which are here shown for the first time at an A. S. R. A. convention. The T-pole bond tester is shown in Fig. 1 as it appears when being used. The principle of this instrument involves the use of a telephone receiver. First, contact is made at three points on the rail, giving two sections of equal length, one being solid rail and the other including the joint; then a resistance box is manipulated until no roaring is heard in the telephone, indicating that the resistance of the two sections of track are then equal. The position of the "balancing switch" shows on a scale the ratio of the resistance of the joint section to the solid section of equal length.



FIG. 1—CONANT PORTABLE JOINT TESTING INSTRUMENT.

The contact apparatus consists of a center pole with steel chisel welded to a socket at its lower end, to which are bolted by one thumb screw, two extension beams reaching out on the rail 5 ft. on either side. These carry two hardened steel chisels which are sharpened so as to bear at their centers. The edges are set so as to extend in the direction of the length of the rail, while the center chisel edge is at right angles to the rail length. The extension beams are of tough and elastic wood. The wrought steel knees, by means of which the extension beams are bolted to the center chisel, are permanently fastened to the beams in such positions that when the T is placed on the rail, the outer chisels touch first, while the center chisel edge is about an inch above the top of the rail. Then by resting the hollow of the foot on one side near the center, the T is sprung down so that center chisel rests firmly on rail. This springing action forces the other chisels outwards with a scraping movement that cuts them into contact with the rail. An additional means is provided for intensifying this cutting effect, by pushing the handle of center pole back and forth, causing both outer chisel

edges to cut through the scale on the rail produced by the rolling action of the car wheels, but does not disturb the contact of the center chisel.

With the T pole connected to the instrument and the telephone in position, the operator places the T-pole on the rail with the rail joint about a foot from the center chisel. The instrument is started by its release switch at the side and the balancing switch is placed on the point numbered 1.



FIG. 2—CONANT MOTOR TESTER IN USE.

A roaring sound in telephone indicates that balancing switch is to be moved to point of silence. When this has been done the number at which switch stands is read off. This number shows the value of the resistance of the rail joint in terms of the standard length of rail spanned which is 3 ft.

Fig. 2 illustrates the Conant motor tester in operation on a car. This apparatus has been adopted by a number of roads, including Boston Elevated Railway, and is reported to be giving perfect satisfaction in every respect.



IT PAYS.

"One bad accident averted pays the cost of equipping all the cars on an entire system with the Providence fender," is one of the very substantial reasons advanced by the Consolidated Car Fender Co., of New York City, why every electric car in the country, whether for city or interurban service, should have one of its life-saving devices.

No better testimonial to the efficiency of this fender could be desired than the hundreds of newspaper clippings that are being received continually at the New York office of the company, relating incidents in which lives have been saved by the fender, in the cities where the Providence fender is standard.

The following is a sample selected at random from these clippings. This one is taken from the Elmira (N. Y.) Advertiser, of Sept. 2, 1902:

"A fender on a street car and a great presence of mind on the part of a motorman saved the life of a boy at the corner of Lake and Church streets last night at 5:30 o'clock. A car running south was about to hit the lad, when the motorman dropped the fender and the boy was tossed into it. Bystanders were horror-stricken, but before anyone could get to him the boy climbed out of the fender and ran like a deer up Lake street and nobody could get his name."



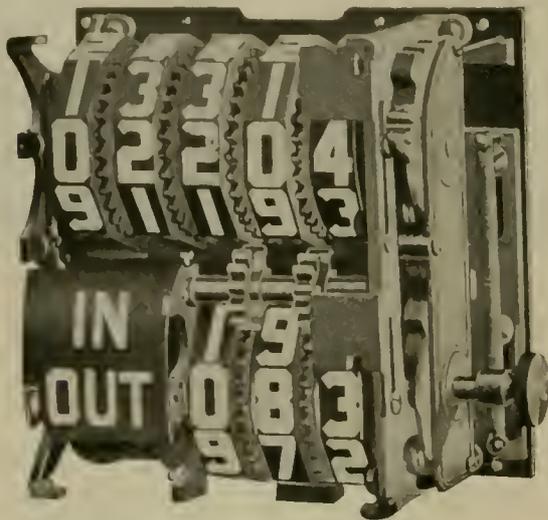
C. J. HARRINGTON, 15 Cortlandt St., New York City, dealer in general electrical supplies, has purchased the entire plant where "Medbury" insulation was formerly made. The plant has been dismantled and removed to the Newark factory of C. J. Harrington, and hereafter the well-known "Medbury" insulation and electric railway material will be sold under the Harrington trade name of "Empire." The firm has space No. 6 at

Exhibit Hall at Detroit in connection with the A. S. R. A. convention; also Parlor B at the Hotel Cadillac, where it will entertain its friends. All are cordially invited to visit both these spaces.



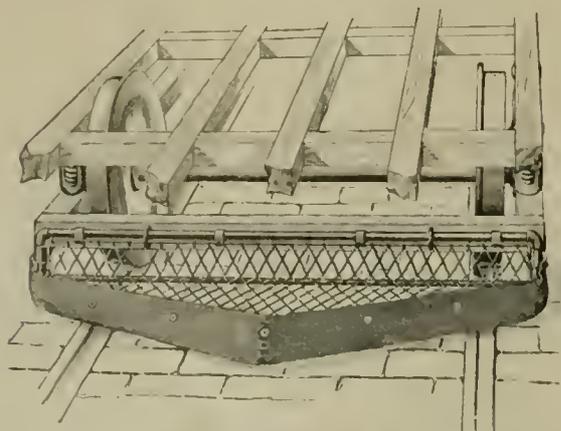
THE STERLING-MEAKER EXHIBIT.

The exhibit of the Sterling Meaker Co. at Space No. 81 includes samples of all that company's products, among which are the Sterling safety brake, the Sterling sand box, the Sterling fender, and fare registers. The brake, sand box, and fender are all shown mounted so that visitors may see the mode of operation in service. Of fare registers there are some six or seven kinds, and of these the new Sterling No. 5 will probably attract the most attention, especially from mechanical experts who understand the problems to be solved in register con-



THE STERLING NO. 5 WITH COVER OFF.

struction. The No. 5 is a development and an evolution, and yet embodies a number of ideas not heretofore brought out in fare registers, and the manufacturer is satisfied that this is the most certain, strongest and most durable register ever built. All wearing parts are of steel; the number of parts is comparatively small, thus promoting simplicity and strength and avoiding complex and delicate adjustment. The new Sterling "Double" register is on



THE STERLING FENDER

exhibition at Detroit and visitors should be on the lookout for it in the Sterling "parlor." There are also the well-known numeral disk register, Sterling No. 1; the stanch old "clock" face, Sterling No. 3; the Meaker 94, which remains the standard on some of the largest roads in the country; the convenient Meaker portable, of which thousands are in use, and one or two more.

ON THE SPOT—PART II

Some few days afterwards I was walking towards my home when, on turning a corner, I nearly ran in to No. 80 clad in a tweed suit and a straw hat and having a marked air of freedom about him. He paused as if to speak to me and so I stopped and said:

"Taking a day off?"

"Naup."

"Have you quit?"

"Naup."

"Vention?"

"Case of 'had to.'"

"Lay off?"

"I'm."

"What's the matter?"

"You r'member that young feller with th' spec's as I thought was a spotter?"

"Yes. Did he report you?"

"Him? Why, he's a d'v'n'ty student up at th' sem'nary; th' boys put me on to him for a joke just to cod me!"

"Where did the trouble come in then?"

"Why, you remember that red-headed Mick, with a little jag on, as sat in the front part of th' car the same night? Well, he's the feller all right, all right! Special from one o' the big d'tective offices out West, best in the biz they say, an' there's a whole lot o' the boys lookin' for him—wantin' t' explain things to him! Say—he was no fo l, that fellow wasn't—fodded me t' the top o' my bent an' he got lines on some o' th' slickest men on the lines, got 'em dead to rights, no chance for forgettin' nor 'n alleyby—no, sir! Had their time an' their trip, an' passengers, an' cash, an' transfers, an' tickets an' everything down pat in every single case—oh, he's a wonder, dinged 'f I don't admire him!"

"What was his report on you; did you find out?"

"Yes, th' old man always tells us the facts. Oh, the report? Say—it was a peach, went like this: 'Conductor No. 80 is either careless or cunning. From previous record an' from character given by other employes' (some o' th' other boys been blabbin') 'I should say the latter. I recommend 30 days lay-off an' a warnin' that discharge will follow next adverse report.' Short an' sweet—like a roasted chestnut maggot—ah't it? Oh, he had me down fine!"

"Did the superintendent show you the report?"

"Not he! He calls me in nex' morning' an' says, 'Mat,' he says, 'here's a report on you,' an' then he reads it an' says, says he, 'Does it go,' he says, 'or do you want to enter an explanation?' An' he looks at me sort o' queer. Now I know th' ol' man pretty well—ever since he started in at the biz—an' he's been through it all from greasin' track-up, an' I know from th' way he looked 't me that I was up against it an' I thought hard for a minute an' made up my min' I'd own up an' take my med'cine. An' while I was thinkin' he goes on an' says, 'The man as made this report,' he says, 'does not look like a young minister, but he does look like a tipsy Irishman'—them's just his words—an' he looks at me sort o' queer again an' I says, says I, 'I guess the report stands, sir—an' shall I report again in 30 days?' An' he says, 'Well, that's up to you, Mat. Does the comp'ny get what's comin' to it after this?' says he, an' I says 'It does,' an' he says, 'Report to me at th' end o' th' time an' I'll give you your run back an' you can go 'nd get what's comin' to you now. An' I says, 'Thank you, sir!' an' puts off to the cashier's office an'—oh, my stars!—if there wasn't about fifty o' the boys there drawin' their pay envelopes—an' some o' them drawin' their last ones, too, an' wasn't there some cussin'! Say, if cusses could 'a burnt, that spotter'd been a cinder! You see, he was a crack-a-jack at the biz, he'd been an ol' railroad man an' was a master-hand at disguisin' an' he'd spotted most all o' them under a diff'rent rig—Mick, Dago, Jew, coon, ol' man, young gal, ol' woman, minister, drunken man—just everything you can think of! I'll be blest if the boys won't be scared to knock down after this if there's no one on board but a three months' old baby—I believe I'd suspicion my ol' gran'mother after what they tol' me. Well, it's learnt me a lesson, I've got a little put away 'n a savings bank an' some shares 'n a buildin'loan 'society an' I'm goin' to buy my tobacker outter my own money after this—guess it'll taste sweeter. Good-bye, sir, see you next month!"

SIXTH REGULAR ANNUAL MEETING STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

WEDNESDAY MORNING

President H. C. Mackay called the meeting to order at 10:45 a. m., and introduced Hon. F. A. Blades, Comptroller of the City of Detroit, who addressed the convention as follows:

ADDRESS BY MR. BLADES.

Mr. President—Permit me sir, at the first moment of my meeting you, in behalf of the city government of this goodly city and the people thereof, of whom there are no better in this world, to bid you a most cordial welcome. In welcoming you to our city, we do so with the assurance that nowhere on this round earth will you find brighter sunshine or bluer skies, or a more beautiful or historic river, or a more generous, big-hearted people than you will find right here in Detroit. As to our bright sunshine, we speak on general lines, for 1902 is an exceptional year, and we cannot promise much.

We hope that while here, you will not fail to visit Belle Isle Park, beautiful for situation, and we think without a peer in the world. As you are guests of the Detroit Street Railway people, you will no doubt have opportunities for visiting points of historic interest.



F. A. BLADES,
Comptroller of Detroit.

The only difficulty I have any occasion to fear is that with the officers and employes of the Detroit Street Railway as chaperons, they are so proud of their railroad tracks, and trolley cars, and equipments, motormen, conductors, and officers clear up to President Hutchins, all of them full clear up to the cabin of the beauties, glories and success of the whole system, that they may consume all of your time. Still, if you should say to any one of them by the simple inquiry, "Is there anything else in Detroit besides the Detroit Street Railway system?" they will quickly respond, "Oh, yes," and then you may be reminded that flowing right in front of this beautiful city, there is the Detroit river, that annually floats upon its fair bosom, more commerce than any other river in the world, besides here are as broad and as clean streets as are shown by any other city in the land, while her people are noted for less crime and more public spirit than can be found anywhere else that we know of.

We should be glad to call your attention to our street railway system, only that you are the guests of that corporation, and that we hardly dare in its presence to tell you what we do think of it, and the railroad service, for fear of its reactive influence on the officers to make them think so much more of themselves than they now do, there would be no living with them. Confidentially, however, to you, it is the best street car system and the best managed of any in the whole country. I note that this convention, like some large railroad trains, is run in sections, and of course this is the first section, or aristocratic section, or the governing section, because it is the money section. Here are the men who handle the money, gather it, count it, direct its credits to the several accounts, and departments, and account for it in gross and detail. Here are the men who handle the sinews of war in railroading.

It is said that no chain is stronger than its weakest link. If this link should give out, then the whole thing would have to go, and it depends on you men, and your associates, that the money earned by the money invested and the labor added, shall be honestly gathered, honestly credited, and honestly accounted, and by others like the second section of this gathering, judiciously expended, then the whole railway family will be happy, the stockholders in dividends, the officers and men down to the humblest employe, in fair and increasing salaries, and all will be well, but failure here bodes disaster elsewhere. I have no statistics on the subject, but in answer to some inquiries, I understand that the record of this department of street railway work is one of which every one of you can be justly proud.

Still, it is well to remember that often it requires more skill and toil, and real hard work, to maintain and defend a record or a reputation than it did to make it. An Arabian legend or tale that I read in my boyhood days, has often come to me helpfully in mature years in the fight for life. Two chiefs and their tribes had long been at war, and one had succeeded in mastering the other to such an extent that the unfortunate chief called of counsel of the very best warriors of his tribe, and the question submitted by the chief was, "Why am I, with as good men, as brave men as the desert knows, always beaten by my enemy chief?" After waiting some time for an answer, an old and scarred veteran arose, and said to the chief: "You, sir, have as brave and as true men as can be found in the desert, but your enemy's men are better mounted than are your soldiers. The mare that that chief rides, her ancestors have ruled the desert for many, many years, and until some means are devised for horses that will rank his horses for speed over the yielding sands of this desert, there is but little hope for you or your tribe." The chief dismissed his soldiers and set himself down to solve the problem. He finally reached the conclusion that by some means, either fair or foul, he would possess himself of his rival's favorite mare that he rode in every raid, and finally decided upon the plan that he would disguise himself as a poor sick pilgrim, and lay himself down by the path where he knew his rival would pass, and on his approach would beg for a drink of water, and on his rival's dismounting to give him the drink, he would try to leap upon the back of the coveted mare; and so he did, as the legend goes.

Lying by the path, disguised as a poor sick pilgrim, the rival chief came riding leisurely along, when his eye caught the form of the pilgrim. Checking his mare, he heard the request, "For the love of God, give me a drink or I die." The chief, dismounting, unstrung his bottle of water, always carried by every traveler in the desert. He gave the poor pilgrim to drink, and partially turned around to drink from the same bottle, and assuage his own thirst. At this opportune moment, the pilgrim with a

sudden spring was on the back of the coveted mare, and riding away with a joy his heart could hardly hold, when the voice of the chief called him, "Stop and listen for a moment." Curbing the mare, he heard his rival and enemy say, "You are welcome to the mare; you have gained her, but remember, how many a poor pilgrim lying by the path, where men do pass, dying from thirst, who might have been relieved but for the story of your treachery, and men will not dare to help them in their distress and they shall die. With the mare carry this memory with you that shall shut out all light in the future." Hesitating, the legend says, the chief replied, "I could take your mare and rejoice over my triumph, but I cannot keep her and burden my soul with the memory of men dying for the want of help that they might have had, but from the fear of others, who knowing of my treachery, refused them help and they died. Here, take your mare, and I will still be as free as the air of the desert."

I know of no trust more sacred than that of handling and having custody of other people's money, and no treachery is more damnable than the betrayal of a trust that destroys the confidence of man in his fellow man. Gentlemen, I believe you have the post of honor in the street railway industries of this country. There is no place in the economy of these industries more important, more vital to their success, than is your place. I note that you are mostly young men, I congratulate you on your work, its dignity, and its importance, and I congratulate the street railway companies of the country that they have in you and your associates at home, so competent and trustworthy a body of men.

In no department of human life and industry is the old simile of the human body more forcefully applicable than to the street railway industries of this country, for to a complete human body there are several parts and organs, each dependent upon the other for a complete whole. The head cannot say to the foot, "I have no need of you," nor the hand say to the eye, "I have no need of you." Each in its place makes a human body complete, and each doing its work perfectly, make existence a joy, but when one part or organ becomes diseased, and gets off the track, or in your parlance "off the trolley," then there is trouble all along the line, and every member suffers, and so it is with the enterprises with which you are connected. When every member and organ, from the president down, are faithfully doing their best, to serve the public, and earn the money they charge and get, sometimes as much for poor service as for good service, it secures cheerful patronage and prompt pay and no grumbling. Plenty of money and no grumbling makes every one peaceful and happy.

Gentlemen, I hope that in Detroit, in this month of October, 1902, you will have the best and the most profitable convention you have ever had, and when you have completed your labors incident to the convention, and turn your eyes toward home, and wife and children, as I at first, and repeat it again, bid you a hearty welcome, so then, I will bid you "God-speed and a safe journey home." Gentlemen, I sincerely wish you success, and prosperity, which I believe you richly deserve.

President Mackay expressed to Mr. Blades and the people of Detroit, as represented by him, the thanks of the Association for the kind words of welcome just conveyed to the meeting, and assured their hosts that, although the office of accountant did not carry with it as a rule the gift of oratory, the feelings of the members are just as sincere and grateful for the hospitality shown, as if they were expressed in words of the choicest eloquence.

The President then read his annual address.

ADDRESS OF THE PRESIDENT.

It is with great pleasure I rise to welcome you in this beautiful city, to the sixth annual convention of this Association, and, in this connection, I desire to express my gratification at the confidence you have reposed in me, by the election to the position which makes it both my duty and my pleasure to preside over the deliberations of this representative body. I trust the meeting will prove to be as instructive and interesting to our members as the previous ones have been.

Our Association has established a reputation of which we may feel proud. In its chosen field it has brought order out of chaos by formulating a "Standard Classification of Construction and Operating Accounts" which has met the requirements of the various interests represented from all parts of this great country, and has stood for several years the test of actual practice without the necessity of amendment, demonstrating the careful thought and study which it received.

The Association has adopted a "Standard Unit of Comparison" which has furnished the means of making correct comparisons. This unit, the car-hour, will continue to be appreciated in more and more as its use becomes more general.

The work of our Association has been the means of elevating the standard of the science of street railway accounting until it has become recognized as the corner stone of success. It has brought into more intimate relations the operating and the accounting departments to their mutual advantage.

With the foresight which has characterized the work of this Association generally, it has seen the necessity of securing the co-operation of the National Association of Railway Commissioners, as in a number of states the state boards have authority to prescribe the methods of accounting to be used by electric roads. Without their co-operation, it will be readily seen that, at least in these states, the results would have been to nullify the work of our Association, and, without going into the details, of which you are aware, we secured by that honorable body, the adoption of the classification of construction and operating expenses and forms of report, due credit being given to our Association, and acknowledgment made by it of the value of our work. The states of New York and Connecticut have put this in use, and all electric roads in those states now report to their respective commissioners in accordance therewith.

Your attention has heretofore been directed to the efforts that have been made to secure the enactment of legislation that would place electric railways in the same category as steam roads, and I particularly wish to emphasize the fact that too great importance cannot be attached to the policy of continuing our very cordial relations with the association of railway commissioners. This desirability increases in corresponding ratio with the adoption of our system by each additional state.

Our Association has been officially represented at the last three conventions of the National Association of Railway Commissioners, as explained by my predecessor, Mr. W. F. Ham, in his annual address to this Association. We have been honored by being elected as honorary members of the Association with privilege of debate on matters of accounting, and accorded a representation of three delegates at all subsequent conventions, thus placing our Association on the same footing as the Association of American Railway Accounting Officers.

During the past year, the president of the National Association of Railway Commissioners further honored us by the appointment of our Mr. C. N. Duffy as a member of the committee on "Railroad Statistics," to report at the Charleston Convention, February 11, 12 and 13, 1902. In view of the foregoing, your president appointed as the rest of our accorded representation, Mr. W. F. Ham, of Washington, D. C., and myself.

Our efforts were directed mainly toward securing through individual members the adoption of our classification in states where reports are required, and towards cementing the many friendships heretofore formed, and we are confident that the seed sown will, in the near future, bring forth fruit.

In accordance with a resolution passed at the San Francisco Convention of the National Association of Railway Commissioners, a committee of three was appointed to prepare a standard form of report for electric roads, and to report at the Charleston Convention; this committee to confer with a committee of like number to be appointed by our Association.

A meeting of this joint committee was held in New York, Jan. 10, 1902, where the matter received consideration, but, owing to the sickness of the chairman of the commissioners' committee, and to the limited time before the convention it was decided that a complete statistical report could not be got out which would reflect credit on the committee, and it was decided to so report to the convention, suggesting that the matter go over for another year.

I regret that none of the commissioners' committee was present at the convention, no report being submitted, nor action taken in the matter.

Your president is pleased to report, however, that he has received the assurance from Mr. B. F. Charbourne, the president of that Association, of his hearty co-operation in this matter, and of the re-appointment of the same committee, to confer with a like committee from our Association, in order to present a report at their next convention, to be held in July, 1903, further assuring me that the report would receive careful consideration by that Association. In accordance therewith, Messrs. Wm. F. Ham, Elmer M. White and C. N. Duffy were re-appointed as the committee who will present to this body the reports of their labor. A meeting of this committee was held at Atlantic City, N. J., May 22, 23 and 24, 1902, where the subject was given the same careful scrutiny that always marks the work of the gentlemen of which this committee is composed, and, doubtless, their efforts will be acceptable to both Associations. In this connection, the committee report that they had the assistance of our Mr. Tingley, of Philadelphia, and Mr. Audson, the accountant of the New York State Board, which is very gratifying, inasmuch as it shows the mutual feeling of interest in this work.

In the preparation of the program for this convention, your president has endeavored to secure subjects of general interest, believing that the interest in our meeting and the benefits derived from same will be proportionately greater than by the discussion of subjects wherein only a limited number of our members are interested. Special matters can be considered after we have satisfactorily solved the general problems.

In view of the financial difficulties, receiverships, etc., that have befallen some of the street railway interests during the past few years, (which, in my judgment, have occurred by reason of erroneous methods of accounting) it was my first intention to have a paper prepared and presented to this convention on "Correct Accounting Methods for Electric Railways," being a treatise on the broad, underlying principles of Accounting, including Depreciation, Injuries and Damages, Sinking Fund, etc., with the object of instilling into the minds of those who have the guidance or direction of street railway affairs the vital necessity of making adequate provision for depreciation.

To secure an expression of opinion on this subject, a circular letter was mailed to about one hundred of the different street railways of this country, asking whether the subject would be of interest to them. The replies were practically unanimous in favor of it, but one of the replies received stated that, while of great interest, it was, in their opinion, going beyond the jurisdiction of our Association to discuss matters of policy, and, as we are but the representatives of the members (the companies being the members), and some of us not even being officers of the companies we represent, it might be presumptuous to vote on such questions. Nevertheless, as accountants, we are expected to furnish true accounts and true methods of accounting, which should recognize all the provisions mentioned. In deference to this minority, we have refrained from bringing it before the convention for discussion, but I cannot permit the opportunity to pass without expressing my personal views upon this subject, and without in the slightest deprecating the work of our Association, will say that we have devoted a great deal of time to matters pertaining to true accounting, with scarcely a moment's dissension of one of the very foundation stones of this whole structure.

As an illustration of the manner by which roads have been re-capitalized over and over again, by reason of the failure to apply correct accounting methods, it is but necessary to refer to the article read before the last convention by Colonel T. S. Williams, vice-president of the Brooklyn Rapid Transit Co., whereby the methods of the Third Avenue Railroad Co. were explained.

Before true costs and profits can be shown, there must be created out of operating, or, as a deduction from income, a sum sufficient to equalize all depreciation which has occurred during that period.

Only recently, your president was informed by the general manager of a large system that with them there was no such thing as depreciation; that as far as physical property was concerned it was repaired or renewed as worn out, and expense of same charged to operation.

The fallacy of this line of argument is to my mind so apparent that I need only say that, if the same policy were continued to the expiration of the franchise, and the company obliged to cease operations, there would be a depreciation ranging from practically nothing on the portions that had just been renewed, to almost total value on the portions which were to be renewed within the near future had the company continued to operate.

Not only this, but the method of charging heavy reconstruction charges into operation is destructive of all comparisons. This provision for depreciation must not be considered as covering ordinary maintenance or repairs which must be charged to operating expenses, but applies when the property can no longer with economy be repaired, and must be renewed or replaced. As an illustration, we will assume the life of a track to be fifteen years. A company constructs five miles the first year and a corresponding mileage each succeeding year for the next fourteen years. Now, at the beginning of the sixteenth year, with a total track mileage of 75 miles, it becomes necessary to replace the five miles built the first year in order to retain the original track. This expense, amounting to one-fifteenth of the total track construction, has no place in a property account, as it is simply a renewal of what has been already charged to the property, but must be included in operation unless provision has been made for a Depreciation Reserve, as before mentioned. Bear in mind that, by charging against income monthly a sum sufficient to cover this depreciation, you are distributing this expense over the period during which the depreciation is going on. It is necessary that provision be made, not only for such depreciation, but reserve funds must be created to preserve the capital intact from loss, which may at any moment be sustained through serious accidents, etc. There are unsettled suits and claims for damages always hanging over every company which has been in operation for any length of time, and this contingent liability should appear on the books and be anticipated by proper charges against operation, thus creating an Injuries and Damages Reserve Fund, and a like provision should be made to cover uninsured fire losses.

Sinking Funds should be created to retire outstanding bonds at maturity, and to guarantee the return of original investment to the stockholders, this being particularly applicable to all systems operating under limited franchises.

These funds should not be mere book-keeping accounts, but should consist of interest-bearing securities held in trust for the particular purpose, and not assignable to any other use.

To my mind, one of the strongest arguments that can be used to refute the statements of agitators for municipal ownership is public accounting and statements of true costs and profits, which would have the effect of strengthening our securities.

Individually, if not as an association, we can and should use our influence in this direction, and I consider we would not be performing our duty, were we, realizing the danger, to permit without protest the continuation of erroneous methods simply on the theory that it involved a question of policy and that the directors were responsible for that. The directors, without doubt, feel that the head of the accounting department will give them the benefit of his experience and show them the ultimate results of any line of policy affected by accounting methods.

True, in case an organization is being conducted with the desire on the part of the directors of making a flattering showing in order to unload their securities at a handsome profit, the accounting officer offering such a suggestion would have only labor for his pains, but I am optimistic enough to believe that these are exceptions; that the great majority are laboring to secure fair returns upon a permanent investment, and are desirous of having only correct accounting methods used.

We are reminded of the many courtesies received by us at the hands of the American Street Railway Association, and I am pleased to acknowledge our appreciation of the same. We are likewise indebted to the "Street Railway Review" and the "Street Railway Journal" for the interest they have always taken in our welfare, and gladly give them credit for a great deal of the success which has crowned our efforts.

We have the same able committee on "Standard Blanks and Accounting for Material and Supplies," which is prepared to submit a report of its deliberations, which we trust will bring out a full and complete discussion, and harmonize the many con-

difficult ideas relative to this very important branch of our work.

I desire to thank the gentlemen who have so readily responded to my request to prepare and present to this body the various papers and matters for their information, and the members of the various committees who have given their time and study, and to our worthy and efficient secretary, to whom we are indebted for the printed copies of these articles having been placed at our disposal in time for careful study before this convention. I trust this policy will hereafter be readily followed, as it permits of much more complete discussion. The necessity of having copy in hands of the secretary not later than August 15th is respectfully urged upon members contributing papers or reports, in order that the minimum expense and labor be incurred. In accordance with the authority granted by the last executive committee, your president has approved for payment vouchers covering the traveling expenses of members of committees, there being no reason why expenses incurred wholly on account and for the Association's benefit should be borne by the individuals, in view of the financial condition of our Association.

Your attention is respectfully called to the desirability of hereafter incorporating in the annual report of our convention the "Classification of Accounts and Forms of Annual and Monthly Reports." This can be added to and kept up with very little labor and expense, forms for same being locked up and set aside by the printer for the use of each succeeding report. The advantage of this being that, by referring to the last report, it will be possible to get the complete and corrected classifications, etc., without the necessity of reading through the various reports to ascertain what action was taken upon any given subject. Any amendments or changes would thus be readily seen by a comparison with the previous report. The necessity of a standard classification of construction and operating accounts covering the lighting business is becoming apparent, by reason of the increasing number of electric railway companies that are absorbing lighting systems. The accounts covering the operation and maintenance of a railway power plant apply with equal force to a lighting plant, and with slight modifications, the General Expense accounts are likewise applicable, thus leaving only the cost of distribution to be provided for. These few accounts could be added to our present classification.

The lack of a "Standard Classification of Lighting Accounts" was very forcibly brought to mind by the receipt of a letter from Mr. T. C. Martin, expert special agent of the Electrical Division for the 12th United States Census, in which he stated that blanks of inquiry were being prepared for statistical information covering the street railway industry of the United States, and that these blanks were to follow very closely the classification of accounts as prescribed by our Association, as far as the railway features are concerned, but, inasmuch as the statistics of the lighting industry were likewise being compiled, it was necessary to have similar detailed statements of earnings, expenses, etc., for that department. It is to be regretted that we were not prepared to submit a classification for their guidance, the importance of which is very manifest.

During the past year the secretary has had printed and distributed to all members the verbatim report of the organization meeting, thus completing the history of this association from its inception to the present meeting. I think we will all appreciate the value of this work, which has been got out with the usual good taste displayed by Mr. Brockway.

It is gratifying to be able to report that our finances are in very good shape, and while we continue to lose some of our old members through consolidations, the interest in the Association's welfare has brought in new members, more than enough to offset its losses. Persistent and aggressive solicitation by individual members, as well as by the Association officials, is necessary to maintain our average increase in membership. Our secretary has sent circulars, and otherwise made especial efforts to reach the street railways of this country who are not on our membership list, and particularly those who are members of the American Street Railway Association.

We trust the reputation we have established of promptly and systematically threshing out the wheat from the chaff, throwing out the obsolete methods and agreeing upon those which will increase the efficiency of our departments, and, at the same time

the usefulness of this Association, will be maintained. Let me remind you that we each and all owe to the Association and to the companies we represent prompt and faithful attendance at all meetings.

Then followed the

REPORT OF EXECUTIVE COMMITTEE.

The report commented on the gain in membership and recommended that members in arrears for dues for two years be dropped, and that the Association Reports be withheld from other delinquent companies.

The committee stated that it had had approved the publication of a monthly bulletin to contain such current items of interest that will keep the membership in touch with the Association, and that the books of the treasurer had been audited and found correct.

Secretary Brockway then read his report.

REPORT OF THE SECRETARY AND TREASURER.

I beg to present the following as the report of this office for the year just ended:

Record of Membership.	
Organization Members.....	25
1897.....	12
1898.....	32
1899.....	34
1900.....	21
1901.....	25
1902.....	19
Total.....	168
Withdrawn.	
1897.....	1
1898.....	0
1899.....	2
1900 (caused principally by consolidations).....	25
1901 " " " ".....	11
1902 " " " ".....	7
Total.....	46
	122

The New Companies are:

People's Tramway Co.....	Putnam, Conn.
Muscatine Electric Ry.....	Muscatine, Ia.
Providence & Danielson Ry.....	Providence, R. I.
Richmond Passenger & Power Co.....	Richmond, Va.
Jacksonville Street Railway Co.....	Jacksonville, Fla.
Railways & Light Co. of America.....	Baltimore, Md.
Compania Ltd de Tranvias Electrico de Mexico.....	City of Mexico
Citizens' Traction Co.....	Oil City, Pa.
Natchez Electric Railway, Light & Power Co.....	Natchez, Miss.
Cincinnati, Dayton & Toledo Traction Co.....	Hamilton, O.
Austin Electric Ry. Co.....	Austin, Tex.
Springfield & Eastern Ry.....	Palmer, Mass.
Albany & Hudson Railway & Power Co.....	Albany, N. Y.
Rhode Island Co.....	Providence, R. I.
Portland R. R.....	Portland, Me.
Springfield & Xenia Traction Co.....	Springfield, O.
Trans-St. Mary's Traction Co.....	Sault Ste. Marie, Mich.
Jackson Electric Railway, Light & Power Co.....	Jackson, Miss.
Newton Street Ry.....	Newtonville, Mass.

Resigned:

Toledo, Bowling Green & Fremont Railway Co.....	Toledo, O.
Wilmington City Railway Co.....	Wilmington, Del.
United Traction Co.....	Pittsburg, Pa.
City Electric Ry.....	Port Huron, Mich.
Norfolk Railway & Light Co.....	Norfolk, Va.
Bridgeport Traction Co.....	Bridgeport, Conn.
Southern Traction Co.....	Pittsburg, Pa.

Financial Transactions.	
Balance on hand, Oct. 1, 1901.....	\$1,583 68
Received: Applications.....	\$ 380 00
Received: Dues for 1902.....	1,740 00
Dues for 1901.....	20 00
Interest on deposits.....	24 22
	2,164 22
Total.....	\$3,747 90

Disbursed: Salary, secretary.....	\$ 500 00
Committee traveling expenses.....	374 63
Printing two Reports, etc.....	710 95
Stenographer, 1901, convention.....	110 00
Expenses, 1901 convention.....	69 37
Expenses, secretary's office.....	273 07
Advance expenses Detroit convention.....	62 50
Miscellaneous.....	6 45
	2,106 97

Cash on Hand:

(Home Savings Bank, Toledo, O).....	1,027 08
(Van Norden Trust Co., New York).....	613 85
	1,640 93

Total..... \$3,747 90

Unpaid dues amounting to \$300 are now outstanding.

In addition to the usual routine work of the year, there has been published and furnished to the members the verbatim report of the meeting held in Cleveland, O., March 23-24, 1897, at which this association was organized. As explained in its preface, this was published to supply the demand caused by its not having been printed in a form to correspond with the regular annual report.

During the months of August and September, the work of the office has been carried on under great disadvantages, caused by the removal of the secretary from New Orleans to New York.

On motion the report was accepted.

The first paper on the program was then read:

COLLECTION AND REGISTRATION OF FARES ON CITY AND SUBURBAN LINES.

By William C. Sampson, Treasurer of the Union Traction Company, of Indiana.

Our company has been in search of a satisfactory system for the collection and registration of fares upon interurban cars from the time we began to operate lines requiring a variety of denomination of cash fares. We have passed through a series of experiments, trying aside various methods as a new one presented itself which seemed better than the old plan then in use.

The first plan in vogue was to collect by sections requiring each passenger to pay a 5-cent fare for each section traveled over, each fare being rung up separately. This plan was used upon the line running from Anderson to Marion, a distance of 34 miles, and the fare being 25 cents required each through passenger to pay his fare seven times; and had the same plan been used upon the Muncie-Indianapolis line each through passenger would have had to pay 13 times. This plan proved impracticable for our system and was soon discarded.

The next system put into practice was the torn ticket, one portion going to the passenger and the other to the auditor. The form of ticket used was one with all stations printed across the top of the ticket and also down the left-hand margin, and the tearing was regulated by a metal square which would leave the amount paid by the passenger upon each portion of the ticket in the angle of the square. This system was operated without registration. The tickets were consecutively numbered and conductors were required to account for all tickets charged against them. The principal difficulty with this system was the inaccuracy of the conductors in tearing the tickets, and in a great many cases it was impossible to determine the correct amount to credit the conductor. This system was also very slow of audit and was soon discarded.

The next system used was the collection of the fare from each passenger through to his destination and registering it upon a portable register, ringing once for each nickel collected. This system was in use until March 1st of this year, at which time we adopted the Oliver car register, which registers six classes of fares. While this register does not entirely fill the bill, it has come nearer giving the desired result than any other system we have tried. As above stated, this register takes care of six classes of fares, four of which we use for 5, 10, 15 and 20 cents, respectively; the fifth, together with the use of a duplex

	5¢	10¢	15¢	20¢	25¢	30¢		
* 6360	4883	4801	3129	9628	4323		4804480448044804	SEP 12
1 6360	4883	4801	3129	9628	4323			SEP 12
1 6334	4873	4798	3113	9606	4321			SEP 12
* 6334	4873	4798	3113	9606	4321			SEP 12
	76	10	3	16	22	2		

EXHIBIT A.

Union Traction Co. of Indiana.

Date.....1902.

Train No. Division

Conductor No.

DUPLIX TICKETS ISSUED.

No. off .....	.....
" on .....	.....
" off .....	.....
" on .....	.....
Total (Tickets enclosed hereon) .....	.....

PASSES HONORED.

Identification slips, - .....	.....
Limited employee, - .....	.....
Single trip, - - - - .....	.....
Advertising, - - - - .....	.....
Total, - - - - .....	.....

EXHIBIT B (Original 3 1/2 x 6 in.)

UNION TRACTION CO. OF IND. CONDUCTOR'S REPORT.

.....	Ind.	Date	190
Hour.....	M Car No.....	Reg. No.	
.....	"	"	
Line	"	"	

FARES RETURNED.

Cash from Passengers - - - - \$.....	
" " Baggage - - - -	
Total Cash - - - - \$.....	
6 for 25 cents - - - -	} Used by Conductors on City Lines
Soldiers' Home - - - -	
Scholars - - - -	
Reg. Employee's - - - -	
Ltd. " - - - -	
Spec. Coupon - - - -	
Coupon Pass - - - -	
Advertising - - - -	
Transfers - - - -	

TRANSFERS ISSUED.

Trans. No.	On	Off
Trans. No.	On	Off

PORTABLE REGISTER STATEMENT.

Reg. No.	On	Off	Passengers
"	On	Off	"
Total Registration - - - -			Badge No.....
			Conductor,

EXHIBIT D (Original 1 1/2 x 7 1/2 in.)

The local cashier makes three reports for the auditor's office, only one of which is complete, the other two being completed and balanced in the auditor's office. They are as follows:

1. Report of Duplex Tickets and Passes. (Marked Exhibit E.)

securitively, then arrange by denominations of fares and enter number of each denomination upon the blank marked E, carrying out in the total column the total number of tickets from that train and calculating the total value represented by the tickets:

UNION TRACTION COMPANY OF INDIANA.

REPORT from _____ office of Duplex Tickets
and Passes turned in by Conductors from _____ Division,
on _____ 190

CONDUCTOR	TRAIN	DUPLIX TICKETS.										PASSES.							
		No.	25	30	35	40	45	50	55	60	65	90	Total.	Value.	Card.	Trip.	Adv.	Emp.	Total.

EXHIBIT E (ORIGINAL 7 1/2 x 12 in.)

2. Report of Daily Earnings Interurban Lines. (Marked Exhibit F.)

3. Report of Daily Earnings City Lines. (Marked Exhibit G.)
The columns used by the auditor respectively are marked upon

after this operation is performed for each train this conductor has operated, he then makes a total of the number and value of duplex tickets for the day's work of this conductor and transfers these to the proper column on blank F. The same is

UNION TRACTION CO. OF INDIANA.

TO THE GENERAL PASSENGER AGENT:

The following is the report of differences in Conductors' Reports for

Day _____ Mo. _____ 190

LINE.	CONDUCTOR		CASH		1/2 C. TRTS.		1/2 FARE TRTS.		TRANSFERS OR DUPLIX TRTS.		EMPLOYEE.		PASSES.		REMARKS.
	Name.	No.	Over.	Short.	Over.	Short.	Over.	Short.	Over.	Short.	Over.	Short.	Over.	Short.	

EXHIBIT H (ORIGINAL 8 1/2 x 11 1/2 in.)

the blanks reproduced by an asterisk; the other columns are filled in by the cashier. In making up report No. 1 the cashier assembles all envelopes containing duplex and pass tickets turned in by each conductor and in the order of trains operated;

done with the pass tickets.

On blank F the conductors' names are entered in the order in which they have started from the terminal, and the entire cash receipts of each conductor counted and entered opposite

UNION TRACTION COMPANY OF INDIANA.

DAILY REPORT.

Train No _____

Month	Leaving _____ for _____ at _____ M.																PASSES				Total Passes	Total Passengers	
	5	10	15	20	25	30	35	40	45	50	55	60	65	00	Revenue Passengers	Total Earnings	Card	Trip	Adv.	Emp.			

EXHIBIT I (ORIGINAL 9 1/2 x 12 in.)

or in other words, using the same illustration as was used in explaining the method of collection, he would arrange the envelopes from trains numbered 2, 7, 16 and 23; first open envelope from train 2, see that numbers on the duplex tickets run con-

his name in the proper column. There are also columns provided for city tickets, but these are only occasionally used as with two exceptions our city tickets are not accepted on interurban cars. In the cases where our city tickets are accepted on

Union Traction Co. of Indiana.

DAILY EARNINGS REPORT.

ANDERSON, IND.,

190

Date	Miles	Mileage	Total Miles	Per Cent	GROSS EARNINGS		Net Earnings	Expenses	Total Annual Paying	Corresponding Day Previous Year	Increase	Decrease
					Full	Half						

EXHIBIT J (ORIGINAL 13 1/2 x 16 1/2 in.)

1902.

Ticket Sale	LINES	No. of Cars	Car Mileage	No. of Tickets	Car Mileage	Cash Fares	Transfer Fares		Chartered Cars	Express	Total Amount	Transfers	D. H. Tickets
							From	Total					
	ANDERSON (City Lines). North Anderson Hawthorn S. Highland Cass Avenue Third Street												
	MARION (City Lines). S. Blue's Home College Duff and Co. Carriers North Marion West Marion												
	MUNCIE (City Lines). Lingers, etc. Industry A. S. Miller West Side Herkin Park Whitely and Riverside												
	ELWOOD (City Lines). East Marion North and State St. Loop Fair Ground White												
	ALEXANDRIA (City Lines).												
	JONESBORO (City Lines).												
	INTERURBAN LINES. Anderson and Elwood - Int. Expt. Anderson and Elwood - Int. Expt. Elwood - Int. Expt. Muncie and Indianapolis - Int. Expt. Marion and Gas City Express Car												
	CASH RECEIPTS. Total Cash Fares Total Ticket Sales Total Chartered Cars Total Express TOTAL RECEIPTS												

EXHIBIT I (ORIGINAL 18x15 1/4 IN)

Interurban cars, they are registered as a 5-cent fare. When the total receipts from Interurban lines are obtained the amount is transferred to blank G, and added to the receipts from city lines which gives the amount to be deposited in bank for the day's business from that office. This deposit is made by the local cashier and a duplicate deposit ticket signed by an officer of the bank forwarded with the reports to the auditor's office.

As before stated, the register statements are forwarded by the inspectors direct to the auditor's office, and while the cashiers are counting the money and making up as much of the daily

reports as can be done by them, a clerk in the auditor's office is calculating the value of the day's collections from those register statements, and when the reports arrive from the local cashiers, this clerk takes them and enters the registered value and records the amount over or short. He also verifies the calculations of the local cashier and certifies to the correctness of the deposit tickets.

UNION TRACTION COMPANY OF INDIANA
GENERAL OFFICE ANDERSON, INDIANA

DAILY EARNINGS REPORT.

CITY LINES	CARE		CASH	TICKETS	EXPRESS	CHARTERED CARS	TOTAL
	INVOICED	PAID					
Anderson							
Marion							
Muncie							
Elwood							
Alexandria							
Jonesboro							
TOTAL CITY LINES							
INTERURBAN LINES							
Anderson - Marion							
Anderson - Elwood							
Muncie - Indianapolis							
Marion - Gas City							
Express Car							
TOTAL INTERURBAN							
TOTAL EARNINGS							

COMPARATIVE

COMPARISON	DATE	GAIN	LOSS	PERCENT
Days of				
Jan. 1st to date				
date				

NOTE - Comparisons are made with corresponding DAY OF WEEK in previous year, except in case of LAST DAY OF MONTH which is compared with first day of same month in previous year, in order to obtain a monthly comparison. HOLIDAYS are compared with corresponding HOLIDAY in previous year.

REMARKS:

EXHIBIT K (ORIGINAL 8 1/4 x 10 1/2 IN)

When the reports are all completed and checked, this clerk makes a report to the passenger department on blank marked Exhibit II of the differences in conductors' reports.

The reports are then turned over to another clerk, who makes up the permanent record in a book (a sample sheet of which is marked Exhibit I) and renders a report to the general manager

Union Traction Company OF INDIANA					Union Traction Company OF INDIANA Passenger & City Check					Union Traction Company OF INDIANA Auditor's Sub							
BATTERY No. 911		Detector Check No. 911		Register Check No. 911		BATTERY No. 911		Detector Check No. 911		Register Check No. 911		BATTERY No. 911		Detector Check No. 911		Register Check No. 911	
To		To		To		To		To		To		To		To		To	
From		From		From		From		From		From		From		From		From	
Via		Via		Via		Via		Via		Via		Via		Via		Via	
AMOUNT PAID					AMOUNT PAID					AMOUNT PAID							
25	30	35	40	45	45	50	55	60	65	65	70	75	80	85	85	90	95
50	55	60	65	70	70	75	80	85	90	90	95	100	105	110	110	115	120
75	80	85	90	95	95	100	105	110	115	115	120	125	130	135	135	140	145
\$1	\$2	\$3	\$4	\$5	\$5	\$6	\$7	\$8	\$9	\$9	\$10	\$11	\$12	\$13	\$13	\$14	\$15

EXHIBIT M. (ORIGINAL 5 1/4 x 3 in)

on blank marked Exhibit J and to the directors on blank marked Exhibit K. The daily earnings from each line are kept tabulated in books prepared for that purpose, so that at the end of the month such portions of the totals as go to make up the monthly report are ready for use.

In addition to the records mentioned, an account is kept with each train blank marked Exhibit L. This is made up from

the register statements and the reports of Duplex and pass tickets as given on blank 13, which record also contains the number of passengers carried on interurban lines.

The system explained up to this point has been treated as if pertains to interurban lines with only occasional reference to city lines.

The city cars of this company have also been equipped with the Ohmer register and arranged for the registrations of six classes of fares, to wit: 5-cent, 6 for 25 cents tickets, half-fare ticket, passes, employes and transfers. As in the case with interurban cars, an impression of the register is taken by the inspector before turning the car over to the conductor, who also takes his impression when he takes the car. The register then compiles without an additional impression being taken until the conductor in charge is relieved, at which time he takes an impression, and the conductor relieving him also takes an impression using a different number, and so on until the car is turned in to the barn, when the final impression is taken by the inspector in charge and the entire sheet with all impressions for the day's work of that car is removed by the inspector and forwarded to the auditor's office.

The conductors on city lines make up their reports once each day immediately upon finishing their day's work and deposit same in a safe at the company's office. The report required to be filed out is printed on the back of the envelope in which they deposit their collections, a sample of which is marked Exhibit 10. This is the only report required from them, the register does the rest.

The method of handling the receipts and reports from city lines by the cashier and auditor is practically the same as that of handling the interurban business, and I think will be made entirely clear by an examination of the blanks used for that purpose.

I have omitted up to this time any reference to the collection and reporting for such package and baggage business as is handled on our passenger cars. This branch of the business is taken care of by the conductor in charge of the car, except at such prominent points at which the company has an agent.

We use for this business a triplicate check printed upon an ordinary shipping tag (a sample of which is shown in Exhibit M), one portion being attached to the trunk or parcel, the duplicate given to the passenger, and the triplicate turned in to the cashier with the money. There is no registration made for these checks as we do not wish to confuse them with our passenger business.

These checks are issued by the passenger department and charged to the local superintendent at each station by consecutive numbers, who again charges them to the various conductors by consecutive number, and the auditing department checks up the use of the checks—all three portions being returned through various channels.

In concluding, I wish to say that the systems used by our company have been developed to meet the necessities of our local conditions, and the results obtained are reasonably satisfactory.

An interesting discussion followed on the merits of different fare registering and accounting systems and Mr. Pease, of the International Railway Co., Buffalo, explained the system of tickets in use by that company, which comprised upward of 200 forms. They gave a transfer at both ends, and found that it worked very nicely where the transfer was given as the passenger left the car; but they issued return tickets, and when the passenger came back, if the company did not have the coupon of the local fare the passenger was compelled to pay another 5-cent fare to get him back to his starting point; and if the company had a coupon for each one of the tickets, the passengers that did not need the transfer might use it for a city fare and thereby beat the company out of a local fare sometimes.

In answer to a number of inquiries as to details, Mr. Pease explained the additional complications in the problem as presented in their system, and several suggestions were advanced by the members by way of meeting the situation, but without anything definite being brought out as a thorough remedy.

The President asked for information as to the keeping of a record of through and short line riding on interurban lines, so as to determine the amount of riding from any one station to any

other station. Mr. Sampson and Mr. Pease replied to the question from the bearing of their respective practice in that regard, and the President stated that his company had had in operation for some time an interurban system from which they obtained all this information, and he gave the details of its use.

Another point brought out for discussion by the President was as to the time noted on the trip sheet, whether it should be the time of arrival or the time of departure, and whether the card time or the actual time. A call for a show of hands disclosed the fact that 16 members used the actual time, while 6 used the card time.

The preservation of trip sheets as evidence in suits brought for damages was discussed somewhat fully, and the methods employed for filing these sheets, in a way to overcome the inconvenience resulting from their rapid accumulation.

The President called upon Mr. C. N. Duffy, of Chicago, for information regarding their practice of printing their own transfers.

Mr. Duffy replied that they had found this method much more economical than buying them from the printer. They had been following the method of printing their own transfers for some 18 months. They had a printing office of their own, with seven people employed in it; and outside of ruled account books, lithograph work or very fine ruled work, they did nearly all their own printing. They had a press which cost something like \$4,500, with a capacity of 50,000 transfers an hour. They simply put in a roll of paper at one end of the press, and the tickets came out, cut, at the other end. They were then turned over to the man who ran the stitching machine and stitched with wire, in hundred blocks all consecutively numbered and numerically arranged. They printed about ten million transfers a month.

The President appointed the following committees:

Nominating Committee—Messrs. P. E. Smith, of Chicago, chairman; C. L. S. Tingley, of Philadelphia, and C. S. Mitchell, of Pittsburg.

Committee on Resolutions—H. L. Wilson, of Boston, chairman; J. B. Hogarth, of Denver, and A. L. Lynn, of Utica, N. Y.

On motion, the order of business for the afternoon session was modified by placing the paper on "The Stationery Store Room" first and the Annual Report of Committee on Standard Material and Supply Accounting second, for greater convenience in the consideration of the committee report.

Adjourned until 2 p. m.



AFTERNOON SESSION.

President Mackay called the meeting to order at 2:50 p. m., and the first business taken up was the reading of the paper:

THE STATIONERY STOREROOM.

By J. R. Shurtz, Auditor South Jersey Gas, Electric & Traction Co., Camden, N. J.

In presenting a paper on "The Stationery Storeroom" I shall first endeavor to give you an idea as to the origin of our stationery supplies, which grew to such proportions that it became absolutely necessary to establish a suitable stationery storeroom. Three years ago, our company consisted of two departments,—a gas works and an electric light plant, operating in one city; since that time, we have taken in and now operate, under one company, nine gas works, eight electric light plants, and a railway with 21 miles. In carrying out the consolidation of these various properties, I found that each had been run in a very conservative way, receiving, smilingly, whatever business came, without any effort, and with particularly no care on their part, a total absence of any system of accounting from which monthly reports or details could be gathered; where our policy is to get all that comes our way, reach out for more, and make a big effort to get it. Such little stationery as they had was extremely varied, and was used in many different ways, frequently, the most handy. On this account it became necessary to look for a great deal of information from such clerks, as we had received from the generosity of the previous owners, as well as to make a personal study of a great number of various blanks and forms, which I had gathered from a few of my progressive friends, who had "been there before"; these, together with such original forms as

our experience had prompted us to use—adding here and there a new idea—served as a basis of operation. In the preparation of these blanks, my time was of necessity limited; it generally happened that I would receive notice of a plant having been purchased one day, and that we were to take it over and operate it the next. Then my troubles would begin, endeavoring to convince the newly acquired old clerks that they could do their work differently, and that there were new methods in operating corporations as well as other things.

"Things" I have run up against in the operation of our various departments are numberless, as well as varied,—harvesting lea, selling electric fans, connecting gas stoves—with which to roast the cook, and, at the same time, keep peace in the household,—endeavoring to see the man, who had fallen off a car before he found his doctor dawyer to tell him how badly he is hurt,—issuing an attachment on the menagerie of the last circus for current consumed in their endeavor to leave the city before banking hours,—testing typewriters who "Don't have to work, but will if they like us."



J. R. SHURTZ.

You can readily see that to carry out the detail of such a business, and for the recording of it, we have to have a thousand and one different blanks. But as the fad is "to combine"—and we work on the community of interest plan—I have eliminated a great number of forms, and substituted others giving as much detail, and at the same time covering as many departments as practicable.

We have established a standard size for a great number of blanks, which is a great advantage in filing. It quite often happened that we would have a number of forms, measuring about the same size,—as for instance—blanks between 8 and 9, and 11 and 12 in. These forms can be readily changed, as follows:—first, by ascertaining the size sheets that would cut to the best advantage from paper stock, finding it very easy to cut off a quarter or half-inch, i. e., if needs be, add this amount. I also found it an advantage to use as many different light colors in paper, as possible; when one order called for the performance of one kind of work, I used a paper with as great a distinction in color for the order blank, reversing the work.

I have also found it a great advantage in paying particular attention to having duplicated orders of stationery, cut the exact size of the previous lot, as a tendency of all printers is to add something, or make the forms a little different in size or printing. On account of our business being extended over some 50 square miles of territory, containing some 25 different cities and towns, you can imagine the quantity of printer's ink we have thrown at us from all quarters of that territory; but, in order to collect accounts, in some instances,—and in other cases to stand well in the editor's eyes,—we have not been able to concentrate our purchases, and obtain—at all times—good work for the best prices, it being necessary for these reasons—and others well understood—to distribute our work a great deal. This in time can, and should be, corrected, the business going strictly to the lowest reputable bidder.

Our storeroom is fitted with shelves 18 in. deep around the entire walls of the room, and about 14 in. apart; this allows us to store most of the blanks in a very nice fashion. It is very satisfactory to have the blanks tied up by the printers in as small

packages as practicable, and so delivered; this relieves us of the annoyance of opening packages in the storeroom unnecessarily, as the blanks sell very readily, even with the best of care. In addition to the shelving, we had to provide a cabinet of 100 drawers, running from 1 in. to 8 in. in depth, to take care of small blanks, pencils, pens, erasers, etc., and have found it a most convenient contrivance.

Once the orders are issued for the stock of the stationery storeroom, and the goods delivered and placed upon the shelves and in the drawers, as described, the issuing of it is readily controlled. In the distribution of stationery to the various departments, we make the allotments cover a certain period, guided by the wants of each, so that they will run out, at about the same time; it is not well to issue large quantities, as it serves to make the clerks wasteful and careless.

In charging up the expense of books, blanks, etc., we charge all stationery, first, to the Storeroom Account, under which we have separate columns for each department, charging to Management the general books, reports covering all departments, and the blanks in connection with the work of the railway, to its Expense Accounts; to the Gas Department, the ledgers which extend over a period of twelve months, and all blanks pertaining to that line of our business, and so on through all Departments.

We are using a number of loose leaf filing cases, similar to a ledger,—a style manufactured by a firm in Holyoke, Mass.—and find it very convenient to use the same style in a number of departments, and in as many different ways, one in particular being a file 9x9 in., which permits using the same kind of paper for duplicate and triplicate orders, together with copies of correspondence, and numerous other items.

Mr. Shurtz's paper was discussed by the President and Messrs. Duffy, Burlington, Hogarth, Smith and Mitchell, in a comparison of the methods used by them with those referred to in the paper, and the elicitation of additional details from the author of the paper, who stated that his forms all passed through one person's hands, he (the speaker) looking after that personally; they started in with a lot number for each form, and that was continued on. There was no classification of numbers. As each new blank came along it took the next number. When the form of a number became obsolete, they took that number up with the next blank. The object of carrying the ledger account under separate headings, as stated in the paper, was in order to determine the quantity of stock that applied to a department. There was a special account; it was all charged to stationery store room, and then there were divisions in that; probably \$2,000 charged up to stationery store room in the general ledger, and the man that had charge of the store room had that subdivided and could tell approximately the situation.

Mr. F. E. Smith, of Chicago, for the Committee on Standard Material and Supply Accounting, then read the annual report of that committee.

REPORT OF THE COMMITTEE ON STANDARD BLANKS AND ACCOUNTING FOR MATERIAL AND SUPPLIES.

F. E. Smith, Auditor Chicago Union Traction Co.; C. L. S. Tingley, Secretary American Railways Co., Philadelphia;
Frank R. Henry, Auditor St. Louis Traction Co., Committee.

At the New York meeting of this Association, held October 9th to 11th, 1901, it was voted that the committee which had presented a report on the above subject be continued until this meeting, when they should again report and together with their report present the forms intended for use.

The committee commenced its labor by having sent to each of the members a circular asking an expression of opinion on the several divisions of last year's report, with the idea of letting the members say what they wanted and preparing a report which should be acceptable to the majority. Four members were kind enough to favor us with their ideas, and we, in preparing this report, have tried to comply with their wishes, that the system should be less complex than the one presented last year. From

the discussion at the New York convention, and from what we have learned since, we are of the opinion that most of the larger roads have in operation systems with which they are perfectly satisfied, and that they would not adopt any other system even though it should have the approval of our Association, but that some of the smaller roads are not so well provided. In preparing this report, therefore, we have tried to obtain a good accounting with the minimum of labor. With this end in view we recommend that practically all the clerical work, so far as pricing and charging out are concerned, be done in the accounting department, letting the storekeeper deal with quantities in and out only.

We will divide the report under the same general heads as last year, viz.:

- A. PURCHASE.
- B. RECEIPT.
- C. DISBURSEMENT.
- D. ACCOUNTING.

which we will sub-divide as follows:

A.
PURCHASE.

(1) Requisition for Purchase.

The first requirement is a proper requisition for the purchase of material and supplies for stock or for immediate use. It should be made in duplicate, the original for the purchasing department, the duplicate to be retained by the department making the requisition. It should state for what purpose the material is needed, that is, whether for stock or for some specific work. If for stock, should state the quantity on hand as well as quan-

retaining Form 6 in his own department. If the order is on the company's shop, the original should also be sent to the accountant who should enter the number assigned same on it, to enable the shop department to make its charges against this number. All labor and material used by the shop in filling these orders should be charged to some designated account and a report made of same on Form 7, when work is completed, to the accountant, who should extend prices of material and make a total of the cost and advise the purchasing agent, at the same time crediting the account which had been charged temporarily with the labor and debiting Stores Account or the proper expense account if made for immediate use. The purchasing agent should advise the accountant of all payments to be made by the company that should be deducted from the face of the bill as well as those payments which add to the cost.

(3) Record of Bills Approved by Purchasing Department. (Form 8.)

This department should be required to keep a record of all bills approved by it. It should be in such form that a total of all bills approved will be shown, and can be made in sheets so that one can be sent to the accountant and a copy kept, or in book form, which can be sent to the accountant as soon as the entries for the month are closed. The accounting department should check the charges to material and supplies on the voucher record by this record.

B.
RECEIPT.

(1) Recording and Reporting.

Upon receipt of a consignment of material at stores, the receiv-

Form 1

ORIGINAL.

RAILWAY CO. Requisition for Material and Supplies No.

PURCHASING AGENT: Please furnish the following for the _____ Department within _____ days.

On Hand, or Due on Previous Requisition	Lot No. of Quantity on Hand	Quantity required	DESCRIPTION OF ARTICLES	FOR WHAT PURPOSE REQUIRED.	Purch. Agent's Order No.

ORIGINAL TO BE PERFORATED
DUPLICATE TO REMAIN IN BOOK

Approved _____
General Manager

_____ Head of Department

Date _____ 190__

Date _____ 190__

FORM 1

ty needed and a description of the material required. The original should be sent direct to the general manager or some other official with equal authority, who should make such corrections as to quantity to be ordered, as he desires, and after approval, send to the purchasing agent. (Form 1.)

(2) Order from Purchasing Department, and Assignment of Lot Numbers by Accounting Department. (See Form 2.)

This should be made in triplicate, but the original only is reproduced. The duplicate instead of having the receipt attached should have a column at the side in which the accountant can enter the lot numbers. The original for the party or company's shop from whom goods are ordered, the duplicate for party to whom goods are to be consigned, and the triplicate to be retained in the purchasing department. These orders should be consecutively numbered, should bear the requisition number and contain full shipping directions. The original should also show the conditions of purchase, which can be made to fit the specific requirements of each company and should be signed in the name of the company by a properly authorized person. When the purchasing agent has drawn the order he should send the duplicate to the accountant, who will enter same on his Lot Number Record (Form 3) enter the proper numbers in spaces provided for same on the duplicate, fill out as far as Number and Description of Material are concerned, the cards (Forms 4 and 5) and the sheet (Form 6). He should then forward the duplicate and Forms 4 and 5 to the department for whom goods were ordered,

ing clerk should check same by the duplicate order (Form 2). When goods are received at a branch storeroom where it is not convenient to have these on file, the person in charge should be provided with suitable blanks on which to enter the materials received and report to the storekeeper. Consignors should, so far as possible, be required to make a bill for each order and send same to the purchasing department as soon as filled. If, however, a part of the order remains unfilled at the end of the month, a bill should be sent for such material as they have delivered, in order that the accountant may have the necessary data to complete his record. The storekeeper should make a report each day to the accountant on Form 9, sending the original and retaining the duplicate as his record of material received. Upon receipt of the bills by the purchasing department they should be checked by the order and certified as to the correctness of prices and terms. They should then be entered on his record (Form 8), giving them the first open bill number, which number should then be placed on the bills to thereafter identify them. They should then be sent to the accountant who will check them by the storekeeper's daily report of material received and note on bills that goods have been received. He should then fill in the balance of data on Form 6 and, if correct in all particulars, put the bill in line for voucher. A rubber stamp containing information as shown on Form 10, may be applied in the purchasing department to facilitate matters. By the adoption of the above plan all confidential prices are confined to departments of the pur-

Lot Nos. _____ to _____

Department _____ Letter _____

LOT NUMBER RECORD.

RAILWAY CO.

Form 3

Form 4

Lot No. _____
DESCRIPTION OF MATERIAL

REMARKS	Received Report No.	Bill or Cash Sheet No.	FROM	DESCRIPTION OF MATERIAL.	Order No.	Date	Distribution of Cost Labor Mat'l	Unit Cost	Lot No.
---------	---------------------	------------------------	------	--------------------------	-----------	------	-------------------------------------	-----------	---------

FORMS 3 AND 4.

Binding space if sheets are used instead of cards

Binding space if sheets are used instead of cards

ORIGINAL
Note our
Order No.
on your Bill

Chicago,

PLEASE FURNISH THE
Railway Company
the following at _____ and _____ each consignment direct to the _____ Department
same day shipment is made

For _____
Wanted _____
Department _____ Purchasing Agent
READ NOTICE ON BACK BEFORE FILING ORDER
I hereby acknowledge receipt of Order for _____ and material to _____
Purchasing Department, _____ Railway Co.
RECEIPT of your Order No. _____ is hereby acknowledged and is accepted
subject to all conditions printed on the back
Shipment will commence _____ 1901 via _____
and will be completed _____ 1901
Dated _____ 1901

FORM 2A.

Form 5.

Stored at _____ Lot No. _____
Description _____ Maximum _____
From _____ Minimum _____
Dates _____ 190 _____ 190 _____ 190 _____ 190
Rec'd Q. _____ Q. _____ Q. _____ Q. _____

Dates Sent Out	Man'fst No.	Quantity	Dates Sent Out	Man'fst No.	Quantity	Dates Sent Out	Man'fst No.	Quantity

FORM 5.

Form 6

Stored at _____ Lot No. _____
Description _____ Unit Cost _____
From _____ Bill No. _____ Amt. _____
Freight Charges as per Bill No. _____ Amt. _____
Charges for hauling and handling _____ Amt. _____
Rec'd _____ Total _____

Dates Sent Out	Man'fst No.	Quantity	Dates Sent Out	Man'fst No.	Quantity	Dates Sent Out	Man'fst No.	Quantity

FORM 6.

RAILWAY CO. Sheet No. _____

RAILWAY CO. Cost Sheet No. _____

ACCOUNTANT The following is a detailed statement of the cost of _____ Department on Purchasing Agent's Order No. _____

Charge was made against Account _____ Signed _____

ACCOUNTANT: The following material was received _____ 1902, and added to stores _____ Signed _____

Dates	Hours	Rate per Hour	Amount	MATERIAL USED		Order No.	Lot No.	Quantity	ARTICLES	FROM
				DESCRIPTION	PRICE					

FORM 5

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Date	BOUGHT OF	Order No.	Total Amount	DISCOUNT	Deductions, Freight, etc.	Net Amount	Charge to Stores Acct.	CHARGE TO OTHER ACCOUNTS		Date Sent to Auditor
									Account	Amount	

FORM 6

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

FORM 7

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Date	BOUGHT OF	Order No.	Total Amount	DISCOUNT	Deductions, Freight, etc.	Net Amount	Charge to Stores Acct.	CHARGE TO OTHER ACCOUNTS		Date Sent to Auditor
									Account	Amount	

FORM 8

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

FORM 9

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

FORM 10

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

FORM 11

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

FORM 12

RAILWAY CO.

REPORT OF BILLS APPROVED BY PURCHASING DEPARTMENT

Bill No.	Deduct	Charge Ac	Deduct from Bill No	Favor of	Pay on or before	Storekeeper's Advice	Date	Price O. K.

chasing agent and accountant. This plan, too, does away with the delay incident to the sending of bills to various departments for their approval. It will perhaps be held by some that general managers will object to approval of vouchers for these bills if they do not find thereon a prior approval by the head of the department ordering the same, but the stamp notation on the bill showing that the goods have been received, giving reference to the advice of same, we think will obviate this difficulty.

(2) Stock Ledger.

We believe that the use of Forms 5 and 6 will entirely obviate the necessity of keeping a regular stock ledger. It is intended that these cards shall be indexed after the following plan:

Lamps, Incandescent, Lot Numbers 26 and 364. This would indicate that two consignments of Incandescent Lamps had been received and designated by Lot Numbers 26 and 364. A reference to the cards or sheets arranged numerically, would show the quantity still remaining on these numbers. As soon as all of Lot Number 26 were used up, this number could be checked which would indicate that the only incandescent lamps on hand were those under lot number 364. A reference to the card at any date would show the storekeeper, by referring to his Form 5, and the accounting department by referring to Form 6, the quantity on hand.

(3) Handling of Second-hand Material and Scrap.

The plan outlined in our report of last year seemed to meet the approval of the members at New York and is therefore repeated in this report as follows:

If this class of material is entered on the stock books at a value when it is stored for future use or sale, it then comes under the care of the storekeeper and more importance will attach to it than if it were simply dealt with when sold. Another advantage to be gained by this plan is that the expense or other accounts to be credited with scrap, will receive the credit at the same time they receive a charge for the material which replaces the scrap. Any discrepancy which may occur between the price obtained for the scrap and the value placed upon it, would have to be adjusted proportionately between the accounts credited. When obsolete material is scrapped, stock material account should be credited with the scrap value and the difference charged to proper expense account or to a depreciation account, if one has been provided, or to profit and loss direct. See paragraph B, under "Manifesting," for forms to be used.

C.

DISBURSEMENT.

(1) Distribution and Charge of Material.

(a) Regular Requisition.

Regular requisition should cover the needs of a department for a specified period, being made but once a month if practicable. They should be drawn in duplicate, the original to be submitted to the general manager or some other official of equal authority, for approval before being filed, and the duplicate to be retained by the person drawing the requisition. They should be numbered consecutively. (See Forms 11, A and B.)

(b) Emergency Requisition.

The emergency requisition is designed to provide for material for emergency use, which could not be anticipated or covered by the regular requisition, and should be honored by the storekeeper without the same approval as surrounds the regular requisition, with the understanding, however, that a regular requisition will be drawn later, covering such emergency requisition honored. They should be drawn in duplicate, the original to go to the storekeeper, and the duplicate to be retained by the person drawing the requisition. They should be numbered consecutively.

(c) Request for Material and Supplies.

This form provides for the drawing of material by employes of the shop, track, electrical or other departments, after the request has been signed by the foreman in charge of the employe, and the goods should be delivered to the employe upon presentation of the request. The request is honored by the storekeeper with the understanding that the head of the department making same will sign a manifest for the material so delivered, or requisition the request later, if so desired by the storekeeper. This form is put up in blocks, is drawn only in original, not numbered, and operates as a sight draft on the storekeeper.

(Note: No blanks are provided for the emergency requisition

APPROVED
GEN'L MANAGER

Form 11A

RAILWAY CO. _____ Dep't. Req. No. _____

STOREKEEPER at _____ DATE, _____ 190__

This department needs the following supplies within _____ days for use at _____

On hand or due on Req No	Additional Quantity Required	DESCRIPTION	Charge to Account	STOREKEEPER'S MEMORANDA		
				No of Req. on Pur Agent	Sent out on Manifest No.	Quantity Sent

FORM 11 A.

Form 11B

RAILWAY CO. _____ Dep't. Req. No. _____

STOREKEEPER at _____ DATE, _____ 190__

MEMORANDA OF MATERIAL ORDERED

For use at _____

On hand or due on Req No.	Additional Quantity Required	DESCRIPTION	Charge to Account	Date Received	Storekeeper's Manifest No.	Quantity Received

FORM 11 B.

Form 12A

RAILWAY CO. No. _____

MANIFEST FOR SUPPLIES ISSUED, _____ 190__

FROM _____ STOREROOM TO _____

Requisition No	Lot No	Quantity	DESCRIPTION	Charge	Account No

The above material received in good order except as noted, and charges are approved.

DATE, _____ 190__

IN CHARGE. _____

FORM 12.A

Form 13

RAILWAY CO. No. _____

MEMORANDA OF MATERIAL RETURNED TO STORES OR TRANSFERRED.

FROM _____ To _____

CHARGE _____

State whether this is NEW SECOND-HAND OR SCRAP material.

QUANTITY	DESCRIPTION	VALUE	LOT NO	CREDIT ACCOUNT	AMOUNT

FORM 13.

or request ticket, but forms in use on several roads will be found among the forms filed with the secretary.)

(2) Manifesting.

(a) A regular manifest (form 12) should accompany each shipment of stock from the storerooms. This should be in triplicate, the original and duplicate going with goods, the original to be receipted and returned to storekeeper, the duplicate to be retained by person receiving the goods, and the triplicate to remain in storekeeper's book. It has been suggested that the labor and expense of manifesting can be avoided by having the requisition (Form 11) made with a receipt attached and sending same back with the goods. When receipted they would be returned to the storekeeper who would in turn send them to the accountant. This plan would obviate checking the manifests, all entries being made from the original requisition which has been duly approved. Consideration of both plans by the members is desired.

(b) A blank to be used for one or all of the following purposes (Form 13):

The transfer material from one storeroom or department to another.

Second-hand material transferred to storehouse.

Scrap material transferred to storehouse.

Material transferred from storage yards to the place where it is to be used.

This form should be in triplicate. The original to go with the goods and be receipted and returned to the sender, the duplicate to be sent to accountant, to be given a lot number and entered on his record and then sent to the department (if a storeroom) to which same were sent, with the necessary cards.

(c) A blank that may be called "suspense." Being a manifest designed to cover the issuance of material which cannot be intelligently charged out when issued, for instance, the delivery by the storeroom of material for line repairs which is to be used on emergency or tower wagons. This should be made out by the heads of departments and consecutively numbered and be in duplicate, the original to be retained by person responsible for the material issued upon it, until every article is accounted for on a place provided on the blank, and the duplicate to be retained by the person sending out the material. All material which has been issued upon this manifest which is unused on the last day of the month, must be returned to the storekeeper for inspection; the storekeeper will receipt for it and re-manifest it. The person to whom the material is issued shall report upon this blank the use to which the material was put, giving all particulars regarding same. No sample form has been provided, but may be seen among forms on file.

REPORTING.

No reports, other than the daily reports of material received and sent out or the receipted requisition for same, will be required from the storekeepers. They should be required, however, to send in the receipted manifests covering all shipments sent out to enable the accountant to check their work.

ACCOUNTING.

Suitable blanks or books will be required on which to enter the daily reports received from the storekeepers and distribute same among the various expense accounts, but as these forms must of necessity be of large size and would vary considerably to cover the special accounts each road has, the committee has not felt warranted in going to the expense of getting them out and having them reproduced.

In transmitting this report the committee desires to thank those members who have aided them by their suggestions, and also the Library Bureau, who kindly offered their assistance in getting out such of the forms as their system would apply to and did prepare Form 5, for us.

We trust the members will come to the Detroit Convention prepared to thoroughly discuss this report so that some conclusion may be reached at this meeting.

The President called for an expression of opinion, and in reply Mr. Longyear stated that their system of store room accounting was not the lot number system; they used the bin number and card system combined, and the same form of requisition made out by the head of the department or by the general storekeeper, which was required to show the quantity on hand, quantity required, and the quantity consumed during the month. That

requisition, if made out by a department, went to the general storekeeper, and he noted thereon the quantity of material that he had on hand which he could apply toward that requisition, and in the use of a new form just adopted, the general storekeeper sends the original requisition, so endorsed by him, to the purchasing agent. All material except for specific work went direct to the storeroom, whence it was drawn on monthly requisitions by the heads of departments and the latter were not allowed to overdraw their monthly requisitions. If they needed additional material they made out special or emergency requisitions. If they did not draw out as much as requisitioned for a month, the balance left went back into the stock and was considered as new stock. In regard to the requisition their system did not differ from the plan reported by the committee.

Mr. Mitchell also described the methods used by his company in this respect, which included the requiring of duplicate bills for all goods purchased.

Mr. Wilson objected to requiring duplicate bills, and thought the same result could be accomplished very easily by requiring the persons of whom goods were purchased to send a statement of all the charges they had each month, and then as the bills came in they could be checked up.

After some further discussion as to practice in this regard, Secretary Brockway read Section A, Purchase, Clause 1, Requisition for Purchase, from the report of the committee, and suggested an amendment in the phraseology thereof by changing the word "equal" to "proper" so as to read: "The original should be sent direct to the general manager or some other official with proper authority," etc.

Mr. Burlington, after some further discussion of the question, moved that it be changed to read as follows: "The original should be sent direct to the properly authorized official, who should make such corrections," etc., which was adopted.

Secretary Brockway then read Clause 2 of the report under the same section, "Order from purchasing department, and assignment of lot numbers by accounting department."

The President referred to the fact that the duplicate, according to the report, was to be sent first to the accounting department and then to the party to whom the goods were to be consigned, and yet the triplicate which was to remain in the purchasing agent's department must have the terms and instructions, etc., and as he (the President) understood it, the purpose of the committee was to eliminate that from anyone except the accounting department and the purchasing department; and, having the duplicate go to the party to whom the goods were to be consigned, he wished to inquire how it would be arranged to eliminate the prices and terms.

Mr. Smith replied that they had Form 2, and they were made so that the one part that went to the firm was a little smaller than the other two, and the other two had a stub which was perforated, to be filed. They were made out on typewriter, and if it was desired that the storekeeper know nothing about the prices, it would have to be arranged to use a short carbon, so that on the copy that went to him that would not print; have a long carbon between the duplicate and the triplicate.

Mr. Smith added that in discussing the report with some persons since it was written, it was suggested that the Form 6 which the committee recommended be kept in the accounting department was entirely unnecessary; it was a duplicate of the one kept in the store room, and he (the speaker) was rather inclined to think that it was not necessary. By having the lot number record made a little larger so as to include the data now assigned to Form 6, the latter could be dispensed with.

Asked by the president what he would do in case of a fire that destroyed the records of the storeroom, Mr. Smith replied, "Well, we would be up again it." Of course the committee recommended the first plan, but he suggested the modification as more economical if any one preferred it.

At the suggestion of Mr. Schurtz the president asked how many of the members secured reports from their storekeeper without his knowledge as to what should be returned, and three members indicated that they so received reports.

Mr. Duffy moved that Section 2 be adopted as read, unless there was objection.

Mr. Smith: The merit of the whole thing is right in there.

That is the lot number that you kiked about last year.

The President: Mr. Ham, can't you give us some pointers on this?

Mr. Ham asked the chairman (Mr. Smith) whether in his opinion this system was one which he would recommend for all storerooms, large and small, to which Mr. Smith replied in the negative. Mr. Ham thought for the smaller system, the plan reported was entirely too cumbersome, and that as good results could be obtained for such systems in a simpler way. On the system represented by him (the speaker) the storekeeper and the purchasing agent were the same and they had an intimate knowledge of everything that went on; he believed that the more these officers knew as to prices, etc., the better it was for the company.

The president called attention to the fact that the primary object in attempting to standardize the material and supply system was to weed out all unnecessary items and get something that would apply both to large and small companies.

Mr. Smith said he thought the system presented was pretty simple, and that, if anything, there would not be enough to it to suit a large road. That was why he had said "no" in response to Mr. Ham's question. So far as small roads were concerned he thought this system would fit their needs.

Mr. Smith stated, in reply to Mr. Longyear, that the number of times each article would have to be copied before the order was placed with the dealer, would be five. This Mr. Longyear conceded to be a necessity if the lot number were adopted, but why go so far? Why not have the requisition and the order number, and then when the material was delivered it was only necessary to make two copies.

Asked by Mr. Duffy to explain the difference between the bin card and the stock card, Mr. Smith stated that as arranged in the report, the bin card was simply one lot number and description of material. It might be a very small piece of paper tacked right up on the bin. That was all there was to that part of it, just the top part of the card, without any reference to the going out part. It was simply an identification check, that the bolts in a given bin were lot number so-and-so and of such a size.

Mr. Longyear thought that the principle laid down in the report was an advance in supply accounting; that it would be adopted in whole or in part according to the requirements of different companies.

(The President put the question on Mr. Duffy's motion to adopt Section 2, and it was determined in the affirmative.)

Mr. Ham stated that personally he was heartily in accord with the suggestion of Mr. Longyear that the report was in many respects far ahead of any system that there had been, though he still believed it was not the simplest that could be devised. As a general proposition, however, he was heartily in favor of the system reported, and he moved that the report of the committee be adopted as read.

The President then put the question on the adoption of the report in its entirety, with the amendments heretofore made therein, and it was determined in the affirmative.

On motion, the program was modified and the report of Committee on Standard Form of Report for Electric Railways, called for, and read by Mr. W. F. Ham, of Washington, D. C.

Mr. Duffy moved, owing to the lateness of the hour for taking up the discussion of this important report, and the absence of Mr. Judson, of the New York Board of Railroad Commissioners, and Mr. Stewart, of the Census Department, who by special invitation were expecting to be present at the consideration of the report, its further consideration be postponed until the next session.

The President stated he considered the suggestion a very appropriate one, and, on motion, an adjournment was taken until Friday morning at 10 o'clock.

Everyone in attendance at the convention will be glad to know that Mr. Hutchins was sufficiently recovered yesterday to spend some time on the floor of the exhibition hall. He was very enthusiastic in his words of appreciation regarding the fine display of street railway apparatus and was much gratified at the unusually large attendance. We all hope Mr. Hutchins will be himself again before the convention closes.

Mr. Albert Korst, of New York, is hustling among the delegates in behalf of the Union Mica Co., which he so ably represents.

EXCURSION TO MALBY LUMBER YARDS.

The Malby Lumber Company sends us the following: "It's only a two-hour trolley and launch trip to the cedar pole yard of the Malby Lumber Co. Take any car on Fort St. line except a "Woodmere" or "Through" car. Car every 10 minutes. Representatives of the company meet every car and the launch makes constant trips. No time lost."

RECEPTION TO THE LADIES.

From 10 a. m. until 1 p. m. yesterday an informal reception was held in the Cadillac parlors for the visiting ladies, and this proved to be a most delightful function. The visitors were received by ladies' committee.

The rooms were most tastefully decorated, roses and palms being in profusion, and refreshments were served. The reception was much appreciated by the visiting ladies, as it afforded an opportunity to become acquainted with each other before the excursions.

HART TIE PLATE.

The Hart tie plate, as its name implies, is a device designed to be attached to the tie for the purpose of affording lateral strength to the rail and prevent buckling. The company in announcing the invention furnish the following description:

"The top surface (not the entire plate) is cambered. To prevent the accumulation of sand under the rail, thereby minimizing a sand-cutting effect on the plate on the rail; to act as a natural shed for water, brine, acid, or other drippings from the cars; to increase the adhesive qualities of the plate to the tie by minimizing the wave motion on the plate, and also to prevent buckling.

"The top surface of the plate is corrugated. These oblique corrugations beginning near the median line of the plate gradually widen and deepen as they approach the outer edge of the plate. This is done to prevent the accumulation of sand on any part of the plate's surface; to carry off water, brine, acid, or other drippings from the cars; and also strength is added without destroying the fibre or grain of the metal or causing crystallization of the metal in process of manufacture.

"The under surface of the plate is provided with longitudinal flanges. The flanges are designed to compress the fibres of the wood, thereby increasing its density, and to firmly embed the plate in the tie. The design of the flanges and the distribution of metal furnish greatest transverse strength.

"The camber and corrugations in combination form a natural means for shedding foreign matter. Brine and other liquids drain from the surface of the plate, and sand will gravitate and be carried off from the corrugations, thereby automatically clearing the surface of the plate."

"CLIMAX" POSTS.

The Climax Fence Post Co., of Chicago, is represented by H. E. Overstreet, general manager of the company, and exhibits at space No. 35. The patented posts of this company consist of a steel top, for strength, with a clay base to prevent destruction by corrosion.

The Atlas Railway Supply Co. is offering a reward of \$100 for the return of a box containing 800 souvenirs intended for distribution at the convention. The box was lost or stolen from the company's space on Tuesday or Wednesday.

Mr. G. Edgar Barnes, certificate clerk, announces that the railroad certificates will be ready for delegates and visitors after 10 o'clock on Friday.

Mr. Neil Paulson, superintendent of the Jewett Car Co., of Newark, Ohio, is on the scene.

Mr. Nat P. Lane, manager of the railway department for Parrott Varnish Co., of Bridgeport, Conn., is busy talking the good points of Parrott varnishes. Mr. Lane is one of the oldest varnish men in this country.

A. S. R. A. PROCEEDINGS.

(Continued from page 653)

Professor Goldsborough, of Purdue University, received the managing directorship of the electrical department of the Louisiana Exposition and he is present to-day for the purpose of enlarging a little upon the scope of these resolutions and giving a little better understanding of them, and I would ask the convention to extend to Prof. Goldsborough five or ten minutes' time in which to speak upon this resolution. I therefore make it a motion.

Motion carried.

Professor Goldsborough: I greatly appreciate the honor you confer upon me, permitting me to tell you something of what we intend to do for the street railway interests at the Louisiana Purchase Exposition. I come here to-day as a representative of the Exposition and of the Business Men's League of St. Louis, to invite you to meet in St. Louis in 1904, because we are preparing for you there a feast that I believe every one of you will thoroughly enjoy. The Louisiana Purchase Exposition, as you probably know, will by the time the gates open, have expended fifty millions of dollars in preparing what we hope will be the greatest international exposition. I think that our hopes in this line will be realized, for the reason that the Federal Government has made a most generous appropriation toward the work. This has been seconded by the city of St. Louis, by the citizens of St. Louis, and by the state of Missouri. So that the Exposition company starts out with \$17,000,000 to devote to the Exposition. The Chicago World's Fair, which at that time was the greatest exposition the world had known, started out with \$13,000,000; so that you see from the financial standpoint the initial movement is well backed. We also have ample space in which to present the picture of our national growth. Chicago used Jackson Park with its 600 acres in presenting its picture. The St. Louis association has Forest Park, in which there is 1,200 acres or double the amount of ground. Of the 15 large exhibit buildings on the ground the smallest has an area of four ordinary city blocks. I give you this measurement because we are all in the habit of thinking of a city block being 300 feet on a side. The largest of the buildings will have an area of ten city blocks, which is the largest building under one roof that has ever been built or attempted. I am quite certain that when you know we are organizing a power plant which will have a capacity of over 20,000 horse-power you will feel that our illuminations which will be shown at St. Louis will probably equal those of any other exposition. Buffalo presented beyond all doubt the most beautiful picture of illumination which the world has ever seen. It has been very aptly termed by Dr. Penello, the crescendo in illuminations. There they used about 5,000 horse-power. But with six times this amount of power used at St. Louis, we will probably be able to present to you a picture glorious indeed, when viewed by the electrical engineer; and I think it will be one that we will all be glad to feel we have some part in as electrical engineers and as people interested in electricity.

When we come to the street railway presentation at the exposition we have a very pleasing problem. Naturally, since your work is part electrical and part mechanical, a division must be made at some point. Willard Smith, Chief of Transportation, has used every effort to exploit all the mechanical details of the railway problem on a very broad line in the transportation building. There all matters pertaining to traffic maintenance, maintenance of way, trucks, car bodies, mechanical construction of the line, etc., will be pictured. In the electrical department the electrical side of the problem will be pictured. All matters relating to the generation and the distribution of electricity and to the control of cars and trains by electrical methods come in the electrical department. In other words, the electrical engineer in the electricity building will study the street railway or the electrical railway problem from the generator through the transmission system, through the transforming devices, through the substations and storage battery, out over the line, through the motors to the car axle. In the transportation department he will study all those things that pertain to the building of the track, ballasting, the construction of viaducts, of car bodies, of automatic signal devices and other matters that pertain directly

to the mechanical study of this great problem. Mr. Smith and myself have been working for some months past on a matter which I think will give our exposition an added interest to you. We want to have a track some 1,300 ft. in length, double and triple track, as conditions may permit us to make it, on which experiments can be made of all street railway traffic systems. Whether these be pneumatic, steam, gas or electrical in power, or electrical systems, they are all to be exploited. We want to organize the thing on very broad lines. I think you will all agree with me at that time there will probably be a large number of systems using alternating current, as well as the systems we now have using a direct current, and I cannot imagine a picture which will present a greater interest to you than that of seeing these various systems all exploited on the same ground and at the same time by the engineers of the various companies exhibiting there. This in a nutshell gives you a slight idea of the great undertaking which we have at St. Louis. We have advanced in the St. Louis exposition ten years beyond Chicago as gauged by the inventions that have taken place in that time in our national growth. We realize that unless our exposition is ten years in advance of Chicago, it will be a failure. They have gone into the work in that spirit, and I feel as time goes on and I am brought closer in contact with the work, that they will succeed. Thank you.

The President: The next paper is on "Electric Express and Parcel Delivery, by George W. Parker, General Express Agent of the Detroit United Ry.

[After the discussion on this paper, which lack of space prevents our publishing in this issue, the chair appointed as the committee to nominate officers and select a place of meeting the following: R. S. Goff, N. H. Heft, R. McCulloch, C. G. Goodrich, D. B. Dyer.]

The convention then adjourned till Friday, at 10 A. M.



SUPPLYMEN'S ASSOCIATION.

The committee on organization of supplymen met yesterday morning and arranged to hold a general meeting of all exhibitors Friday morning at an hour to be announced later.



In addition to the official entertainments provided for to-day, there will be various side trips arranged by the Crocker-Wheeler Co., the General Electric Co., Berry Bros., and the overflow theatre party this evening given by the Wheel Truing Brake Shoe Co.



The Union Mica Co., of New York, arrived too late to get any space on the Convention Hall floor, and has made arrangements to show its various specimens of mica board, flexible mica varnish cloth, segments, rings, etc. Mr. Albert Korst, the company's representative, is in attendance and promises to interest all callers.

Exhibit Hall will be open every evening of the convention, from 10:30 o'clock.



WEBER RAILWAY JOINT MFG. CO., NEW YORK.

This company is showing this year samples of its standard railway joint for T rail, the standard joint for girder rail and the compromise or step joint. At the back of the booth are shown photographs of track laid with Weber joints and also blue prints setting forth the construction of the joints used by the Union Traction Co., of Albany, and the Lynn & Boston R. R. Co., of Boston. The remarkable success of the Weber joint was attested by a large reproduction of the medals granted by the Exposition Universelle at Paris, 1900. The Weber booth was in charge of J. M. Barr, of New York, assisted by Mr. F. A. Poor, W. T. Smetten and H. C. Holloway.



Mr. Clifford Taft Hanson, of the Bethlehem Steel Co., keeps busy distributing a souvenir pamphlet in which the special products of the company are succinctly set forth.



EXHIBITION HALL AT THE OPENING OF THE CONVENTION, OCTOBER 8th.

IMPORTANT ANNOUNCEMENTS.

A series of jolly trolley parties was inaugurated yesterday by the General Electric Co. representatives, who have secured the private car "Detroit" for the purpose, through the courtesy of the Boland line officials. The car is equipped with the Type M control and the excursionists leave the General Electric booth in the annex at 11 a. m., 4 p. m. and 8 p. m.

Mr. Thomas Farmer, superintendent of motive power of the Detroit United Railway, has called a meeting of all master mechanics present in the city to be held at 3 p. m. this afternoon in Power Station A, for the purpose of organizing a master mechanics' association.

The local committee announces that exhibitors' mail will be kept at the office of the chairman of the exhibit committee, while mail for the delegates will be held at the Bureau of Information at the entrance to the hall.

The Exhibit Committee announces that special provision has been made for the ladies at Exhibition Hall. A large room on the main floor, just to the right of the main office, has been set aside for their use and in addition several boxes in the gallery have been reserved for the accommodation of the ladies who may care to rest after "doing" the exhibition.

The Information Bureau is in the registration office, just inside the main entrance.

Among the visitors to the accountants' association yesterday morning were Mr. Judson, of the New York Board of Railroad Commissioners; Mr. T. C. Martin, and Mr. Stevenson, representing the Census Bureau.

Mr. J. E. Sullivan, florist, of 214 Woodward Ave., Detroit, Michigan, announces that some of the delegates while calling on Tuesday at his establishment left a bunch of keys. The owner can have the keys by calling and identifying them.

"A CROCKER-WHEELER TROLLEY TRIP."

Delegates and representatives at the convention are invited to join the Crocker-Wheeler Co. in a trolley party this afternoon to the Rochester power house, on the Flint division of the Detroit United Ry. Special cars have been provided and will leave from Griswold and Congress Sts. at two o'clock sharp, city time. The trip will doubtless be an interesting one, as the road lies through a very pretty country and the power house contains considerable apparatus of interest to street railway men.

One car will be given up to the ladies who may wish to join the party, and will make a run beyond Rochester to a very pretty spot, Lake Orion, while the gentlemen have stopped at the Rochester power plant. It is hoped that as many of the ladies as can will make the journey. The trip promises to be an enjoyable and entertaining one and the delegates and exhibitors generally are invited to be on Griswold St. promptly at two o'clock so that there may be no delay in getting away. The party will probably reach the city about five on the return, in ample time for the theater party in the evening.

REGISTRATIONS ON TUESDAY AND WEDNESDAY.

A. S. R. A MEMBERS IN ATTENDANCE.

Akron, Ohio—Chas. Currie, W. H. Douglas, T. W. Sheldon, J. T. Ross, Northern Ohio Traction Co.
 Alton, Illinois—Geo. D. Rosenthal, Alton Ry., Gas & Electric Co.
 Altoona, Pa.—J. J. Crane, Altoona & Logan Valley Electric Ry. Co.
 Asbury Park, N. J.—J. B. Cade, S. F. Hazelrigg, Atlantic Coast Electric Ry. Co.
 Atchison, Kansas—C. M. Marshall, Atchison Ry., Light & Power Co.
 Atlanta, Georgia—Geo. B. Travers, A. M. Moore, P. S. A. Knight, Thos. K. Glenn, D. A. Belden.
 Augusta, Ga.—D. B. Dyer, A. J. McKnight, Augusta Ry. & Electric Co.
 Aurora, Ill.—F. M. Zimmerman, Elgin, Aurora & Southern Traction Co.
 Austin, Texas—
 Anderson, Ind.—Albert L. Riehey, Wm. H. Bloss and wife, Wm. C. Sampson, Union Traction Co. of Ind.
 Baltimore, Md.—H. H. Adams, W. H. Staub, United Ry. & Electric Co.
 Bay City, Mich.—E. J. Dimmock, J. J. Thomas.
 Binghamton, N. Y.—G. T. Rogers, Binghamton Ry. Co.
 Birmingham, Ala.—W. B. Brockway, Birmingham Ry., Light & Power Co.
 Boston, Mass.—Howard F. Grant, Henry L. Wilson, Boston Elevated Ry. Co.
 Boston, Mass.—Walter Trumbull, J. F. Shaw, H. Fisher Eldridge, Boston & Worcester St. Ry. Co.
 Boston, Mass.—E. C. Fisher, D. D. Bartlett, Boston Northern St. Ry. Co.
 Boston, Mass.—Robt. S. Goff, Geo. W. Palmer, Old Colony St. Ry. Co.
 Bridgeport, Conn.—R. C. Crane, A. Bass, Connecticut Ry. & Light Co.
 Bridgeport, N. J.—B. F. Hires, Bridgeport & Millville Traction Co.
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 Camden, N. J.—W. E. Harrington, G. G. Browning, Houlings Lippincott, Camden & Suburban Ry. Co.
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 Chicago, Ill.—T. C. Pennington, C. N. Duffy, Richard McCulloch, M. O'Brien, C. E. Land, Chicago City Ry. Co.
 Chicago, Ill.—T. E. Smith, Chicago Consolidated Traction Co.
 Chicago, Ill.—W. O. Griffin, Frank Hedley, Northwestern Electric Ry. Co.
 Chicago, Ill.—T. E. Smith, Chicago Union Traction Co.
 Chicago, Ill.—Wm. Welmsly, South Chicago City Ry. Co.
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 Cincinnati, Ohio—H. C. Genrich, Robt. Dunning, D. Stevens, Cincinnati Traction Co.
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 Columbus, Ohio—M. S. Hopkins, P. F. Burlington, Columbus Ry. Co.
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 Columbus, Ga.—H. S. Reynolds, Columbus Railroad Co.
 Cleveland, Ohio—Chas. W. Wason, J. Jordan, Cleveland, Palmsville & Eastern Ry. Co.
 Danville, Ill.—S. L. Nelson, Danville St. Ry. & Light Co.
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 Bittenhelm, Harold S., Street Railway
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 Edy. Co., Buffalo
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 Mfg. Co., Syracuse, N. Y.
 Bailey, Theo., General Elec. Co., Chic-
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 nal, Chicago
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- Horran, J. B., The National Conduit & Cable Co., New York.
- Hall, T. B., The International Reg. Co., Chicago, Ill.
- Howard, Geo. E., Starritt Car Seat Works, St. Louis, Mo.
- Harrington, C. J., representing C. J. Harrington, New York.
- Hough, Ben K., Stanley Electric Mfg. Co., New York.
- Hoyt, L. B., Buffalo Electric Co., Cleveland, O.
- Holmes, B. P., New York City Claim Bureau, New York, N. Y.
- Hunter, L. J., Hunter III, Car Sign Co. (No address).
- Hunt, Ed. J., A. E. & C., Wheaton, Ill.
- Hogan, James, Mich. Elect. Co., Detroit, Mich.
- Hodges, Percy, Pittsburg Reduction Co., Boston, Mass.
- Haskell, Geo. M., J. G. Brill Co., New Haven, Conn.
- Humphrey, C. B., Westinghouse Elec. & Mfg. Co., Cincinnati, O.
- Hoopes, Wm., Pittsburg Reduction Co., Pittsburg, Pa.
- Hayes, J. M., New Haven Cash Reg. Co., New Haven, Conn.
- Hentings, H. H., J. G. Brill Co., Philadelphia, Pa.
- Hartwell, Arthur, Westinghouse Electric & Mfg. Co., Pittsburg, Pa.
- Hutchinson, F. L., Christensen Eng. Co., Milwaukee, Wis.
- Hart, Capt. G. A., Crane Co., Chicago.
- Hocker, H. L., Lorain Steel Co., Lorain, O.
- Hastings, Geo., S. George S. Hastings & Co., Cleveland, O.
- Harwood, G. A., The Ohio Brass Co., Mansfield, Ohio.
- Hinkley, John L., Poughkeepsie Ry. Co., Poughkeepsie, N. Y.
- Hawley, Cornell S., Consolidated Car Co., New York.
- Hawkins, Geo. B., Christensen Engr. Co., New York City.
- Hammond, Mr., Consolidated Car & Heating Co., Chicago, Ill.
- Hamilton, G. W., Baldwin Locomotive Works, Philadelphia.
- High, John M., New York N. Y.
- Hough, C. D., General Electric Co., Aurora, Ill.
- Hutchins, S. D., Westinghouse Air Brake Co., Columbus, O.
- Harris, S., American Union Elec. Co., New York.
- Harris, C. M., Pittsburg Reduction Co., Cleveland, O.
- Haskell, G. M., J. G. Brill Co., New Haven, Conn.
- Harrington, Wm., Gould Storage Battery Co., Detroit.
- Harvey, James, Springfield Mfg. Co., Bridgeport, Conn.
- Hinman, W. E., Ohmer Fare Reg. Co., Dayton, O.
- Hayes, A. J., Citizens' Elec. Ry., Mansfield, O.
- Hollingsworth, Geo., Consolidated Car Fender Co., New York.
- Hartwig, J. W., Crocker-Wheeler Co., Detroit.
- Hart, O. W., Union Stop & Signal Co., Fall River, Mass.
- Hammond, E. H., Am. Elec. Works, Chicago.
- Hopkins, J. C., Knud Air Brake Co., Battle Creek, Mich.
- Hoyer, P. M., The Ohio Brass Co., Mansfield, Ohio.
- Hames, W. L., Consolidated Car Fender Co., New York.
- Holloway, H. C., Railway Joint Mfg. Co., Chicago, Ill.
- Henry, O. D., Lorain Steel Co., Johnstown, Pa.
- Hanrahan, Roger, Detroit, Mich.
- Hartwell, Arthur, West. Elec. & Mfg. Co., Pittsburg, Pa.
- Harpell, F. S., Griffin Wheel Co., Chicago, Ill.
- Haycox, W. E., Cleveland, O.
- Hitchings, F. W., Allen & Morrison Brake Shoe & Mfg. Co., Chicago.
- Hart, H. H., Hart Tie Plate, Chicago.
- Harrison, H. Y., Detroit.
- Hanson, C. E., Bethlehem Steel Co., So. Bethlehem, Pa.
- Hamilton, C. W., The F. Bissell Co., Toledo, O.
- Haines, Fred W., Triumph Electric Co., Detroit, Mich.
- Irwin, M., Pittsburg Steel Co., St. Louis, Mo.
- Irwin, C. E., J. G. Miller Railway Supply, St. Louis, Mo.
- Johnson, Alfred, Reliable Trolleybar, Quincy, Ill.
- Johnston, A. R., Clarence Brooks & Co., Columbus, O.
- Jones, B. J., Sargent & Lundy Engr's., Chicago.
- Johnson, Claude, Creaghead Engineering Co., Cincinnati, O.
- Johnson, O. W., Johnson Wrecking Frog Co., Cleveland, Ohio.
- Johnson, A. J., Federal Mfg. Co., Cleveland, Ohio.
- James, J. C., Christensen Eng'r. Co., Milwaukee, Wis.
- Jones, Arthur E., National Lead Co., Cincinnati, O.
- Johnson, Chas. F., Chas. F. Johnson, Buffalo, N. Y.
- Junkins, Sidney E., Westinghouse, Church Kerr & Co., Boston.
- Jackman, Geo. W., Springfield Mfg. Co., Bridgeport, Conn.
- Janson, Louis, Am. Car Seat Co., Brooklyn.
- Jones, Arthur E., National Lead Co., Cincinnati, O.
- Johnson, O. W., Johnson Wrecking Frog Co., Cleveland, O.
- Jenkins, R. B., Toronto, Ont.
- Jones, B. J., Chicago.
- Judson, A. L., N. Y. State R. R. Commission, Albany, N. Y.
- Judson, A. L., N. Y. State Board Ry. Commission.
- Kent, N. B., Atlas Ry. Supply Co., Chicago.
- Knaupp, E. J., Powell Turner Truck Co., New York.
- Kraushaar, C. F., Kraushaar Lamp & Reflector Co., St. Louis.
- Kalus, Anthony T., The Q. & C. Co., Chicago.
- Knowlton, Jno. F., Selma St. & T. Ry. Co., Selma, Ala.
- Klauder, R. H., Elect. Storage Battery Co., St. Louis.
- Keyes, F. A., Am. Steel & Wire Co., New York.
- Kerr, H. H., Westinghouse, Church Kerr Co., Chicago, Ill.
- Kelly, W. E., Western Electrician, Chicago, Ill.
- Knickerbocker, C. K., Griffin Wheel Co., Chicago, Ill.
- Kerschner, W. R., 2nd, The Col. Mch. Wks. & Mch. Iron Co., Brooklyn, N. Y.
- Kummel, G. F., Am. Steel & Elec. Co., Chicago, Ill.
- Kennedy, J., Street Railway Journal, Detroit, Mich.
- Kirkpatrick, E. F., McRoy Clay Works, Chicago, Ill.
- King, Chas. P., Valec Supply Co., Philadelphia, Pa.
- Kemp, H. S., Standard Elect. Co., Norfolk, Va.
- Kenfield, Fred., Street Railway Review, Chicago.
- Korst, Albert, Union Mica Co., New York.
- Kent, Jas., Washington & Canonsburg Railway Co., Washington, Pa.
- Kmsman, F. E., Kmsman Elec. Ry. Supply Co., New York.
- Kuhn, Frank, United Electric Heating Co., Detroit, Mich.
- King, Chas. P., Phila. Commercial Museum, Philadelphia, Pa.
- Kimble, H. L., The Central Electric Co., Chicago, Ill.
- King, Alvin S., Sterling Varnish Co., Pittsburg, Pa.
- Kuhn, Robert, United Electric Heating Co., Detroit, Mich.
- Kenfield, H. J., Street Railway Review, New York, N. Y.
- Kemp, H. C., N. H. C. Reg. Co., New Haven, Conn.
- Kennedy, F. B., New Haven Cash Reg. Co., New Haven, Conn.
- Kerran, N. C., Wabash R. R., Chicago, Ill.
- Kimball, Herman T., Standard Underground Cable Co., New York.
- Knight, C. S., Jr., Am. Steel Electric Co., Chicago.
- Kemp, H. S., Reversible Elec. Car-Sign Co., Richmond, Va.
- Kingston, Wm. W., The Lorain Steel Co., Atlanta, Ga.
- Klinschmidt, H. P. A., Lorain Steel Co., Johnstown, Pa.
- Knight, Chas. D., Christensen Eng. Co., Milwaukee, Wis.
- Kler, S. W., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
- Kirkland, Jas. L., Amer. Circular Loom Co., New York, N. Y.
- King, C. P., Brady Brass Co., Jersey City, New Jersey.
- King, C. K., The Ohio Brass Co., Mansfield, Ohio.
- Kerchoff, Wm. G., St. Louis Register Co., St. Louis, Mo.
- Lambe, A. B., Canadian Gen. Electric Co., Toronto, Ont.
- Leaman, H., Electric Storage Battery Co., Detroit.
- Lindsay, E. C., Baldwin Locomotive Works, Philadelphia.
- Littlefield, A. S., Lorain Steel Co., Chicago.
- Langworthy, E. S., Adams Westlake Co., Chicago.
- Lincoln, P. M., Westinghouse Electric & Mfg. Co., Pittsburg, Pa.
- Lyons, James W., Allis-Chalmers Co., Chicago.
- Lindsay, Wm. W., Charleston, Va., Electric R. R. Co., Detroit.
- Livesey, J. R., General Electric Co., Detroit, Mich.
- Laurence, George, M. Miltshkun Co., Detroit.
- Lovejoy, F. H., Strong, Carlisle & Hammond Co., Cleveland, O.
- Lintern, Wm., The Nichols-Lintern Co., Cleveland, O.
- Learier, A. L., Ft. Wayne Electric Works, Fort Wayne, Ind.
- Littlefield, A. C., Lorain Steel Co., Chicago, Ill.
- Lancaster, R. H., Reversible Electric Car-Sign Co., Richmond, Va.
- Lane, Nat. P., Parrott Varnish Co., Philadelphia, Penn.
- Littlejohn, C. F., New Haven Cash Reg. Co., New Haven, Conn.
- Lancaster, Robert A., N. H. Cash Reg. Co., New Haven, Conn.
- Leach, P. S., American Brake, Shoe & Foundry Co., Detroit, Mich.
- Lockwood, Jos. E., Nor. Electric Mfg. Co., Detroit, Mich.
- Lewis, Wilbur, Westinghouse Co., Brooklyn, N. Y.
- Lachinger, John H., American Elec. Co., Detroit, Mich.
- Lovejoy, J. K., General Electric Co., Schenectady, N. Y.
- Lohr, C., The Northern Ohio Traction Co.
- Little, F. A., The Cleveland Frog & Crossing Co., Cleveland, O.
- Lincoln, P. U., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
- Millbridge, Ray D., Stanley Electric Mfg. Co., New York, N. Y.
- Lawrie, Avah K., The Pittsburg Reduction Co., Pittsburg, Pa.
- Lanford, G. H., Platt & Washburn Repairing Co., New York.
- Ledenger, Peter, Dayton Mfg. Co., Dayton, O.
- Ledenger, Joseph, Dayton Mfg. Co., Dayton, O.
- Ludlow, J. B., Ludlow Supply Co., Cleveland, O.
- Lewis, W. H., Curtain Supply Co., Chicago, Ill.
- Merrick, Mr., Westinghouse Elec. & Mfg. Co., Bethlehem, Pa.
- Morton, E. H., Westinghouse Elec. & Mfg. Co., Detroit, Mich.
- Medbury, C. F., West Church Keer Co., Detroit, Mich.
- Miller, J. S., The P. S. Co., St. Louis, Mo.
- Mannery, W. H., St. R. R. Journal, New York, N. Y.
- Min, Chas., Morgan Air Brake Co., Detroit, Mich.
- Morgan, G. T., Morgan Air Brake Co., Toronto, Ont.
- Moore, R. E., Gen. Elec. Co., Philadelphia, Pa.
- Moloney, J. P., Gen. Elec. Co., New York.

Morrison, Jas. Magann Air Brake Co., Detroit, Mich.
 McQuiston, J. C., Westinghouse Co., Pittsburg, Pa.
 Miller, D. W., Miller Sanding Machine, Hamilton, Ont.
 Merrill, F. E., D., Y., A. A. & J. Ry., Ypsilanti, Mich.
 Maltby, A., Maltby Lumber Co., Bay City, Mich.
 McFarlane, Miss M., Bay City, Mich.
 Markham, F. L., Geo. S. Hastings & Co., Cleveland, O.
 Miller, C. S., U. S. Steel Co., Everett, Mass.
 Moore, Miles F., Morden Frog & Crossing Works, Chicago, Ill.
 McCormick, N. G., The Ohio Brass Co., Toronto, Ont.
 Martin, F. C., Electrical World & Engineer, New York, N. Y.
 Masterson, Frank D., Chase Shawmutt Co., Boston, Mass.
 Magann, P., Magann Air Brake Co., Detroit, Mich.
 Mitsuikun, M., M. Mitsuikun Co., Detroit, Mich.
 McDonald, J. M., J. R. McCardell & Co., Trenton, N. J.
 Munoz, S. C., Munoz Boiler Co., New York
 Manson, Ray H., Kellogg Switchboard & Supply Co., Chicago.
 McMichael, J. G., Atlas Ry. Supply Co., Chicago.
 Morris, Elmer P., Amer. Union Elec. Co., Morris Elec. Co., New York.
 Merritt, Fred L., Standard Pole & Tie Co., New York.
 Merrill, J. J., Cahal Co., Chicago.
 Metzger, Wm. E., Wheel Truing Brake Shoe Co., Detroit.
 McLean, E. B., Sterling-Meaker Co., New York.
 Mahony, J. J., General Elec. Co., New York.
 Morrell, F. A., Fowler & Robert Mfg. Co., New York.
 McCowan, J. H., Lorain Steel Co., Lorain, O.
 McVicker, W. B., Dearborn Drug & Chem Works, New York.
 Markham, F. L., Geo. S. Hastings & Co., Cleveland, O.
 Mason, W. R., Mechan. Boiler Cleaner Co., Chicago.
 MacDonald, M., Ohmer Fare Reg. Co., Cleveland, O.
 Marks, Walter F., National Lead Co., Chicago.
 McDonald, W. S., Detroit Trolley & Mfg. Co., Ltd., Detroit.
 McKintoch, O. N., Bellamy Vestlette Mfg. Co., Cleveland, O.
 Martin, F. L., Kellogg Switchboard & Supply Co., Chicago.
 Milloy, Peter D., International Trolley Controller Co., Buffalo.
 Metzelaar, A. H., Knell Air Brake Co., Battle Creek, Mich.
 Miller, C. S., U. S. Steel Co., Everett, Mass.
 McCormack, E. D., Canadian Gen. Elec. Co., Toronto, Ont.
 McGovern, John C., Seldner-Miner Elec. Co., Detroit.
 Miley, R. K., National Carbon Co., Cleveland, O.
 Murphy, Andrew J., Baldwin Locomotive Works, Chicago, Ill.
 MacEachron, A. G., Wilber-Moreland Co., Detroit, Mich.
 Mallon, Wm. P., Marbo Varnish Co., Inc., Detroit, Chicago, Ill.
 McHardy, W. T., F. F. McCardell & Co., Trenton, N. J.
 McDonald, W. A., J. T. Blair, Detroit, Mich.
 McCosh, Mr., Continuous Railjoint Co., Chicago, Ill.
 Martie, C. W., Consolidated Car Heating Co., Chicago, Ill.
 Mason, N. H., Dallett & Co., Phila. Delphia Pa.
 Masterson, F. T., Illuminating Co., Detroit, Mich.
 McCarthy, Jas. R., Detroit Electrical Iron, Detroit, Mich.
 McCoy, Frank, St. Louis Car Co., Pittsburg, Pa.
 McGeigh, S. P., Continuous Railjoint Co., Chicago, Ill.
 Malye, Evelyn A., Maltby Lumber Co., Bay City, Mich.
 Morgan, Godfrey, The Youngstown & Sharon St. Ry. Co., Youngstown, O.
 McAndrews, Thos. W., Jersey City, Hoboken & Patterson St. Ry., Patterson, N. J.
 Mason, J. F., The Ohio Brass Co., Chicago, Ill.
 McFay, J., Powell & Lin Truck Co., Troy, N. Y.
 Miner, F. I., Electric Supply Co., Detroit, Mich.
 Mitchell, Geo. W., The A. E. Holiday Mfg. Co., New Haven, Conn.
 Merrick, F. A., Westinghouse Elec. & Mfg. Co., Johnstown, Pa.

MacGovern, Frank, The Rossiter, MacGovern & Co., New York, N. Y.
 Miller, Frank, C. J. Harrington, New York.
 McCleary, E., McCleary & Colquitt Co., Detroit, Mich.
 Moran, Wm. M., Townsend, Reed & Co., Indianapolis, Ind.
 Marks, Albert G., National Lead Co., Detroit, Mich.
 Morse, Geo. C., Rochester Car-Wheel Works, Taunton, Mass.
 Mead, G. A., The Ohio Brass Co., Mansfield, O.
 Miller, J. H., Continuous Railjoint Co., St. Louis, Mo.
 Moore, R. E., General Electele Co., Philadelphia.
 Mason, Frederick H., Harrison Safety Roller Wks., Detroit, Mich.
 Mettelshausen, C., Wallace Supply Co., Chicago, Ill.
 Mead, George A., The Ohio Brass Co., Mansfield, Ohio.
 McGuire, W. A., McGuire Mfg. Co., Chicago, Ill.
 Meech, C. E., Milwaukee & Norman Co., Grand Rapids, Mich.
 Miller, J. C., Pennsylvania Steel Co., St. Louis, Mo.
 McQueen, W. J., Gould Elec. Heater, New York.
 Medbery, Chas. F., Westinghouse Elec. Mfg. Co., Detroit, Mich.
 McKintoch, Walter C., General Mfg. Co., Chicago, Ill.
 Marymont, David J., Detroit Trolley & Mfg. Co., Detroit, Mich.
 Maycock, Jos., Pratt & Lambert, New York City.
 Meeten, Wesley, Wallace Supply Co., New York City.
 Madill, Thos., The Sherwin-Williams Co., Chicago, Ill.
 Meek, J. E., Manville Co., New York.
 Mason, Daniel W., Frederick H. Mason, Specialist in Steam Purification, Detroit, Mich.
 Nutter, Alanzo E., U. S. Curtala Co., Newark, N. J.
 Nicol, C. E., Armspear Mfg. Co., New York.
 Newell, Frank C., Westinghouse Air Brake Co., Pittsburg, Pa.
 Newhall, E. G., Newhall & Co., Detroit.
 Newell F. C., Westinghouse Air Brake Co., Pittsburg, Pa.
 Nol, C. S., Gen. Elec. Co., Chicago, Ill.
 Nullin, S. W., Gen. Elec. Co., N. Y.
 Noves, Ernest H., Pittsburg Reduction Co., Chicago, Ill.
 Nashall, J. H., The Ball & Wood Co., Detroit, Mich.
 Mayhan, Judson, Northhouse Elec. Co., Detroit, Mich.
 Newbury, W. C., Westinghouse Elec. & Mfg. Co., Wilmington, Del.
 Nate, J. J., Stromberg Carlson Tel. Mfg. Co., Chicago, Ill.
 Newton, D. M., American Elec. Co., Detroit, Mich.
 Newcomb, F. H., Newcomb Uniform Cans, N. Y. City.
 Neston, W. H., Palge Iron Works, Chicago, Ill.
 Nel, J. J., Christensen Engineering Co., New York.
 Nellis, George A., Sawyer-Man, Elec. Co., Pittsburg, Pa.
 Neborent, Edgar C., Chicago, Ill., Palge Iron Works.
 Oakley, William E., Worcester Steel Ely. Co., Worcester, Mass.
 Overstreet, H. E., Cimax Stock General Co., Chicago.
 Odona, F. M., Jr., Buckeye Elec. Co., Cleveland, Ohio.
 Genell, Otto, Knell Air Brake Co., Pontiac, Mich.
 Orntch, Wm. Morgan Air Brake Co., Detroit, Mich.
 O'Hara, J. B., Street Railway Journal, New York, N. Y.
 Olyver, J. W., The Am. Machinery Co., Grand Rapids, Mich.
 Odona, F. M., Buckeye Electric Co., Cleveland, Ohio.
 Osborne, L. A., West Elec. & Mfg. Co., Pittsburg, Pa.
 Ohmer, John F., Ohmer Fare Register Co., Dayton, O.
 Polling, Wm. I., S. W. & A. Ry. Windsor, Ont.
 Padgett, Wm., St. Railway Review, Cleveland, O.
 Parker, W. E., Westinghouse Elect. & Mfg. Co., Buffalo, N. Y.
 Peveor, J. B., General Elect. Co., Cincinnati, O.
 Perrine, F. A. C., Stanley Elec. Co., Pittsfield, Mass.
 Pierce, C. C., General Elect. Co., Boston, Mass.
 Perkins, F. B., Toledo & Western Ry., Toledo, O.
 Partridge, Arthur S., St. Louis, Mo.
 Puetzker, E. J., Am. Steel & Wire Co., Chicago, Ill.

Peirce, Edward B., Amer. Trackbarrow, Lowell, Mass.
 Packer, E., Amer. Union Elec. Co., New York.
 Phelps, Neil S., Knell Air Brake Co., Battle Creek, Mich.
 Patterson, E. B., Bassett-Presley Co., Cleveland, O.
 Patton, W. B., Gen. Elec. Co., Schenectady, N. Y.
 Pomeroy, L. R., Gen. Elec. Co., New York.
 Perrault, Jesse D., J. D. Perrault, Detroit, Mich.
 Palne, F. B. H., Westinghouse Elec. & Mfg. Co., New York City.
 Price, O. J., Detroit, Pontiac, Lapeer & Northern Ry. Co., Detroit, Mich.
 Poppennusen, P. A., Green Engineering Co., Chicago, Ill.
 Paradis, E. J., The W. G. Nagel Electric Co., Toledo, O.
 Payne, A. E., Craighead Engineering Co., Cincinnati, O.
 Parmelee, Geo. H., The Lorain Steel Co., Johnstown, Pa.
 Power, Wm. W., Christensen Engineering Co., Philadelphia, Pa.
 Patch, N. K. B., Lunen Bearing Co., Buffalo, N. Y.
 Pote, A. N., Ohmer Fare Register Co., Dayton, O.
 Perry, Jas. W., H. W. Johns-Manville Co., New York, N. Y.
 Phillips, L. F., Edison Illuminating Co., Detroit, Mich.
 Porter, Wm., The Ohio Brass Co., Chicago, Ill.
 Parker, W. S., Det., Pontiac, Lapeer & N. R. R., Detroit, Mich.
 Pope, W. C., The Globe Ticket Co., Philadelphia, Pa.
 Pinar, J. A., The Rossiter, MacGovern & Co., St. Louis, Mo.
 Powell, Chas. W., Powell Truck Co., Troy, N. Y.
 Potts, Walter C., H. Hanshaw, Detroit, Mich.
 Provost, Geo. W., R. D. Nuttall Co., Pittsburg, Pa.
 Parshall, L. A., Ball & Wood Co., of New York, Detroit, Mich.
 Pashby, B. F., Potts Trolley Wheel Co., Detroit, Mich.
 Porterfield, C. D., Atlas Ry. Supply Co., Chicago.
 Perry, David H., Kuhlman Car Co., Cleveland.
 Palne, F. B. H., Westinghouse Elec. Co., New York City.
 Person, F. B., National Lead Co., Detroit.
 Partridge, James, Partridge Carbon Wks., Sandusky, O.
 Prohassa, W. M., Westinghouse Companies, Pittsburg, Pa.
 Phelps, W. E., The Phelps Co., Detroit, Mich.
 Pendleton, D. D., West. Elec. & Mfg. Co., Pittsburg, Pa.
 Priest, E. D., Genl. Elec. Co., Schenectady, N. Y.
 Parsons, R. P., The P. S. Co., Chicago, Ill.
 Perry, Frank L., Western Electrician, Chicago, Ill.
 Parker, W. G., Westinghouse Elec. & Mfg. Co., Buffalo, N. Y.
 Phelps, William, The Phelps Co., Detroit, Mich.
 Porter, Wm. M., Alphaduct Mfg. Co., New York City.
 Porter, J. J., Porter Derailing Switch, Cleveland and Detroit.
 Paulson, H., Jewett Car Co., Newark, Ohio.
 Peck, H., Wheel Truing & Brake Shoe Co., Detroit, Mich.
 Pulver, G. W., Westinghouse Elec. Mfg. Co., Syracuse, N. Y.
 Pratt, G. E., Niles Car Co., Niles, Ohio.
 Pendleton, D. D., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Quinn, Hugh, Peter Smith & Co., Chicago, Ill.
 Royce, Daniel, Editor Street Railway Review, Chicago.
 Rushmore, David B., Stanley Elec. Co., Pittsfield, Mass.
 Roe, Julian, Crocker-Wheeler Co., Chicago.
 Riggs, C. W., Westinghouse Elec. & Mfg. Co., Chicago, Ill.
 Raymond, F. W., Magann Air Brake Co., St. Louis.
 Rooke, Geo. F., Rooke Register Co., Pearl, Ill.
 Rosdyehl, C. W., Pitts. Steel Co., Steelton, Pa.
 Rawls, R. E., Am. Steel Elec. Co., Chicago, Ill.
 Rosenthal, C. D., Genl. Elec. Co., St. Louis, Mo.
 Renshaw, C., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Reynolds, John N., U. P. Railway Age, Chicago, Ill.
 Reid, Arthur, Shelby Electric Co., Shelby, Ohio.

- Robinson, John C. Wm Wharton, Jr & Co., Boston
- Rold, E., New York
- Rayner, H. J. Westinghouse Church Kerr & Co., Detroit
- Riley, James, Christensen Engr. Co., Cleveland, O.
- Runge, E. T., International Reg. Co., Chicago
- Rood, Alexander, United States Wood Preserving Co., New York
- Ricker, C. A. G. P. Kuhlman Car Co., Cleveland, O.
- Rawstrom, H., Allen & Morrison Brake Shoe Mfg. Co., Chicago
- Reynolds, A. J., National Ticket Co., Cleveland, O.
- Raynor, A. J., West Church Kerr Co., Detroit, Mich.
- Randall, F. C., Christensen Engr. Co., New York City
- Rutherford, E. C., G. T. Morgan A & Brake Co., Detroit, Mich.
- Ransom, Henry W., Christensen Engr. Co., Cleveland, O.
- Richardson, Wm F. General Supplies, Detroit, Mich.
- Root, F. N., Root Track Scraper Co., Kalamazoo, Mich.
- Reynolds, E. E., Matthy Lumber Co., Bay City, Mich.
- Randolph, Oltz, The Lorain Steel Co., Lorain, O.
- Robinson, W. R., Detroit Electric Ry Switch Co., Detroit, Mich.
- Richardson, A. N., Mich. Electric Co., Detroit, Mich.
- Ruth, E. J., F. J. Ruth & Co., Chicago, Ill.
- Richards, J. F., Seidner-Miner Co., Detroit, Mich.
- Runge, E. T., The International Reg. Co., Chicago, Ill.
- Randolph, The Rossiter, MacGovern & Co., Boston, Mass.
- Rousseau, A. J., Stromberg Cortson, Tel. Mfg. Co., Chicago, Ill.
- Reubens, Chas. W., Brady Brass Co., Jersey City.
- Register, C. W., Westinghouse Elec. Mfg. Co., Pittsburg, Pa.
- Riley, Jas. J., Christensen Engineering Co., Milwaukee.
- Richards, A. J., Christensen Engineering Co., Milwaukee, Wis.
- Rockwell, W. B., Syracuse Lakeside & Baldwinville Ry., Syracuse, N. Y.
- Reitzell, William, Ruitus, Pullman Automatic Ventilator Co., York, Pa.
- Rutherford, J. A., The Pittsburg Reduction Co.
- Snow, P. C., Globe Ticket Co., Philadelphia.
- Smith, J. C., Allegheny Brake & Shoe Co., Allegheny, Pa.
- Stanley, G. J., Nerst Lamp Co., Pittsburg, Pa.
- Smith, Geo. W., Elec. Storage Battery Co., Chicago, Ill.
- Smith E. J., Peter Smith Heater Co., Detroit, Mich.
- Sisson, A. H., Jewett Car Co., Newark, Ohio.
- Skinner, C. E., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
- Stevens, W. F., Kalamazoo Ry. Supply Co., Kalamazoo, Mich.
- Slocum, A. W., Keystone Car Wheel Co., Pittsburg, Pa.
- Stowell, Myron R., Patterson Sargent Co., Pittsburg, Pa.
- Storer, N. W., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
- Sargent, F. W., American Brake, Shoe & Fld'y. Co., New York City.
- Shippy, H. L., John A. Roebbling's Sons Co., New York.
- Sullivan, W. L., Crocker-Wheeler Co., Cleveland, O.
- Stewart, R. P., McGuire Mfg. Co., Chicago, Ill.
- Sherry, John, Sterling Lubricator Co., Rochester, N. Y.
- Schumacher, Geo. L., Pneumatic Ry. Equip. Co., Cleveland, O.
- Smetten, Wm. T., The Weber Rail Joint & Mfg. Co., Chicago, Ill.
- Smith, W. M., Chicago Insulated Wire Co., Chicago, Ill.
- Smith Geo. B., Seidler-Miner Elec. Co., Detroit, Mich.
- Startsman, Charles W., Crocker-Wheeler Co., Amherst, N. J.
- Schulte, H. D., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
- Stanley, G. J., Nerst Lamp Co., Pittsburg, Pa.
- Smith, D. W., Peter Smith Heater Co., Detroit, Mich.
- Stewart, John A., John A. Stewart Electric Co., Cincinnati, O.
- Stridiron, Wm., Berry Bros., Detroit, Mich.
- Spear, Grant W., Dearborn Drug & Chemical Co., Chicago, Ill.
- Solffen, E. H., West Church Ken Co., Newark, N. Y.
- Stiller, R., American Union Elec. Co., Columbus, O.
- Specr, J. S., Speer Carbon Co., St Marys, Pa.
- Seagrove, Mr., Consolidated Car & Heating Co., Albany, N. Y.
- Syddam, H. H., Cincinnati, Ohio.
- Pros., The Cincinnati Mfg. Co.
- Shute, Henry D., Westinghouse Elec. Mfg. Co., Pittsburg, Pa.
- Stedman, J. H., Rochester, N. Y.
- Sharpe, W. E., Atlas Engine Works, Indianapolis, Ind.
- Schwabe, H. C., The Ohio Brass Co., Mansfield, Ohio.
- Storer, N. W., Westinghouse Electric Mfg. Co., Pittsburg, Pa.
- Stare, Burton R., Peckham Mfg. Co., Kingston, N. Y.
- Snow, W. H., Bangor St. Ry. Co., Bangor, Maine.
- Schultz, E. F., Murphy Varnish Co., Cleveland, Ohio.
- Smith, H. D., G. P. Magann, Detroit, Mich.
- Smith, Peter, Peter Smith Heater Co., Detroit, Mich.
- Stedman, J. H., J. H. Stedman, Rochester, N. Y.
- Scott, T., McMillshken Co., Detroit, Mich.
- Searling, Geo. S., Hart Switches, Chicago, Ill.
- Sylvester, P. J., The P. S. Co., Boston, Mass.
- Sammon, R. J., American Elec. Switch Co., Pittsburg, Pa.
- Sutton, Wm., St. Louis Car Co., St Louis, Mo.
- Shaw, W. A. C., Street Railway Journal, London, England.
- Skinner, C. E., West. Elec. & Mfg. Co., Pittsburg, Pa.
- Shephard, J. H., Am. Street Elec. Co., Worcester, Mass.
- Super, Warren J., West. Elec. & Mfg. Co., Ottawa, Ont.
- Stout, John F., Wm. Hall & Co., Boston, Mass.
- Shepherd, W. J., Columbian Watch & Clock Holder, Denver, Col.
- Stratford, J. C., The Standard Paint Co., Chicago, Ill.
- Shiffard, A. B., Guit. Elec. Co., Cleveland, O.
- Strleby, F. S., Guit. Elec. Co., Louisville, Ky.
- Sharn, Edward P., Lumen Bearing Co., Buffalo, N. Y.
- Seavay F. H., Process Copper & Brass Co., Boston, Mass.
- Shippy, H. L., J. A. Roebbling's Sons Co., New York, N. Y.
- Stlesinger, Luther, Luther Stlesinger, New York, N. Y.
- Snow, P. C., The Globe Ticket Co., Philadelphia, Penn.
- Shepherd, W. J., Combination Watch & Clock Holder, Denver, Col.
- Sheldon, Wm. H., Billock Electric Mfg. Co., Detroit, Mich.
- Stuart, Wm. M., U. S. Government, Wash., D. C.
- Sedler, B. F., Seidler-Miner Elec. Co., Detroit, Mich.
- Stridiron A., Berry Bros. Ltd., Detroit, Mich.
- Salle, Geo. M., American Elec. Co., Detroit, Mich.
- Stendevant, C. R., Ohio Brass Co., Mansfield, Ohio.
- Scranton, B. H., Am. Electric Heater Co., Detroit, Mich.
- Sas, F. S., The National Conduit & Cable Co., Boston, Mass.
- Schenck, L. C., Sterling Varnish Co., Pittsburg, Pa.
- Swan, G. W., Jno. A. Roebbling's Sons Co., New York City.
- Stare, Wm., Peckham Truck Co., Kingston, N. Y.
- Sellers, Edw., Ohmer Fare Register Co., Dayton, O.
- Stoddard, D. G., Michigan Electric Co., Detroit.
- Seagrave, F. E., Toledo & Western Ry. Co., Toledo, O.
- Smith, E. J., The Peter Smith Heater Co., Detroit, Mich.
- Smith, Herbert W., Stuart, Howland Co., Boston.
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- Sturdvant, S. A., The Ohio Brass Co., Mansfield, O.
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- Thomas, Wm. H., Indianapolis Switch & Frog Co., Springfield, O.
- Treatman, E. E. R., Engineering News, Chicago.
- Thibert, Naresst, Univ. Sanitary Cuspldor Co., Worcester, Mass.
- Thomas, Maurice W., Stanley Elec. Mfg. Co., Detroit.
- Tolman, Chas. P., Christensen Engr. Co., Milwaukee, Wis.
- Thomson, F. C., Detroit Automatic Stoker Co., Detroit.
- Thomas, Chas. K., Amerlean Elec. Urban, Chicago, Ill.
- Turner, H. U., Acme White Lead & Color Works, Detroit, Mich.
- Taylor, John, Taylor Elec. Truck Co., Troy, N. Y.
- Thomas, R. L., National Lock Washer Co., New York.
- Turner, J., Powell Turner Truck Co., New York.
- Thomas, Edw. G., Boston, Mass.
- Tingley, A. G., Jno. A. Roebbling's Sons Co., Trenton, N. J.
- Thomas, W. G., Street Railway Review, New York.
- Taylor, F. H., West Elec. & Mfg. Co., Pittsburg, Pa.
- Thomson, A. G., Detroit U. Ry., Detroit, Mich.
- Thompson, J. S., Amerlean Brake, Shoe & Foundry Co., Chicago, Ill.
- Thompson, J. S., Amerlean Brake, Shoe & Foundry Co., Chicago, Ill.
- Tell, R. P., Christensen Engineering Co., Milwaukee, Wis.
- Thomas, A., Spring Spring Co., Detroit.
- Temple, Albert, Harold P. Brown, New York.
- Thomas, R. L., The National Lock Washer Co., New York, N. Y.
- Tarvin, —, Hunter, Ill., Car Sign Co., Covington, Ky.
- Thomas, E. M., Port Huron Street Ry. Co., Port Huron, Mich.
- Towley, R. R., Scarritt Car Seat Works, St. Louis, Mo.
- Trawick, S. W., General Electric Co., Atlanta, Ga.
- Tench, W. E., W. E. Tench & Co., Detroit, Mich.
- Tate, H. F., The National Conduit & Cable Co., Chicago, Ill.
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- Umphray, Geo. H., Under-feed Stoker Co. of America, Detroit
- Uloff, O. W., Ohio Brass Co., St. Louis.
- Underwood, C. W., Westinghouse Elec. & Mfg. Co., Buffalo, N. Y.
- Uthoff, Ottow W., Ohio Brass Co., St. Louis, Mo.
- VanDorn, W. T., W. T. VanDorn Co., Chicago.
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- Vosburgh, A. C., The New Process Raw Hide Co., Syracuse, N. Y.
- Van De Mark, A. S., Alliance Elec. Co., Alliance, Ohio.
- Viele, F. S., Standard Underground Cable Co., Pittsburg, Penn.
- Wilcox, F. W., Gen'l. Elec. Co., Harrison, N. Y.
- Wickwire, E. F., Sterling-Meaker Co., New York.
- Wilson, J. M., Cincinnati, Milford Loveland Tract Co., Cincinnati, O.
- Walker, M. S., F. Bissell Co., Toledo, Ohio.
- Wisman, W. H., Devers & Wisman, Dayton, O.
- Wardwell, C. M., Mich. Elec. Co., Detroit.
- Wood, Chas. N., Frank Ridlon Co., Boston.
- Whinery, S. B., Pittsburg Blue Print Paper & Mfg. Co., Pittsburg, Pa.
- Wheatly, W. W., Brooklyn.
- Wabbling, J. E., American Union Elec. Co., N. Y.
- Wiss, Cliff, Chicago, Ill.
- Woodruff, W. W., Westinghouse Elec. Mfg. Co., Pittsburg, Penn.
- Whitton, R. L., Berry Bros., Ltd., Detroit, Mich.
- Woltman, E., Albert & J. M. Anderson Mfn. Co., New York.
- Wranter, C. N., Ohio Brass Co., Mansfield, O.
- Whitney, C. G., Western Electrician, Chicago, Ill.
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- Wilkinson, A. J., The Ohio Brass Co., Mansfield, Ohio.
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- Wakeman, J. M., St. Ry. Journal, New York City.
- Woodbridge, J. Lester, Elec. Storage Battery Co., Philadelphia, Pa.
- Wiley, J. R., Standard Underground Cable Co., Chicago, Ill.
- White, W. A., The John Pratt Co., Hartford, Conn.
- Wilson, Hugh M., Railway Age, Chicago, Ill.
- Waters, W. L., Christensen Eng. Co., Milwaukee, Wis.
- Wilson, Harold R., Stanley Elec. Mfg. Co., Pittsfield, Mass.
- Welling, Wm., The Hunter Illuminated Car Sign Co., Cincinnati, Ohio.
- Whitlock, F. B., The National Malleable Casting Co., Indianapolis, Ind.
- Willis, A. C., Street Railway Review, Chicago.

Wissing, W. H., Crocker-Wheeler Co., St. Louis.
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 Whiteside, W. H., West Elec. & Mfg. Co., Pittsburg, Pa.
 Wharton, W. Rodman, Wm. Wharton Jr. & Co., Inc., Philadelphia, Pa.
 Wisner, A. C., Knell Air-Brake Co., Battle Creek, Mich.
 Whitcomb, T. H., Griffin Wheel Co., Chicago, Ill.
 Whipple, A. L., Curtain Supply Co., Chicago, Ill.
 Weatherby, W. E., Burrough's Adding Machine, St. Louis, Mo.
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 Wood, M. M., General Electric Co., Schenectady, N. Y.
 Wheeler, Jno. T., F. J. Ruth Co., Chicago, Ill.
 Wheeldea, W. E., Christensen Engineering Co., Boston, Mass.
 Welthas, R. L., National Lead Co., New York.
 Warren, A., Westinghouse Companies, London, Eng.
 Wilcox, C. H., The Arbuckle Ryan Co., Toledo, O.
 Willard, E. R., The Standard Paint Co., Chicago, Ill.
 Wolsten, Mr., Mich. Electric Co., Detroit, Mich.
 Wright, C. R., The Am. Machinery Co., Grand Rapids, Mich.
 Walker, Henry L., Henry L. Walker Co., Detroit, Mich.
 Wilcox, Francis W., General Electric Co., Edison Lamp Works, Harrison, New Jersey.
 Williams, Lowell Pullman Aut. Ventilator Co., Philadelphia, Pa.
 Young, J. S., Griffin Wheel Co., Chicago, Ill.
 Young, J. W., North Jersey St. Ry., Newark, N. J.
 Yannell, V. H., American Atrified Conduit Co., New York, N. Y.
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Track Sanding System

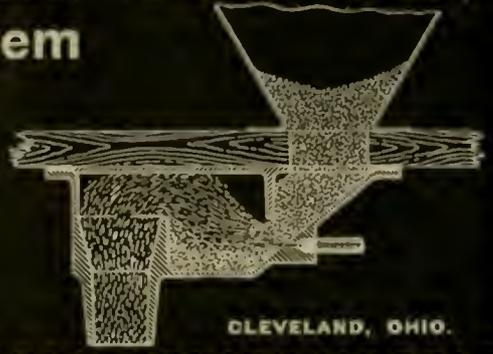


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ELECTRIC BLDG.,

CLEVELAND, OHIO.

THE N. Y. C. SPECIAL.

A goodly number of supply men arrived in town yesterday morning on the Detroit special which left New York at 4 p. m. Tuesday over the New York Central, coming from Utica via the Michigan Central.

It was expected that a large Boston contingent would meet the special at Albany, among them several New England street railway men of prominence, including General Manager E. A. Newman, of Portland, Me., and General Manager R. T. Laffin, of the Worcester (Mass.) Consolidated Street Railway Co. So sure was Colonel N. H. Heft, president of the Meriden (Conn.) Electric R. R., that the "Downcasters" would connect with the special that he had reserved two staterooms on the special for their accommodation. It seems that the Boston train reached Albany before the special and continued on its way to Detroit. The uncalled for berths in the staterooms were given over to supply men who asked for them.

Beside Col. Heft on the special, other street railway men were his son, Dr. G. Stanley Heft, of Port Chester, N. Y.; Roy Copeland Cram, of the Connecticut Railway & Light Co., Bridgeport, Conn.; Charles G. Fitch, superintendent of New York & Queens County Railway Co., Long Island City, N. Y.; F. P. Maize, master mechanic of the N. Y. & Q. C. Railway Co.; J. C. Welch, electrical engineer of the Schenectady Railway Co., and J. R. Shurtz, auditor of the South Jersey Gas, Electric & Traction Co., Camden, N. J.

The special was a finely equipped combination of four Pullman coaches, a diner and a buffet smoker. Attached to it for part of the run was the private car of District Superintendent Smith, of the New York Central, who had a party of friends on board. The wants of the passengers were carefully conserved by Passenger Agent J. Frank Myers, of New York, who was in charge to Utica, where Passenger Agent C. A. Cascardin, of Buffalo, took charge for the Michigan Central.



CURTAIN SUPPLY CO.

The Curtain Supply Co. has a very effective and complete exhibit of all kinds of car curtains, curtain fixtures, and curtain materials. As the originators of curtain fixtures, it has kept pace with the progress in car construction and equipment and is offering to the trade curtains and curtain fixtures that have been tested and tried for years in all parts of this country as well as abroad, and have proven to be perfectly satisfactory. The policy of this concern is to stand back of all goods that it manufactures. Owing the basic and fundamental patents on curtain fixtures, it is also able to afford complete and absolute protection to its many customers and friends.

The exhibit is tastefully arranged and is the headquarters for many of the delegates. Mr. W. H. Forsyth, general manager, and Mr. A. C. Whipple, general sales agent, are representing the company. The company recently opened an eastern office at 2131 Park Row building, New York City, and is thus better able than ever to care for its trade.

THE CLIMAX STOCK GUARD

H. S. OVERSTREET, Manager,

714 Marquette Building, - CHICAGO, ILLINOIS.

Manufactured from Shale Clay, Burned Hard, Vitrified and Glazed. Blocks 24 in. long, 8 1/2 inches wide, 4 1/2 in. high. Material in ridges 1 1/4 in. thick.

40 Blocks to each guard, 8 ft. x 8 ft. Weight, 1,200 pounds.

A FEW REASONS WHY IT IS SUPERIOR TO ALL OTHERS.

Its own weight is all that is necessary to keep it in position with a two-inch wooden cleat around the guard. It can neither burn, rust or decay, and is practically indestructible. It is cheaper than either wood or iron, and, in fact, has no competitor in price.

It, unlike other guards, does not require to be taken up at least twice a year, that the weeds growing through it may be cut; no weeds grow through this guard. The expense of installation is practically nothing, as it needs no special preparation to place it in the track; no excavation, and no changes in the track beyond the possible replacing of seven (7) ties, requiring the use only of ordinary section labor. It can readily be adapted to any gauge and to any length of guard desired.

In case a wrecked car or train passes over it, or break beam strikes it, it sustains less damage than any other guard manufactured. Should any of the blocks be broken, they can readily be removed and new ones put in, leaving the balance of the guard intact. A guard of any other form, under such circumstances, would be totally destroyed or so much damaged as to prevent its being reconstructed. It is impossible for train men or others crossing the guard to be injured by falling on this guard or caught in it. In repairing or changing the track, it can be taken up and replaced without the slightest damage and at practically no cost.

The following is a list of Sales for Four Months, ending August 1, 1902:

Chicago, Milwaukee & St. Paul R. R.	250 Guards
Aurora, Elgin & Chicago R'y Co.	720 "
Chicago & Milwaukee Electric R'y Co.	45 "
Atchison, Topeka & Santa Fe R'y Co.	26 "
Indianapolis & Plainfield Electric R'y Co.	40 "
Cincinnati, Dayton & Toledo Traction Co.	15 "
C. C. C. & St. L. R. R. Co. (Big Four)	110 "
Rockford, Janesville & Beloit Traction Co.	8 "
Coal Belt Electric R. R. Co. (Marion, Ill.)	6 "
Chicago & Eastern Ill. R. R. Co.	34 "
Marcellus (N. Y.) Electric R. R. Co.	30 "
Olean (N. Y.) Street R'y Co.	20 "
Cleveland, Elyria & Western R. R. Co.	40 "
The Barborton & Akron Belt R. R. Co.	24 "
Chicago, So. Shore Ry.	50 "

1418

Western Ohio Traction Co. All needed for 110 miles track.
 Utica & Mohawk Valley R'y (Sept. 5) 250 Guards.

**NOT BAD FOR A NEW THING—IS IT?
 LET US ENTER YOUR NAME IN THE LIST.**



RECEPTION AT HOTEL CADILLAC.

The reception last evening tendered by the local committee to the delegates and visitors was more than usually enjoyable. Several hundred attendants and ladies assembled in the spacious parlors of the Cadillac and enjoyed the music, dancing and refreshments, provided by the committee as an aid in getting everybody acquainted. Once more we take pleasure in acknowledging the hospitality of our local hosts.



POSITION WANTED.

First class armature foreman, wants position. Extensive experience. Seven years in charge of armature department of one of the largest roads in the west. Well acquainted with all types of Westinghouse and General Electric motors. Call at "Street Railway Review" Booth.

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VOL. XII. Friday, October 10, 1902. No. 3

MEETING OF MASTER MECHANICS.

In pursuance of the suggestion made by Mr. Thomas Farmer, superintendent of motive power for the Detroit United Ry., a meeting was called yesterday for the purpose of organizing an association of electric railway mechanical and electrical men. This meeting, which was held at Power Station A of the United Railway, was well attended, and after thoroughly canvassing the benefits to be derived from such an association a temporary organization was effected, and a call issued for a meeting to be held to-day at 1 o'clock at the office of the Detroit United Railway, 12 Woodward avenue, for the purpose of perfecting a permanent organization. At yesterday's meeting the following gentlemen were elected temporary officers: Mr. Thomas Farmer, chairman, with power to appoint a secretary. Executive committee: E. W. Olds, superintendent of rolling stock, Milwaukee Electric Light & Power Co., Milwaukee, Wis.; Wm. Pastell, superintendent of motive power and machinery, Consolidated Street Ry. Co., Worcester, Mass.; G. W. Palmer, Jr., electric engineer, Old Colony Street Ry., Fall River, Mass.; C. A. Brown, M. M., Toledo Railway & Light Co., Toledo, Ohio; W. O. Mundy, M. M., St. Louis Transit Co., St. Louis, Mo.

In addition to those mentioned the following gentlemen were present: H. H. Adams, superintendent of shops, United Railways & Electric Co., Baltimore, Md.; R. H. Coleman, superintendent of transportation, Fond du Lac Street Ry. & Light Co., Fond du Lac, Wis.; T. F. Grover, president and manager Fond du Lac Street Ry. & Light Co., Fond du Lac, Wis.; J. E. Welch, master mechanic Des Moines City Railway, Des Moines, Iowa; W. S. Patterson, master mechanic Salt Lake City Railway & Power Co., Salt Lake City, Utah; J. W. Glidden, superintendent Dekalb Sycamore Elec. Co., Dekalb, Ill.; J. M. Yount, master mechanic North Jersey Street Ry., Newark, N. J.; Lewis Pfingst, 31 State street, Boston, Mass.; H. E. Bradford, Zanesville, O.; S. M. Coffin, master mechanic M. M. Mobile Light & Railroad Co., Mobile, Ala.; J. W. Lewis, chief engineer Toledo & Monroe Traction Co., Monroe, Mich.

No definite action was taken yesterday with the exception of the appointing of the officers, it being decided to leave all questions referring to the scope of the association, its aims and purposes, etc., to the action of the meeting to-day. As a name for the proposed organization "The Mechanical and Electrical Association of Electric Railways" has been suggested, and will be presented at the meeting for final approval. Other points to be discussed are the advisability of holding the annual convention at the same time and place as the American Street Railway Association, the work to be attempted by the association, dues, qualifications for membership, etc.

Mr. A. H. Stanley, general superintendent of the Detroit United Railway, spent considerable time at Convention Hall yesterday. Mr. Stanley expressed himself as being very much gratified that the convention in Detroit should have been so well attended, and he wishes to acknowledge the words of appreciation heard on all sides of the efforts of his company to make the convention an unqualified success. Mr. Stanley also wishes to acknowledge the spirit of cooperation displayed by the citizens of Detroit in seconding the efforts of the United Railway company to keep up the reputation enjoyed by Detroit as a convention city.

A. S. R. A. PROGRAM.

"Discipline of Employes by the Merit System"—Metropolitan Street Railway Co., of Kansas City, by W. A. Satterlee, general superintendent.

"The Steam Turbine: Its Commercial Aspect"—E. H. Sniffen, of Westinghouse, Church, Kerr & Co., New York.

"Signals for Urban and Interurban Railways"—Old Colony Railway Co., Boston, by G. W. Palmer, jr., electrical engineer.

"The Adjustment of Damage Claims"—Chicago City Railway Co., by M. B. Starring, assistant general counsel.

Report of Committee on Rules for the Government of Employes.

Report of Committee on Standards.

Election of officers.

ACCOUNTANTS' ASSOCIATION.

Chart of Street Railway Blanks, suggested by G. E. Tripp, general auditor, Stone & Webster's Co.'s, Boston, Mass.

Annual report of Standardization Committee.

Afternoon, 2 o'clock.

Report of Committee on Nominations.

Election of Officers.

Report of Committee on Resolutions.

Installation of Officers.

ENTERTAINMENTS.

A trolley ride will be given for the ladies this morning leaving Hotel Cadillac at 10 a. m. for Mount Clemens, via the Rapid Railway and Gratiot Ave., returning via the Shore Line to the Country Club, Grosse Pointe, where luncheon will be served at 1 o'clock. The return to the city will be made at 4 p. m.

The banquet will be held at Hotel Cadillac at 8 o'clock, at which the installation of the officers elect will be held.

MICHIGAN STATE ASSOCIATION.

One of the most gratifying announcements that it has been our privilege to make is the call for a meeting to organize an electric railway association for the state of Michigan. Those interested are requested to meet in the billiard room of the Light Guard Armory (Convention Building) at 2:30 p. m. (city time) to-day.

MAIL AND TELEGRAMS UNCALLED FOR.

Mail and telegrams for the following are uncalled for at the office of the chairman of the Exhibit Committee:

Telegrams: Frank Silliman, Jr., W. A. Shirley, C. T. Maines, C. O. Maillonx, Thos. R. Elliott, G. W. Hamilton, W. R. Garton, G. W. Chance, H. M. Pease, W. E. Jaques, Henry L. Doherty, Cornell Hawley, Frank Schneider.

Mail: M. S. Walker, George R. Mitchell, Frank S. Given, Thos. Elliott, Wm. A. Snow, E. D. Helms, Ralph H. Beach, Herbert Warren, Geo. W. Rounds.

ANNOUNCEMENT FOR EXHIBITORS.

The Local Exhibit Committee wishes to inform exhibitors that they can save themselves considerable annoyance by notifying Mr. Albert Eastman, in the office of the Exhibit Committee, just when the shipments will be ready and their nature. Those who will have enroute shipments to make on Saturday or the early part of next week are particularly requested to give advance notice to Mr. Eastman so that proper arrangements may be perfected.

Secretary Prockway of the Accountants' Association well deserves the many compliments we have heard passed upon his work since the convention opened. By printing the papers, and especially the reports in advance of the meeting, the members were enabled to devote practically the whole of the sessions on Wednesday to the discussions, and to dispose of even more business the first day than was called for on the program.

TWENTY-FIRST ANNUAL MEETING

AMERICAN STREET RAILWAY ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

(Continued from page 671.)

ELECTRIC EXPRESS AND PACKAGE DELIVERY.

By George W. Parker, General Express Agent, Detroit United Ry.

The establishment of the electric service is a boon to interurban towns, to which lines are being rapidly extended in all directions within a radius of from 75 to 100 miles, and in a great many cases reaching towns and villages which have never heretofore enjoyed a railroad connection, or at the best, in a roundabout way, entailing great delay and almost prohibitive expense. Electric service has also made next-door neighbors of communities between which, before its establishment, even wagon communication was not satisfactory or feasible, so that the electric service may justly be regarded as the chief factor in suburban progress, though not yet a decade old.



GEO. W. PARKER.

To the lay mind, the express and parcel business of the electric line or system would appear to be an additional and profitable use of the franchise, involving no additional expense beyond suitable rolling stock, and the necessary train crew; but my experience has been that the operating expense tends to become greater than that of the passenger service, for the latter calls for no local station or agents, the company assuming no responsibility before the passenger has been sighted and after he alights, while it does become an insurer of freight or express from the moment of the giving of a receipt until it has taken one, thus necessitating a salaried agent and suitable depot facilities, stationery, etc.

In addition to the foregoing handicap to a profitable operation of the express service, I find myself confronted, in Detroit, by an ordinance which prohibits the use of trailers, and worse still, which levies a tax of one dollar per car per round trip, regardless whether the car is empty or loaded. This tax is a radical departure from the good old days, when the town or its public spirited citizens gladly raised a bonus to encourage a railroad connection, and then considered themselves highly favored.

The management of a system should show a proper appreciation of the importance of the express department, and its bearing on the continued and increasing prosperity of the system, in the building up of an interurban patronage, for it seems a necessary conclusion that the out-of-town dwellers will avail themselves of the mail-order and telephone facilities of the large city stores

because of the convenient and speedy electric express car delivery to their doors, and the habit once formed of sending their shipments or orders via the electric express car must eventually result in more frequent trips on passenger cars for personal and wider selections of their requirements.

But it must not be assumed that all branches of the system, or even all towns and villages on a branch, warrant the establishment of an electric express service. The population, situation, products and future of each individual place, and the competition of existing steam roads, if any; also the old established express companies, must be carefully weighed, or that terrible ledger must be faced at the end of the year.

To secure and hold the favor of the public I have found it necessary to insist upon and maintain high-class service, which means all the little details of careful handling, prompt transit and courteous treatment. This naturally calls for the co-operation of the entire management, especially in the operating department, and the personal attention of the general express agent, and his assistant, at all hours, in all kinds of weather, and the ability to avert disaster when least expected. But he must not at any time neglect his office, to which all matters pertaining to the handling of express should be referred, and from which all instructions as to rates, claims, complaints, etc., should issue. The best results can be only obtained by the employment of a traveling express agent, whose special duties should be the soliciting of business and securing of routing orders from consignees on shippers, which routing orders are instructions to shippers to forward all shipments in connection with the electric express.

The traveling express agent should have an open ear for all complaints, diplomacy, and a knack of handling people so he can always retain their friendship. In addition to the above, the traveling express agent should have the oversight of the local agents at the various points, who are usually subject to frequent lapses by reason of inexperience. He should, moreover, be capable of acting as trainmaster in the proper distribution of rolling stock, especially in case his road or system should be so unfortunate as to be in the vicinity of the sugar-beet business, or in close proximity to freight of that character.

Where the system includes leased or other lines, in addition to its own, a central freight or express depot and a joint agent are absolutely necessary as a measure of economy and the proper handling of the business. At Detroit, the most important thing to contend with has been the expense of handling, which prior to the consolidation of the electric lines was cared for through three separate depots. For instance, express from the Rapid Railway system was handled through one depot; that from the Detroit & Pontiac, Detroit & Wyandotte, Detroit & Northwestern and the Detroit, Rochester, Romeo & Lake Orion roads through another depot, and that express for the Detroit, Ypsilanti, Ann Arbor & Jackson Railway through yet another. This entailed an expense for each depot of an agent or staff, which till only recently has been changed and the stations consolidated in one large joint depot, now located on the corner of Fifth and Congress Sts., in close proximity to depots of steam and navigation companies, thus also decreasing cartage expense where interchange is necessary.

The building is 45 by 195 ft. On one side is the team track or driveway, where freight is received and delivered. The illustrations give a fair idea of the traffic handled. On the east side of the shed there are double tracks with accommodations for four cars on each track, with ample room for switching. The interior

of the shed is clear of all posts, thus giving ample floor space necessary for prompt receiving, sorting and loading the express and freight. There is also cold storage for the protection of perishable goods during the summer months.

The joint express agent who would have charge of a depot of this kind must of necessity be an experienced railroad man, also an accountant of no mean ability, as the duties covered are manifold, from the handling of a truck on a punch, in the depot, to the settlement of his station accounts, which latter job becomes complicated at times from various reasons, such as change in rates, errors of agents, careless checking and handling of freight, etc.

It may be asked to what class of freight or express should an electric service be confined? In this part of the country, the electric express service may be said to have its origin in the transportation of milk, which was originally handled in the small compartment on passenger cars, reserved for baggage, but which has now grown to such proportions as to tax daily the capacity of entire cars.

29

No. 3446

No. 3446

VOID IF DETACHED
Form No. 10
Detroit United Railway
Good for transportation of
one car milk, said to con-
tain 10 gals. or less.

Shipper must fill out this ticket
in full before forwarding can

Northville 10

MILK TAG.

In the handling of milk our experience has been that the best results are obtained by the issuing of milk tickets, which are consecutively numbered, and taken into account through the cashier's office. These tickets resemble our ordinary shipping tag; they are perforated in the middle, the lower portion being detached by the conductor carrying the cans when filled, and the other portion being left on to pass the empty cans on return trip. This ticket, as per sample, you will notice, shows the point of shipment, shipper, destination and to whom consigned; this information being on both portions of ticket, eliminates the possibility of errors in delivery of cans when either filled or empty. These milk tickets are charged for at so much per ticket, according to distance the milk is to be carried, and by their use assures protection from loss through bad accounts.

It may be added that the conductor when accepting shipments of milk, notes carefully that there is a ticket for each can. After the shipment is loaded, he detaches the lower portion and carries same to the auditor at the end of his trip with regular way-bill showing full particulars of cans loaded, ticket numbers, consignees' names, etc., who in turn checks over the number of tickets enclosed and if any irregularities, promptly advises the general express agent, who takes the matter up with the conductor for explanation.

When delivering the full cans on arrival at destination, the upper portion of ticket is left on the full can, which portion must be on the can when it is to be returned for refilling, otherwise the conductor should not accept it until a ticket is provided. These instructions are necessary on the return empties, otherwise there is possibility of your service being imposed upon, through unscrupulous milk dealers sending their milk in by wagon or stage road, and leaving your line to carry the empties back free of charge.

The question may be asked, what is done with the last portion of the ticket? This portion is left on the can until the conductor starts to distribute cans along the line, when this portion is detached and also returned to auditor at the end of trip, and handled in the same manner as the first portion.

Dipping a good deal of territory that has hitherto had no railroad connection has recently thrust upon the electric express for the first time a class of freight that ought not to be carried in equipment of that character and which cannot be dis-

criminated against, the rates charged being governed by railroad tariffs for similar class of freight are in some cases insufficient, and therefore unsatisfactory from the revenue standpoint.

It may be interesting to know how the express is handled on the system in this vicinity, so the following is a brief outline. For use in this service a full set of blanks has been designed and prepared with care. The shipper fills in the receipt, showing the date, from whom received, to whom consigned, destination and a complete list of articles making up the shipment. This receipt is made in duplicate, a carbon copy being taken. The Detroit United Railway receives the property "subject to the conditions on the back hereof," which are in the form usually adopted by common carriers.

When express is received at the depot, it is checked in on this shipping bill, or that part of the form marked "Duplicate." If the shipment agrees with the shipping bill, the original is receipted by the checker signing agent's name with the checker's initials. This receipt is retained by the shipper, and the duplicate is kept by the company and the shipment rechecked into car, thus giving the company a double check on each shipment. Any exceptions as to shipment being in bad order, etc., are noted on these shipping bills, thus enabling the company in case of claim to know the exact condition the goods were in when received and forwarded.

After goods have been received and loaded into express cars, they are then billed out on a way-bill, this form being printed in three sizes—quarter sheet, half sheet and full sheet—the latter being 12½x16 inches. The way-bill is the same as express and railroad way-bills, forwarding point, destination, date of shipment and way bill number showing in proper places. The way-bill numbers are arrived at by commencing with number one the first of each month, and numbering them consecutively until the end of the month. This way-bill number is used as reference in all correspondence relating to any particular matter coming up in regard to any shipment covered by this particular way-bill. The facts shown on the way-bill are designated by the headings of the various columns, which includes consignor, consignee, number of packages, description, weight, rate, charges, advances, amount prepaid and total to collect.

The rate is taken from the company's regular express tariff, which is governed by the rules of the official classification.

Form 158.

201

Detroit United Railway.

Pro. No.

Car No. Int.

WAY-BILL of Express Forwarded from To 190

Conductor Time Via W. B. No.

Consignor	Consignee and Destination	No. Pks.	Description of Express	Weight	Rate	Charges	Advances	Prepaid	Total to Collect
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WAY BILL.

The rates on the different commodities handled are according to the value, dimensions and weight of each article. For example, shipments of glassware, furniture or any articles liable to damage from leakage are given a much higher rating than articles that are packed in such a manner as to occupy less space in the express car and which will weigh more than the articles first mentioned.

After this way bill is complete, it is then copied in a tissue book, one extra tissue being taken. These extra copies are forwarded to the auditor daily, who checks the weights, rates and extensions, and files the tissue copy for future reference.

On arrival of the shipment at its destination the receiving agent checks the various shipments billed to his station from the original way bill in thing overplons, if there be any, as to condition of express when received from car. In case of there being any articles damaged, over or short, the receiving agent makes report of the fact on a special form, filling in the information

called for in the various blank spaces. This form is made out in duplicate, the original being sent to the forwarding agent for his report, on that portion of this form designated "Forwarding agent answer following questions." This enables the forwarding agent to advise the receiving agent to correct, in case of error in billing, and what course to pursue in case of overs and shorts. This form is 9x8 1/4 in. and is shown reduced in Fig. 1.

The duplicate of this form is sent to the general express and passenger agents' office, where it is recorded in what is known as "The Over, Short and Damaged Register." These records remain open until the matter has been finally settled, thereby making it impossible for either the forwarding or receiving agent to allow the matter to drag along without receiving the prompt attention due such matters.

The way-bill is then entered by receiving agent in his "Express Received" book. The pages of this book are 16 1/2 x 22 in., and the column headings are shown in Fig. 2.

The keeping of this book correctly is the key to what is known as a Station Balance, as the various amounts shown under the headings of "Weight, Pre-Paid, Express, Advance Charges, Total of Way-Bill," etc., must agree with the corresponding columns of the "Abstract of Way-Bills Received." This form is, as its name designates, an abstract or summary of the totals of all way-bills received, and is made up for periods ending 7th, 14th, 21st and last of each month, and a like abstract of "Way-Bills Forwarded" is made up on a similar form.

Form 184

EXPRESS ORDER
Detroit United Railway.

2523

190

Received from

By DETROIT UNITED RAILWAY, the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned and destined as indicated below, which said Company agrees to carry to the said destination, if on its road, otherwise to deliver to another carrier on the route to said destination

Marks, Consignees and Destination	DESCRIPTION OF ARTICLES	WEIGHT Subject to Correction

Agent.

Form 181

EXPRESS RECEIPT
Detroit United Railway.

190

The DETROIT UNITED RAILWAY, will receive and carry the property marked, consigned and destined as indicated below to the said destination, if on its road, otherwise will deliver to another carrier on the route to said destination.

Marks, Consignees and Destination	DESCRIPTION OF ARTICLES	WEIGHT Subject to Correction

Consignor.

SHIPPING RECEIPT.

The abstracts of way-bills forwarded is compiled from the tissue book copies and shows Date, Way-Bill No., Weight, Freight, Advance, Prepaid.

After the particulars have been entered in the Express Received book an "Expense Bill," shown reduced in Fig. 3 (original size 9x6 in.), is made out, a carbon copy being taken. When the shipment is delivered, the consignee's receipt is taken on the duplicate and the agent receipts for charges on the original. Collections are made on delivery unless the consignee has a regularly authorized ledger account.

When money has been collected by the receiving agent, he makes an entry of it in his cash book. Agents make daily remit-

ances of money collected, holding in the cash drawer only a small amount for change.

At designated times a balance sheet, form No. 166, is made out by the agent; the particulars of the debits and credits are shown opposite the various numbers on this sheet, and are arrived at from the totals of the different forms and books already described.

Form 77

Detroit United Railway.
RAPID RAILWAY

2817

190

Until Further Advised Please Ship All My Orders Via ELECTRIC EXPRESS

ROUTE ORDER SIGNED BY CONSIGNEE.

(Original 4 x 6 in.)

Form No. 166 is a double sheet 13 1/2 x 8 1/4 in. when folded once. The balance sheet is on the first page. The second and third pages show statements of express on hand forwarded and received, arranged under the heads in Figs. 4 and 5. On the fourth page is a statement of the remittances for the month.

This system for the express service on electric lines radiating from Detroit was adopted with a view to handling express and all accounts relating thereto in a simple, practical and systematic manner as possible.

Baggage is no longer carried in and out of Detroit on regular passenger cars, but follows on the next express car at a uniform rate of 25 cents per piece not exceeding 150 lbs. Where the actual weight exceeds the latter-mentioned minimum, the first-class rate named in the express tariff is applied from and to the point to which baggage is going at actual weight. This arrangement was necessary on account of the additional expense involved in the handling of baggage and the low passenger rates in effect which would not allow of a free checking system.

It is still an open question whether compartment cars could not handle both baggage and passengers during certain light hours of the day, thus giving baggage early preference and more suitable care.

Under our present arrangement of checking baggage, a passenger can have his baggage checked from any point on our system at which we have agents, which arrangement, if the passenger is coming to Detroit, includes delivery to all hotels, steamboat landings, railroad depots and residences, is working out admirably in connection with the Detroit Omnibus Line. It might be added that this company (D. O. L. Co.) has representatives to meet all trains and boats, so that the passenger coming to Detroit can by turning over his checks to one of these representatives be relieved of all responsibility in connection with his baggage in case he desires to avail himself of the frequent electric service.

There is a future in the parcel feature of the business, if properly conducted, which problem we have not yet been able to solve to our satisfaction, owing in a measure to the peculiar condition existing at this point. Under our present arrangement we are accepting parcels weighing from one to fifty pounds for a minimum charge of 15 cents going to points within a radius of forty miles, and a charge of 25 cents when going to points beyond forty miles. This charge, it must be understood, is for the electric express service only, with a slight additional charge for cartage in case the consignee wishes package delivered.

[The other blanks referred to may be found in the article by Mr. Parker in the "Review" for Jan. 15, 1902, page 25.]

DISCUSSION.

The President: In considering the subjects for this meeting your Executive Committee went over the question very thoroughly and took up some matters that had been presented to them by correspondents, as questions some of the members would like to have brought up, being important new questions in connection with interurban electric operation, and this is one of the questions. Our Detroit friends consented to take this matter up from their standpoint, they probably having had the largest express and freight service in connection with interurban operation. They have given us a very valuable paper and I should like to hear it discussed or any questions asked that may enlighten the meeting with regard to this class of service.

I would inquire of the author of the paper if the original franchise contemplated the hauling of freight through the streets of Detroit, and if not, what conditions did the city impose when it granted this right.

Mr. Parker: The original franchise, I believe, did not allow the Detroit United Railway to carry freight through the streets of the city, but an ordinance was passed granting that privilege. The original franchise did not specify anything, if I remember correctly, about carrying freight, but the electric express and freight system was started, and while it was not satisfactory at the beginning owing to various conditions, the city council passed an ordinance prohibiting us from loading or unloading on the streets, compelling us to put up a depot of our own, and still further taxing us \$1.00 per car per round trip, whether the car was loaded or empty.

Mr. C. W. Wason, Cleveland: I would ask the gentleman, from the moneys received, whether the business increases month by month?

Mr. Parker: It is only a year ago this month, as I remember, when the express service was started. The business shows some increase.

Mr. Connette: There is another question which suggests itself to my mind which, perhaps, would be impertinent, but the gentleman can use his discretion whether or not he answers it. I wish to know if he keeps his accounts so that he can tell what proportion of the income from the operation of the freight and express service it costs to operate it?

Mr. Parker: As a matter of policy, I prefer not to answer that question.

Mr. Crafts: I would ask Mr. Parker if he has noticed any material increase in the business of the passenger service due to carrying packages and light express matter.

Mr. Parker: Yes, there is; it always has a tendency to increase the business.

Mr. Crafts: You think it gives you a marked advantage in carrying the package business, that is, that you gain in your passenger service?

Mr. Parker: Yes, sir.

The President: I gave the president and general manager of the Express company in New York City in the annexed district, and expected he would be here, with some statistics which would answer many questions regarding this subject, but some local business conditions have made it impossible for him to come. Under the conditions of operation that we have there the company has nothing to do with the express service. The express company has a contract with the street railway company for operating on its tracks, and the business is only limited by the facilities which the express company have been able to establish at the present time. In other words, it has all the time at least 30 per cent more business offered it than it has facilities to take care of. As fast as the facilities increased the business has increased in larger ratio. As far as the question of the division as between the actual cost and receipts, based upon percent gain, in the original operation of the system, which means, as you know, the operation of 15 or 20 cars for the first six months to establish the business, the average of the whole would more than pay for the operation of the cars and the interest on the investment is paid by the express company, so that answers your question as far as we are concerned. There has been no expense entailed on our company in the operation of this service even in its infancy. What the losses of the express

company, that is not so easy for me to answer.

The secretary read the following letter from Mr. Farmer: "Will you kindly announce that there will be a meeting of all master mechanics at the Detroit United Power Station A at 3 p. m. Thursday. This meeting is called for the purpose of organizing an association of master mechanics of the different street railway companies."

Mr. Beggs: May I say a word in connection with the announcement which has just been made? I presume this invitation includes the superintendents of maintenance of way and all others connected with the mechanical department as well as master mechanics. I desire to impress upon the presidents and general managers who may be present, the importance of their urging on their mechanical staff an attendance as requested by Mr. Farmer. I think there are some here who recollect that at the last two meetings I have suggested the very thing which is contemplated in this communication, a matter which is of great importance to our industries, and that is an organization of the master mechanics of the various companies. We all know how important it has been in steam railroad practice. We have had an illustration ourselves of what has been accomplished by the Accountants' Association, those in charge of that branch of our business. I believe that even greater good will accrue to the several companies by the organization and the annual getting together of those charged with the design, with the construction, and with the maintenance of the mechanical elements entering into our business. I heartily hope that this matter will be urged and that hereafter we may have an organization as enthusiastic and as effective as has been the Accountants' Association. It would be the best standardizing committee that we could have, Mr. President and gentlemen.

The President: Following out the lines of Mr. Beggs's suggestion I want to say something about what is being done in steam railroad work in connection with associations of this character. I am and have been for four years president of the New York Railroad Club, which takes in all of the transportation, mechanical and operating men of the whole eastern section of the country, the middle states, and in fact, portions of the entire country. That club has a membership of over 1,200. The average attendance of each monthly meeting last year was over 200 and went as high in some instances as 450, men coming from Chicago, St. Louis, Boston, and numerous points in the east to attend these meetings for the purpose of getting what good there was in them. The discussions which we have had during the past year have had an important influence in connection with transportation and mechanical problems. And the importance of these meetings to the members in their work has been emphasized that there is scarcely a meeting of the association when the president doesn't have to stop the discussion so as to give the members an opportunity for lunch and so that they may catch the late trains for their homes.

As far as your association work is concerned, I have already said it—I certainly have done so in connection with the New York State Association—and it would certainly be true of this association that the young men who are connected with the various street railways in the country cannot overestimate the value of this association to them in their work and bringing themselves into prominence. I have seen in the New York Railroad Club a number of men who have secured prominent positions through a paper read on the floor of that club. The paper was read before the men who represented a great railroad system. Any young man who reads a paper at one of these meetings, which shows intelligence and ability to analyze and good judgment, is bringing himself before every man who is connected with prominent street railroad systems of the United States. I take this opportunity, as President of the Association this year, to call the special things to your attention, in the hope of creating an interest in the minds of young men in this particular work.

The fact of my getting up on this floor and reading a paper, or Mr. Beggs reading a paper, or Mr. Dickinson reading a paper, men who have established reputations in the railroad world, is not of as particular value to them, except as it may help you; but in the case of any young man connected in any branch of the work it gives him an opportunity, and brings him prominently

before the men who are at the head of the various companies. In my 25 years of railroad experience I have been able to place a great many men in railroad positions for steam and street railroads, and the first knowledge I had of the capabilities or possibilities of these men was in listening to them before the American Society of Railroad Superintendents, or the General Time Association, which is now known as the American Railway Association, or the New York Railway Club, or the American Street Railway Association or the New York State Street Railway Association. You may work earnestly in your own city, and feel that you are somebody there and attracting some attention, but the United States is large and there is a good deal going on in it. It is only by bringing yourself prominently before a large association that the young men may hope to gain a reputation among the various managers of the country, at least in the majority of cases.

I apologize for taking so much time, but in work of this kind I either go into it to do something, or want to get out of it. I am glad to say that the two sessions that we have held here have been very much above the average of the sessions of this association, both in attendance and in interest. I hope that this association will go forward and occupy the place in the electrical railway world to which it should attain. If it does not go ahead and take its proper place I for one do not want to stay in it. I have not the time and am too much pressed to give my time to an institution unless it is being pushed up hill by its members. Adjourned.

KNELL AIR BRAKE.

The Knell Air Brake Co. is located at space 23 near the center of the main floor. Its exhibit this year comprises a car truck completely equipped with the axle driven air brake system and is in full operation. The company has this year one of the most elaborate exhibits and is showing the various styles of axle driven compressors adapted for all styles of trucks. The elevated style compressor is on exhibition this year for the first time and has already proved a great success. The elevated style compressor is especially adapted for maximum traction trucks and has been used for nearly two years on the Coney Island & Brooklyn road. The present master mechanic of that road highly commends the merits of the Knell system. The company will distribute on Thursday and Friday flowers as souvenirs. This has been the custom of the company for the past few years and has always been appreciated by the members of the Association, and particularly by the ladies in attendance. The company is represented by Mr. A. H. Metzelaar, general manager; Joel C. Hopkins, secretary; A. C. Wisner and others. The company hope to see all street railway members at its booth, where it is distributing its new catalogue descriptive of the Knell air brake system.

ATLAS RAILWAY SUPPLY CO.

The interests of the Atlas rail joints, tie plates and paints are being looked after by Mr. J. G. McMichael, R. B. Kent and C. D. Porterfield. Mr. McMichael is well satisfied with the prospects of a fine convention, and is especially gratified with the words of approval that he hears on all sides concerning the good qualities of the Atlas supplies. The Atlas joint has been adopted as standard by over 50 of the leading steam and electric railroads in America, and is used extensively abroad. The paints made by the Atlas Co. are particularly adapted to street railroad work for priming and surfacing of cars, the primer taking the place of paste or oil, wood fillers, and is to be applied on the bare wood without any other preparation. The Atlas surfacer takes the place of oil and lead surfacers and under colors. These products reduce the time required to paint a car several days and lessen the cost per car from \$15 to \$20. The company is prepared to guarantee its primer and surfacer, which can be painted over ordinary cracked old work provided the old paint is on firm and solid, without burning the old paint off. They fill all old cracks in the work, no matter how badly the surface has been damaged. A passenger car 60 to 65 ft. long will require four gallons—that is, one gallon of primer and three gallons of surfacer; or a car

20 ft. long with vestibule will require about two gallons, including primer and surfacer, one prime coat and three surfacer coats.

THE CRANE CO., CHICAGO.

The chief features of the Crane exhibit this year consist of samples of heavy piping with flanges formed according to the new process recently developed by this company by means of which the pipe is rolled into the flange, taking the place of the older methods of shrinking flanges on to pipe. The sample that is exhibited has been put under test of 1,100 lbs. without a gasket being placed on the connection of pipe to flange to determine if a leak should be discovered. At this pressure no leak developed.

The other feature in connection with the valves is the new method of placing the by-pass valve. Formerly these by-pass valves were put on with gause necks. Now the valve is self-contained and can be easily replaced, making a much simpler device. The company's new catalog, just issued, illustrates all these features and can be had by asking or writing for same.

Capt. G. A. Hurd, of the home office, is looking after the interests of the company. Former members of the association will remember Capt. Hurd as having been with the Second U. S. Vol. Engineers during the Spanish-American war.

CHRISTENSEN ENGINEERING CO.

The Christensen Engineering Co., Milwaukee, has a very interesting exhibit, including a straight air-brake school equipment, and an automatic air brake multiple unit equipment, both of which were in operation. Also a Christensen portable motor driven air compressor in operation by means of a hook connection to a trolley wire.

The company also exhibits some of its new electrical machinery, including a 250-k. w. 3-phase 2200 volt alternator; a 30 h. p. 500-volt open style motor, and a 4 h. p. 500-volt enclosed style motor.

The company distributed very attractive booklets on its air-brake equipments and electrical machinery.

The Christensen Engineering Co.'s interests were cared for by the following representatives: F. C. Randall, manager sales department, New York; J. T. Cunningham, eastern sales agent, New York; J. J. Neff, engineer, New York; J. F. Dixon, Jr., secretary sales department, New York; J. H. Denton, chief engineer sales department, New York; W. W. Power, Pennsylvania sales agent, Philadelphia; Wm. Gobel, Pennsylvania engineer, Philadelphia; H. N. Ransom, sales agent, Cleveland; J. J. Riley, Cleveland; J. E. Eldred, Jr., sales agent, Chicago; C. P. Tolman, assistant chief engineer sales department, Chicago; S. A. Christensen, consulting engineer, Milwaukee; Chas. D. Knight, mechanical engineer, Milwaukee; W. L. Waters, electrical engineer, Milwaukee; J. C. James, Milwaukee; W. J. Richards, Milwaukee, F. L. Hutchinson, advertising manager, Milwaukee.

AMERICAN STEEL & WIRE CO.

One of the most attractive booths is that of the American Steel & Wire Co., with its display of trolley wire, conduits, cables, fencing for right of way, and rail bonds. The company is represented by C. S. Knight, Jr., F. A. Keyes, T. A. Sheppard, George Chandler, H. T. Pratt, W. H. VanSicklen and W. C. Bogue. The brightest feature of the exhibit, and, in fact, the brightest feature of the entire exhibition is the large electric sign over the entrance to the booth. Over 350 incandescent lamps were taken to spell out the company's name in full. The various small samples are artistically displayed on bulletin boards at the back of the space. The company's souvenir this year consists of a very neat little pocketlock.

One of the most jovial attendants at the convention is M. W. Conway, of Brooklyn, N. Y., who looks after the interests of the New York Switch & Crossing Co., of Hoboken, N. J., the Catskill R. R., and several other business enterprises with which he is actively identified. He came to town on the "Detroit special" that arrived Tuesday morning.

THE OHIO BRASS CO. EXHIBIT.

With customary progressiveness the Ohio Brass Co. presents this year an exhibit which is a radical departure from any heretofore attempted by the company, and which is, in fact, one of the most unique and attractive exhibits at the convention. The exhibit is located in Space No. 39 on the main aisle of the building, and fronts on three aisles. In lieu of a railing, the space is surrounded by a number of third rail insulators which support a standard section of steel rail. These rails are bonded with various types of the well-known "All Wire" rail bond made by the company, and well illustrate the application of the bond. A very complete and varied line of overhead line material is shown, including a number of track bonding devices, and various motor and car appliances, such as are manufactured by the company. These are very attractively displayed on five stands of unique design, which permit of a ready inspection of the different articles.

Among the larger products of the company might be mentioned a variety of different styles of flexible pole brackets, including the well-known "Richmond" and "Detroit" types, a "Monarch" track cleaner, and an emergency hose bridge. A great profusion of "All Wire" rail bonds is displayed, in all the various types and forms made by the company. The company has arranged to distribute among both the lady and gentlemen visitors, a number of attractive and useful souvenirs.

An office is situated at one end of the space, and enclosed with palms and screens.

Those in attendance at the exhibit are: F. B. Black, president; C. K. Kling, secretary; G. A. Harwood, general agent; G. A. Mead, electrical engineer; A. B. Edes, H. C. Schwable and C. N. Manfred, of the Mansfield office, and the following representatives of the company: A. L. Wilkinson, of Mansfield, O.; N. M. Garland, manager New York office; Burt Gellatly, manager Pittsburg office; M. A. Berg, J. W. Porter and E. R. Mason, of the Chicago office; Otto W. Uthoff, manager St. Louis office; J. C. Warren, jr., manager Norfolk office, and E. D. McCormack, of the Canadian General Electric Co., Limited, of Toronto, the Canadian representative of the company.



POLES AND TIES.

The view of the pole yard on this page was taken in the pole and lumber yards of the Maltby Lumber Co., of Bay City, Mich. The yards are situated near Detroit on the River Rouge, and from here are shipped the large orders for poles from the West-



LOGS IN YARD OF MALTBY LUMBER CO.

ern Union Telegraph Co., the American Telegraph & Telephone Co., and from other telephone companies, as well as from many electric railway companies.

Although the boats' down unloading might give the idea that all the pole come by water that is not the fact as a greater

portion come in by rail. At one time last winter there were 75 cars on tracks at the yards waiting to be unloaded. The photograph of the steamer "Emerald" was taken on her arrival from her sixth trip. She has made two trips since then, and the steamer "Seattle," not shown, has made one.

Next adjoining this yard are the yards of the Western Union Telegraph Co., in which are stored at all times from 75,000 to 85,000 telegraph poles. The two yards together probably constitute by far the largest stock of poles anywhere in the United States.



HEADQUARTERS FOR HIGH GRADE VARNISHES.

The illustration herewith shows the handsome and dignified building recently erected by Messrs. Berry Brothers, Limited, the varnish manufacturers of Detroit, to be used by them as an office. The term office seems inadequate in the present case, however, as the various departments and large clerical staff handling not only the Detroit business, but that of the many branches located in the principal cities of the United States entitle the structure to be called the administration building of the firm which it is in reality.



OFFICE OF BERRY BROTHERS, LTD.

The building is a type of the modern French Renaissance, and all its details, both exterior and interior, have been dominated by this idea. The wall field is of dark red pressed brick laid up in English cross bond, the main cornice, main entrance and exterior trimmings generally being of gray terra cotta. The roof is of red terra cotta tile. The interior trim is of antique finished quarter sawed oak, the finely developed grain of the wood bearing eloquent tribute to Berry Brothers' celebrated hard oil finish. The ceiling is supported by massive columns of Florentine marble with bronze capitals and Verde antique marble bases. The columns carry ornamental stucco cornices of handsome fluted design with which the entire ceiling is paneled. The main office floors are of quarter sawed white oak laid in herringbone pattern in pieces 12 in. long, and, as finished with Berry Brothers' liquid granite, present a very handsome appearance.

The large and finely appointed private offices, of which there are six, are divided by wide panels built up of veneers with moulded cornices, the spaces between them and the ceiling being filled with polished plate glass set in antique brass. The private offices have also antique oak mantels and fireplaces of Verde antique marble, and bronze.

An extensive system of fire proof vaults is fitted up with the latest devices in steel shelves, lockers, etc., and the entire building is heated by hot water with both direct and indirect radiation with the fan system for ventilation.

The dimensions of the building are 95x115 ft.; no striking effects are aimed at, the building being a perfect specimen of the restful and conservative type of architecture, and exciting admiration for the dignified symmetry of its lines and proportions.

SIXTH REGULAR ANNUAL MEETING STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

(Continued from page 670.)

REPORT OF THE COMMITTEE ON A STANDARD FORM OF REPORT FOR ELECTRIC RAILWAYS.

W. F. Ham, Comptroller Washington Railway and Electric Co.;
E. M. White, Cashier Hartford Street Railway Co.; C. N. Duffy,
Secretary Chicago City Ry.; Committee.



REPORT FOR ELECTRIC RAILWAYS.

To correctly understand the objects sought to be accomplished by this committee, it is necessary to review briefly the circumstances leading to its appointment. As stated in the constitution of this Association, one of its objects is to promote the adoption of a uniform system of accounts. At its first meeting held in Cleveland, Ohio, March, 1897, a committee was appointed to submit a report on a standard system of street railway accounting. With the work of that committee, known as the Standardization Committee, you are all familiar, and it is only necessary to say that the classifications reported by them were adopted by this Association as standard and are now in general use throughout the country.

We should, however, speak more particularly of the relations existing between this Association and the National Association of Railroad Commissioners. The Standardization Committee had two objects.

First. To devise a standard system of street railway accounting, covering the classification of construction and equipment accounts, classification of operating expense accounts and forms of monthly and annual reports; and

Second. To promote in every way possible the adoption and use of the above classifications and forms.

From the first they realized the desirability of working in harmony with such public officials as exercise supervision over the accounts of street railways, with a view to having the classifications of this Association approved by them and used in the reports of street railway companies.

Learning that the National Convention of Railroad Commissioners had appointed a committee to prepare a standard system of street railway accounts, the Standardization Committee put itself in touch with them and after several conferences, the system prepared by the Standardization Committee and adopted by this Association was approved and recommended for use by the National Convention of Railroad Commissioners held at Denver, Col., August, 1899.

You will understand that this approval by the National Convention of Railroad Commissioners did not necessarily mean its adoption and use in any individual State. To accomplish this result required action by the several State Boards of Railway Commissioners. Up to the present, the only states that prescribe our system are New York and Connecticut, so that much remains to be done by this Association and its Standardization Committee to bring into line the other states that exercise supervision over the accounts of street railway companies.

Our position, however, was much strengthened by the action of the Denver Convention and we were invited to send representatives to the Convention of Railroad Commissioners held in Milwaukee in May, 1900, and again to their convention held in San Francisco in June, 1901. At the latter convention, a constitution was adopted in which it was provided that the Street Railway Accountants' Association should be made an honorary member of their Association and should be represented at each convention by three delegates, thereby giving us formal and permanent recognition.

At the San Francisco Convention, the following resolution was adopted: "That a special committee of three be appointed by the Chair to prepare a form for reports of electric railroads and that said committee be authorized to act in co-operation with a similar committee to be appointed by the President of the Street Railway Accountants' Association of America, and to invite the assistance of any other person possessing expert knowledge of the subject and that they make report of the result of their proceedings to the next annual convention of this body."

In accordance with the above resolution a committee was appointed consisting of Hon. Lavant M. Read, of Vermont; Hon. George W. Bishop, of Massachusetts; and Hon. Ashley W. Cole, of New York. The President of this Association was informed of the appointment of the above committee and was asked to appoint a committee to confer with them in the preparation of a report. Our committee met a majority of the committee of the Association of Railroad Commissioners in New York in January, 1902, but owing to the severe illness of Judge Read, the chairman of their committee, and the short time intervening before the next convention to be held in Charleston, S. C., in February, their committee decided to allow the matter to go over for another year.

Since the Charleston convention, the president of the National Association of Railroad Commissioners, Hon. Benjamin F. Chadbourne, of Maine, communicated with the president of this Association, suggesting that our committee submit a report to our Association at the present convention, and that this report be the subject of conference between their committee and our committee, the result of such conference to be reported to their next convention to be held in Portland, Maine, July, 1903.

From the foregoing, you will correctly understand why this committee was appointed and what it hopes to accomplish. As it has been the aim of the Standardization Committee to secure the adoption of a standard system, so it is the aim of this committee to assist the National Association of Railroad Commissioners in their efforts to secure uniformity in the form of reports by street railway companies to state boards or other bodies exercising supervision over their accounts. It is needless to say that such a result will be of the greatest benefit. To the public, it will be the culmination of our efforts in the direction of standardization of accounts.

The Standardization Committee confined itself to a classification of construction and equipment accounts, classification of operating expense accounts, and forms of monthly and annual reports.

This committee has gone somewhat further by preparing a Comparative Balance Sheet, with accompanying schedules; a form for description of road and equipment; a form for mileage traffic and miscellaneous statistics; and a form for historical and general information. We have eliminated certain features of the usual report required by railway commissioners, which have been outgrown in the development of the business. We believe the report submitted contains all essential information and gives to the public a complete and intelligible report in a simple and concise form.

This committee suggests no change in the classification of construction and equipment accounts.

In the classification of operating expense accounts, we suggest the following minor changes:

Account No. 19: To read "Wages of Miscellaneous Car Service Employees" instead of "Wages of Other Car Service Employees."

Account No. 22a: "Hired Equipment." The insertion of this

account to cover rental of cars, electric equipment of cars, and other equipment.

Account No. 20: To read "Stores Expenses" instead of "Store-room Expenses."

Account No. 35: To read "Miscellaneous Legal Expenses" instead of "Other Legal Expenses."

In the form of income account, we suggest changes of more importance.

Gross Earnings from Operation are separated into two divisions:

First: Car Earnings, to include all earnings derived from the operation of cars, and

Second: Miscellaneous Earnings, to include all earnings resulting from the operation of the property not included in car earnings.

Income from Advertising, Rent of Land and Buildings, and Rent of Tracks and Terminals, previously included under "Income from Other Sources," are now treated as "Miscellaneous Earnings."

A new account "Income from Rent of Equipment" is also treated as "Miscellaneous Earnings."

Sale of Power, previously classified as "Miscellaneous Income from Other Sources," is now treated as "Miscellaneous Earnings." Under the former classification, the amount shown as "Miscellaneous Income from Other Sources" was the net amount after the cost of the production of the power sold had been deducted. In the present report, the gross amount received from the sale of power is shown as Miscellaneous Earnings and the cost of the production of this power is included in operating expenses.

With regard to "Rent of Land and Buildings" exception is made of Income from Rent of Real Estate purchased or conducted as an outside investment, and with regard to "Rent of Tracks and Terminals," exception is made of Income from Leased Lines or Terminals, the operation of which has been temporarily or permanently abandoned by the lessor.

Your committee have not made the changes in transferring the above accounts from "Income from Other Sources" to "Miscellaneous Earnings" without a careful consideration of the advantages and disadvantages of so doing. They realize the undesirability of making changes in the forms adopted by this Association as standard and would not recommend changes of consequence were they not fully convinced that the former arrangement was illogical and improper from a correct accounting and common-sense standpoint.

The gross earnings from the operation of a railroad property as surely include income from advertising in its cars, rents from tracks, terminals, land, buildings and equipment, and income from sale of power as the earnings from passengers, freight, mail, etc.

The definition of earnings is "money or other compensation to which one has a claim for services rendered." Surely a service is rendered when we allow others to use the space in our cars for advertising privileges, to operate their cars over our tracks, to use our land, buildings, cars or other equipment, to utilize our power for lighting, heating or other purposes. If these things are not earnings, nothing can be classed as earnings. That they are different from the earnings derived from the operation of the cars, we admit, and have for that reason made two divisions of earnings as above stated, namely, Car Earnings and Miscellaneous Earnings.

Another reason why these items should be treated as earnings from operation is that the expense of maintenance of track, terminals, buildings and equipment is naturally included in operating expenses, and if excluded, the total cost of operation is not shown. This is also true of receipts from sale of power, where in addition, the actual cost of the production of the power sold can not be determined with any degree of accuracy.

The reason for excluding from earnings from operation the rents received from property purchased or conducted as an outside investment is manifest, as we are dealing with the operation of a railroad property. Likewise, the reason for excluding from earnings the income from leased lines or terminals, the operation of which has been temporarily or permanently abandoned by the lessor is apparent, as we are dealing with earnings

from operation and that which is not operated can certainly yield no earnings from operation.

The title "Miscellaneous Income" has been substituted for "Income from Other Sources."

The title "Income from Securities Owned" has been substituted for "Interest and Dividends on Securities Owned."

The title "Gross Income less Operating Expenses" has been substituted for the title "Gross Income."

Here a word of explanation seems desirable. Your committee feel that the title "Gross Income" as used in our previous report and now in general use in street railway and steam railway accounting is radically wrong. Turn, if you will, to Webster's Dictionary and you will find the word "gross" defined, "Undiminished by deduction, entire;" yet in common use as applied to street and steam railway accounting, gross income means "Gross Earnings from Operation and other Sources with Operating Expenses Deducted." This is a manifestly improper use of the word "gross," and we have therefore in our present report used the term "Gross Income less Operating Expenses," as being the correct title in place of "Gross Income."

Taxes we have shown in four separate divisions:

1. On real and personal property.
2. On capital stock.
3. On earnings.
4. Miscellaneous.

The title "Rent of Leased Lines and Terminals" has been substituted for "Rentals of Leased Lines."

As the first deduction from net income we have placed "Reserves and Special Charges" which takes the place of "Additions and Betterments" and "Sinking Funds" in the old form.

At the foot of the Income Statement we have placed a statement of Profit and Loss adjustments during the year, which are to include all items affecting Profit and Loss which have not passed through the Income Account. In this way a complete exhibit is made for the year.

We ask your careful consideration and open criticism of the forms that follow.



FORM OF REPORT FOR ELECTRIC RAILWAYS.

To include:

1. Income Account for the year, with accompanying Schedules.
 - a. Gross earnings from Operation.
 - b. Operating expenses.
 - c. Detailed Statement of rentals of Leased Lines and Terminals.
2. Comparative General Balance Sheet, with accompanying Schedules.
 - d. Construction and Equipment.
 - e. Construction and equipment, Leased Lines.
 - f. Capital Stock and Funded Debt.
3. Description of Road and Equipment.
 1. Mileage, traffic and miscellaneous statistics.
 5. Historical and general information.

REMARKS.

GROSS EARNINGS FROM OPERATION—Divided into

First: Car Earnings, to include all earnings derived from the operation of cars.

Second: Miscellaneous Earnings, to include all earnings resulting from the operation of the property, not included in car earnings.

CAR EARNINGS: Divided into earnings from passengers (whether cash or ticket), chartered cars, freight, mail, express and other car earnings.

As an illustration of a proper charge to the last named account, might be mentioned the fixed compensation received for the transportation of letter carriers in uniform.

MISCELLANEOUS EARNINGS:

Advertising:—If a company conducts the business of selling or renting advertising space in its cars instead of leasing this privilege to others, the amount shown as "Income from Advertising" should be the net income from this source after deducting all expenses of conducting the business.

Rent of Land and Buildings: This refers to Real Estate that has been or is intended to be, used for the operation of the property, and should show the gross rent without deduction of any expenses.

Income from rent of real estate, purchased or conducted as an outside investment, in which might properly be included office buildings used in part for railway purposes should be included in "Miscellaneous Income," after deducting all taxes, insurance, water rents or rates, cost of repairs and other expenses connected with such real estate.

Rent of Tracks and Terminals: To include all compensation received for the use of tracks, terminals and bridges, the operation of which has not been abandoned by the lessor on whatever basis such compensation may be determined. It may be a fixed sum per annum or a fluctuating rental based upon the number of car miles run, passengers carried, etc.

The word "terminals" is not meant to refer to depots, car houses or other buildings at the termini of the road.

Income from leased lines or terminals, the operation of which has been temporarily or permanently abandoned by the lessor, should be included in "Miscellaneous Income."

Rent of Equipment: To include all rent received for cars and other equipment, on whatever basis such rent may be determined.

Sale of Power: To include all receipts from the sale of power, whether for heating, lighting or motive purposes.

If the company conducts a lighting as well as a railway business, this account should not include receipts from the lighting business, but the Net Income resulting from the lighting business should be included in "Miscellaneous Income." The same principle applies to any other outside business conducted by the company, including operation of parks, park resorts and similar property.

Other Miscellaneous Earnings: To include all other miscellaneous earnings not specified above.

MISCELLANEOUS INCOME:

Interest on Deposits: To include interest on current or special funds on deposit.

Income from Securities Owned: To include income from stocks, bonds or other securities owned.

Rent of Leased Lines and Terminals: To include income from leased lines or terminals, the operation of which has been temporarily or permanently abandoned by the lessor.

Other Miscellaneous Income: To include all miscellaneous income not specified above.

Income from rent of real estate purchased or conducted as an outside investment, in which may properly be included office buildings used in part for railway purposes, should appear in "Miscellaneous Income" and the amount shown should be the net amount received after deducting all taxes, insurance, water rents or rates, cost of repairs and other expenses connected with such real estate.

Income from the operation of parks, park resorts or similar property should appear in "Miscellaneous Income" and the amount shown should be the net amount received after deducting all expenses connected with such operation.

If the company conducts a lighting as well as a railway business the net income resulting from the lighting business should appear under "Miscellaneous Income." The same applies to any other outside business conducted by the company.

DEDUCTIONS FROM INCOME:

Taxes: To include all taxes on real estate and personal property, track taxes, franchise taxes, taxes upon capital stock, taxes upon gross earnings, car licenses and other vehicle licenses; excepting, however, taxes on property such as real estate purchased or conducted as an outside investment the net income from which is credited to "Miscellaneous Income."

Rent of Leased Lines and Terminals: To include rent of leased lines or terminals the operation of which has been temporarily or permanently abandoned by the lessor.

INCOME ACCOUNT FOR YEAR ENDING

Gross Earnings from Operation (per schedule "A")	\$.....
Operating Expenses (per schedule "B")	\$.....
Net Earnings from Operation	\$.....
MISCELLANEOUS INCOME:	
Interest on Deposits	\$.....
Income on Securities Owned	\$.....
Rent of Leased Lines and Terminals	\$.....
Other Miscellaneous Income*	\$.....
	\$.....
Gross Income Less Operating Expenses	\$.....
DEDUCTIONS FROM INCOME:	
Taxes	
On real and Personal Property	\$.....
On Capital Stock	\$.....
On Earnings	\$.....
Miscellaneous*	\$.....
Interest on Funded Debt	\$.....
Interest on Real Estate Mortgages	\$.....
Interest on Floating Debt	\$.....
Rent of Leased Lines and Terminals (per Schedule C)	\$.....
Other Deductions from Income*	\$.....
	\$.....
NET INCOME	\$.....
DEDUCTIONS FROM NET INCOME:	
Reserves and Special Charges*	\$.....
	\$.....
Dividends — % on \$.....	\$.....
Preferred Stock	\$.....
Common Stock	\$.....
	\$.....
SURPLUS OR DEFICIT FOR YEAR	\$.....
SURPLUS OR DEFICIT AT BEGINNING OF YEAR	\$.....
PROFIT OR LOSS ADJUSTMENTS DURING YEAR:*	
Credits:	
	\$.....
	\$.....
	\$.....
Debits:	
	\$.....
	\$.....
	\$.....
SURPLUS OR DEFICIT AT CLOSE OF YEAR	\$.....

*Specifying same.

SCHEDULE "A."

Gross Earnings from Operation.

Car Earnings:	
Passengers	\$.....
Chartered Cars	\$.....
Freight	\$.....
Mail	\$.....
Express	\$.....
Other Car Earnings	\$.....
Miscellaneous Earnings:	
Advertising	\$.....
Rent of Land and Buildings	\$.....
Rent of Tracks and Terminals	\$.....
Rent of Equipment	\$.....
Sale of Power	\$.....
Other Miscellaneous Earnings*	\$.....
	\$.....
	\$.....
Total	\$.....

*Specifying same.

SCHEDULE "B."

OPERATING EXPENSES.

MAINTENANCE—Way and Structures:	
1. Maintenance of Track and Roadway	\$.....
2. Maintenance of Electric Line	\$.....
3. Maintenance of Buildings and Fixtures	\$.....

The items under this are Preferred and Common, with a summary showing Total number of stockholders, Total number of stockholders in this State, and Amount of stock held in this State.

For the funded debt the column headings are: Date of Issue. Term of years. Date of maturity. Amount authorized. Amount outstanding. Interest rate, when payable, accrued during year.

A summary shows the stock and debt per mile of track.

DESCRIPTION OF ROAD AND EQUIPMENT.

This form is divided into TRACK and CARS, ETC.

Under "Track" the column headings are: Owned. Leased. Operated under Trackage Rights. Total Operated.

The items under "Track" are: Length of road (first main track). Length of second main track. Total length of main track. Length of sidings and turnouts.

Under "Cars, etc.," the column heads are: With Electric Equipment. Without Electric Equipment. Total Number.

The items are: Closed Passenger Cars. Open Passenger Cars. Combination Closed and Open Passenger Cars. Total Passenger Cars. Freight Cars. Mail Cars. Express Cars. Baggage Cars. Combination Cars. Work Cars. Snow Plows. Sweepers. Miscellaneous. Total.

MILEAGE, TRAFFIC AND MISCELLANEOUS STATISTICS.

Passenger car mileage.

Freight, mail and express car mileage.

Total car mileage.

Passenger car hours.

Freight, mail and express car hours.

Total car hours.

Fare passengers carried.

Transfer passengers carried.

Total passengers carried.

Average fare, revenue passengers.

Average fare, all passengers (including transfer passengers).

Car earnings per car-mile.

Miscellaneous earnings per car-mile.

Gross earnings per car-mile.

Car earnings per car-hour.

Miscellaneous earnings per car-hour.

Gross earnings per car-hour.

Operating expenses per car-mile.

Operating expenses and taxes per car-mile.

Operating expenses per car-hour.

Operating expenses and taxes per car-hour.

Operating expenses per cent. of gross earnings.

Operating expenses and taxes per cent. of gross earnings.

Average number of employes, including officials, during year.

Aggregate amount of salaries and wages paid.

SUMMARY OF ACCIDENTS DURING YEAR.

(The number of killed, injured, and total classified as passengers, employes and others.)

GENERAL INFORMATION.

Historical sketch of organization, construction, leasing and consolidation of lines now operated.

Corporate names and address of company.

Names and addresses of officers and directors.

Date of close of fiscal year.

Date of stockholders' annual meeting.



KINNEAR STEEL ROLLING DOORS.

The Kinnear Manufacturing Co., of Columbus, O., displayed samples of its rolling doors for car houses, of which the company's circulars say: "They are fireproof, durable, easy to operate and minimize the cost for maintenance and repairs." These doors are equipped with special trolley arrangements which afford uninterrupted current to each track in the car house, no matter what the position of the entrance door may be. The Kinnear rolling door has been adopted by the Boston Elevated Railway Co., of Boston, and is used by many of the leading roads of the country.

LORAIN STEEL CO.

The Lorain Steel Co. has been badly disappointed in not receiving its exhibit, the car containing the various parts of the display having been delayed by a bad wreck. The company is doing business, however, at its space in Convention Hall and all visitors will be more than welcome at the booth and at the company's parlors in the Cadillac. The following staff of representatives is on hand: P. M. Boyd, Lorain; A. S. Littlefield, Chicago; D. J. Evans, Chicago; Maj. Henry Charles Evans, New York; W. W. Kingston, Atlanta; Randolph Clitz, Lorain; S. P. S. Ellis, Pittsburg; E. B. Entwisle, Johnstown.



LARGE CONTRACT FOR HEATERS.

General Agent Cornell S. Hawley, of the Consolidated Car Heating Co., states that a recent shipment of 21,600 heaters to the Manhattan elevated railway of New York is the largest contract for electric heaters ever given in the world. Mr. Hawley also calls especial attention to a chair car heater largely used for high speed interurban cars, and which is exhibited here. This heater may also be seen in Detroit in Detroit, Ypsilanti, Ann Arbor and Jackson Railway cars.



A NEW SECTION INSULATOR.

The Albert & J. M. Anderson Manufacturing Co., of Boston, Mass., has space with the Morris Electric Co. in the balcony, where Mr. Ernst Woltmann calls attention to the new Anderson Section Insulator. This device, it is pointed out, has a dozen good points and is calculated to save the trolley wire, the line-man's time and contributes to the general permanence, safety and economy of the line. It is made in malleable iron, galvanized or strong bronze metal, as desired. It is adapted to either round or grooved trolley wire, and the terminals which hold the trolley wire at either end of the device may be detached from the body and renewed without removing the body from the line.



STANDARD UNDERGROUND CABLES.

In a corner of the balcony in the exhibit hall, adjoining the exhibit of the Standard Paint Co., is a display by the Standard Underground Cable Co. The exhibit includes samples showing various styles of underground cables especially designed for street railway work, also new copper rod and wire mills. The company advises its friends to keep December in mind, because its new copper rod and wire mills and weather-proof wire and cable factories are to be in full operation about the 20th. The new factories are claimed to be the finest and most modern in this country. The company is represented here by H. P. Kimball, of New York; J. R. Wiley, of Chicago, and A. A. Anderson and F. S. Viele, of Pittsburg.



In connection with the exhibit of Heywood Bros. & Wakefield Co. the Union Switch & Signal Co., of Easton, Pa., is showing a set of its electric staff instruments for blocking high speed electric railways. Mr. T. H. Patenall represents the company.



The Griffin Wheel Co., of Chicago, is so well and favorably known that it is only necessary to state that it has a space conveniently located to the main entrance to the exhibit hall to insure a constant stream of callers at its booth. This company began business in '77 and now has six large plants turning out its products. Its representatives at the convention are W. S. Harpwell and C. K. Knickerbocker, of Chicago, and J. S. Young, of Detroit.



Mr. C. S. Hawley, general agent for the Consolidated Car Heating Company, of New York, can be found at his space in Exhibition Hall every day and will be glad to talk heaters to anyone interested.



Mr. Geo. M. Hoadley, of the Bemis Car Truck Co., and who was for ten years manager of the Bemis Car Box Co., is in attendance at the convention.

HEYWOOD BROTHERS & WAKEFIELD CO.

The Heywood Brothers & Wakefield Co., which claims to be the largest chair manufacturer in the world, and which has four large manufacturing plants and eight warehouses in various cities, shows a full line of their railroad specialties consisting of car seats, spring seating, rattan webbing, snow broom rattan, mats, etc. The Wheeler No. 42 is shown in rattan, with backs offset, by which means 3 in. is gained in the aisle space of a car at the hips, where the aisle room is most required; this seat also has a brass grab handle on the back for the convenience of passengers standing. There is also shown a handsome sample of this seat in plush, with high back and head rest, and a spring edge cushion, making a most comfortable seat for a long ride; it has a pedestal base, which is a convenience when cleaning the car, and a movable foot rest, allowing room under the seat for grips and packages. Other exhibits include a sample of the double revolving chairs, such as used in Brooklyn; samples of spring seating, which the company furnishes in rattan, carpet, plush or artificial leather; samples of rattan webbing, snow broom rattan and cocoa mats for elevated cars.

The company is represented by Mr. Fred Henry, whose headquarters are at Wakefield, Mass., and Mr. Bertram Berry, who is located at 129 Carlton St., New York.



GOULD STORAGE BATTERY.

The Gould Storage Battery Co., of New York, has an exhibit at space No. 31, where are shown samples of plates of all sizes from small 3x3 in. to large central station type. Glass and lead line tanks are shown with special glass covers to reduce evaporation and loss of acid by "spraying." Attractive features of the exhibit are photographs of railway installations and boosters. Bulletin No. 2 of the Gould company describing plants equipped with Gould C. T. M. P. boosters was printed especially for the convention. The company's representatives are W. M. Donaldson, sales manager in charge; E. L. Draffen, manager Chicago office; Albert B. Herrick, electrical engineer.



AUTOMATIC BLOCK SIGNAL.

One of the busiest men at the convention is Mr. W. S. Berry, general manager of the Pittsburgh Switch & Signal Co., who is constantly called upon to explain the working of the Berry automatic block signal and car spacing device. It is a semaphore signal that does not depend upon incandescent lamps for signaling, but a red target, signifying danger, and a green target, signifying safety. A group of incandescent lamps is so arranged that they can be thrown off during the day and on during the night. It is claimed that as many trains or cars going in the same direction as the management of the road may desire can run into a gauntlet or block at the same time and the targets will not show safety until the last train or car has left the block; also, if from any reason a wire breaks or a magnet burns out the signal will at once go to danger by gravity.

When no car is in the block or gauntlet, the semaphores are held in a perpendicular position by magnets. These signals can be used as car spacers, and where sharp curves occur between turnouts signals can be placed as an extra precaution, so that a careless motorman who may have run against the danger signal at the turnout will be again warned. The signal operates whether the motorman uses power or not and is entirely out of the crew's control. There are no triggers or other obstruction for the trolley wheel or pole to strike to operate signal. Mr. Berry has the assistance at the exhibit of Mr. B. J. Sammon.



A TRACK BARROW.

The American Trackbarrow Co., of Lowell, Mass., has hit upon a new idea in convention waycenders. It is furnishing delegates and visitors souvenir postal cards and engraved letterheads for carrying on their correspondence during the convention. The letterheads bear portraits of the officers of the A. S. R. Association, views of the Cadillac Hotel, the Light Guard Armory, the Masonic Temple and of the American Trackbarrow.

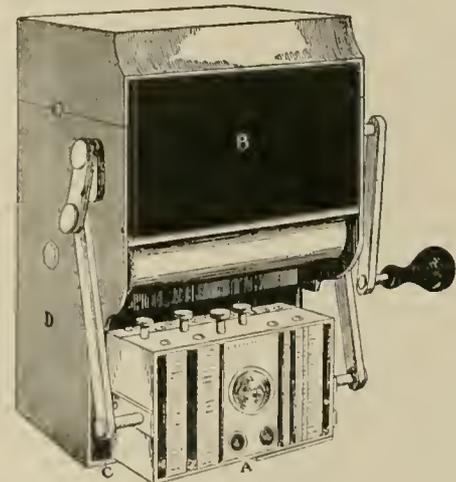
PITTSBURG TRANSFER TICKET MACHINE.

The Pittsburg Blue Print Paper & Manufacturing Co., 1505 Park Building, Pittsburg, has on exhibition a transfer ticket machine which is attracting much attention. The machine has been designed primarily to prevent fraudulent tickets being issued by dishonest or ignorant employes, and is described and the operation explained by the maker as follows:

The machine consists of the printing block A., ink pad B, impression platen C and case D.

The case contains alarm bell, automatic counter, automatic feed rolls and paper roll. The upper end of the case is hinged and may be opened at any time by the operator to put in a fresh roll of paper. The counter and bell are operated at the instant of printing by suitable cams and trip levers.

The printing plate is shown at A. The visible or face side of the plate is made up of actual proof prints from the type side and consequently corresponds to it exactly. The time setting mechanism is worked through ratchet and pawl, which prevents the motion of the hour and minute hand being reversed at any time. A locking pin is adjusted to lock the whole time mechanism at 12, midnight, or any other predetermined hour. The ends of the date indicator screws are covered by a plate which is locked in place before the car leaves the barn each morning.



TRANSFER TICKET MACHINE.

In operation, the day, month and date indicators are set and the time mechanism released before the car starts on its first trip each day. The conductor sets the "from" and "to" indicators and moves the hour and minute hands forward to correct time, and also sets the direction hand. He then turns the crank on the right hand side of machine through one-half revolution, thus bringing the printing block down onto impression pad, printing his ticket, ringing the alarm bell and counting the ticket. By completing the crank revolution he brings the printing plate back to its position on the inking pad and feeds out enough paper for the next transfer ticket.

The principal advantages claimed for the apparatus are its simplicity, its ease and certainty of operation, its economy in that only so many transfers as are actually used need be printed, and the fact that it gives the company absolute control over the transfer business.



LE VALLEY VITAE BRUSHES.

Although at first discouraged by his inability to procure exhibition space, President J. V. Clarke, of the Le Valley Vitae Carbon Brush Co., persevered and at the last moment secured a desirable location in the right balcony, where is displayed to good advantage the brushes for which this company is noted. The Le Valley brushes have been subjected to some pretty severe tests and are reported to have given satisfaction wherever used. Mr. Clarke shows some "old stagers" that have had interesting experiences. Among them is a brush that was used on the Tarry

town, White Plains & Mamaroneck Railway for 16,836 miles and was only worn one-half inch. Another was tested by the Lorain Steel Co. at Johnstown, Pa., where it ran 11,000 miles and was worn but 7/16 of an inch. The Edwards Headlight Co. has adopted Vtae carbons for all of its headlights, and Mr. Clarke states that one large railway company has just placed a very large order, after having tested the brushes for the past year on all its machines. The company has on its books many orders from large railway and electrical concerns all over the country. For a souvenir Mr. Clarke gives all comers a small carbon brush.



GENERAL ELECTRIC EXHIBIT

The General Electric Co.'s exhibit is located in the corner of the Annex and occupies 2,000 sq. ft. of space. The principal feature is an installation of the Type "M" Control now in use on the Manhattan Elevated Railway in New York City. This exhibit is mounted on a frame which permits free examination of the parts during its operation and shows the rise in voltage which, of course, corresponds to the increase in speed of the motors. To indicate this rise in voltage a number of incandescent lamps are used, grouped in the form of the company's monogram, which start at a dull red and gradually come up to full candle power. Other General Electric apparatus for electric railway service exhibited consists of a line of railway motors of various sizes, including the 125 h. p. GE-66 motor which has been adopted by the Manhattan Railway Co. A Brill 27-E truck is shown with two GE-57 motors mounted upon it and equipped with the General Electric new type of shoe for use on the protected third rail system. This latter is here exhibited for the first time. There are also exhibited General Electric air compressors of standard types with automatic governors; these are in operation connected to a standard reservoir.

A Type H electrically controlled oil break switch with a capacity of 300 amperes at 12,000 volts makes a very interesting operating exhibit; the switch being substantially installed as in actual service. Direct and alternating current rotary converter panels of standard type are also shown. Among the small supplies here exhibited may be mentioned a 6,000 ampere carbon break circuit breaker for railway use, beside smaller sizes of the same type. An attractive display stand for rail bonds, incandescent lamp sockets and other small devices is also shown.

The entire exhibit is arranged for convenience of examination by visitors, and the attractive reception space at the center of the exhibit makes a pleasant resting place for the delegates.

A feature of considerable interest which forms a part of the exhibit is a 60-ft. interurban car lent by the Jackson & Suburban Traction Co. and used by the company in demonstrating the system for operating such cars. This car is equipped with the Type M control and four GE-66 motors. It is located on the Detroit United Railway tracks at a point near the Convention Hall and may be used by the delegates and their friends for rides around the city of Detroit.



KELLOGG SWITCHBOARD EXHIBIT

It is the avowed aim of the Kellogg Switchboard & Supply Co. to produce the finest telephone apparatus in the world and, judging by the variety and finish of the instruments shown by it in booth 80, in the balcony, a long step in the right direction has been taken. A full line of common battery and magneto telephones is set up, together with a common battery switchboard with which the telephones are connected. This common or central battery dispenses with batteries at subscribers' stations, the entire exchange being worked from a battery at the central office. The battery may be primary or secondary.

These boards have the advantage of automatic signaling and the line signal used may be a small incandescent lamp placed in proximity to the line jack, or it may be a mechanical target type. Kellogg telephones have been designed and built with the idea of meeting all classes of service. They are all equipped with the new Kellogg transmitters and receivers. Every movable contact in the Kellogg telephone is platinum. The Kellogg factory in Chicago is the largest and best equipped of any independent telephone manufacturing concern.

The exhibit is in charge of Messrs. R. H. Manson, of the engineering department, and F. L. Martin, of the advertising department. These young men know how to create an interest in their display, one of the means employed being to give every caller a chance to talk through himself. Connected with one of the telephones is a hand battery outfit such as physicians use and all that is necessary to enable one to get a shock is to hold the handles and speak into the transmitter. The louder the tones, the stronger the shock.



SOMETHING NEW IN CURTAINS.

The United States Curtain Co. is one of the exhibitors that secured space too late for announcement. Its quarters may be found in conjunction with the Sterling-Meaker exhibit on the main floor. It shows curtains that will absolutely keep out sun, wind and rain. The construction is simple and the curtains are very easy to keep in repair. The device consists of a metal strip fastened to the edge of the curtain, traveling in a metal run in the groove of the post which holds the edges. There is also shown a new device by which by pressing a button on the inside of the car the curtain is released and raised by the spring. This company also makes the pinch-bar fixture, but the curtain recommended is the new balance curtain, as the first-named is called. Mr. Alonzo E. Nutter represents the company here.



THE "P. & B." DISPLAY.

The Standard Paint Co. exhibits in the balcony, displaying the famed P. & B. paints and insulating compounds, P. & B. tape, Ruberoid roofing and P. & B. insulating papers and motor cloth. A feature of the booth is the decoration of the rear wall, which is hung in purple, in the center of which appears in gilt the P. & B. rooster trade mark of the company. Messrs. J. C. Shalnwald, western manager, and B. C. Beckman and E. R. Willard, all of Chicago, dispense hospitality and souvenirs in the shape of a dainty Russia leather combination card case and engagement book.



A LARGE PAINT CONCERN.

The Sherwin-Williams Paint Co. has spacious headquarters in Loath 19, where its representatives are kept busy setting forth its claims, among which is that it is by far the largest paint and varnish concern in the world. This company has four large plants, in Cleveland, Chicago, Montreal and Newark, and warehouses and offices in seven other cities. It makes, treats and refines all its linseed oil; manufactures dry colors; makes varnishes, japans and driers; makes its tin cans; operates its own box factory; has its own printing plant; runs its own machine shops for making the mills and machinery of its exclusive design, and owns a screw steamer for carrying flax seed and lumber down the Great Lakes.

The Sherwin-Williams company specializes in every department and gives individual attention to every order. The exhibit is in charge of S. M. Williams, manager of the street railway department, assisted by Thomas Medill, manager of the railroad department west, and F. A. Elmquist, whose headquarters are at Ste. Claire Hotel, Detroit.

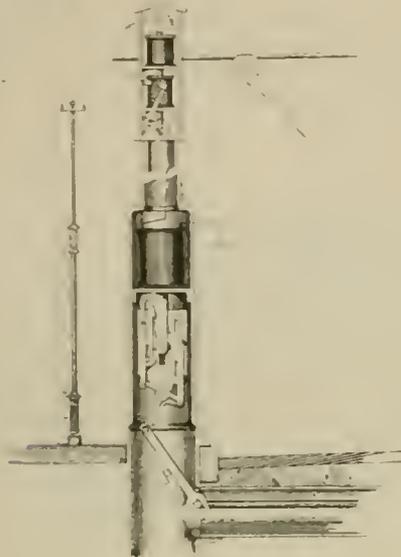


SCARRITT CAR SEAT CO.

The Scarritt Car Seat Co., of St. Louis, exhibits in the smoking room three swing back and two walkover car seats, upholstered in cane, plush and imitation leather. The walkover seat is a new type, which has not been put out to any extent. The other seats are well known and used by many railway companies. Mr. R. R. Touhy, assistant superintendent, has charge of the exhibit. The superintendent, Mr. George E. Howard, intended to be here today, but late yesterday sent word that business engagements would prevent his coming.

PORTER ELECTRICAL OPERATOR.

The Porter "Electrical Operator" for operating track switches is the latest invention in this line. Mr. Porter has been making electrical switch operators for seven years and has carefully studied the difficulties to be surmounted, and has at last produced an operator which he is satisfied overcomes all the objections heretofore found in this class of switch operators. First, he has placed the working and electric mechanism all above ground and has so simplified the mechanism that anyone can readily see the mode of operating, and any motor car which can run on the track can operate one switch or ten or more switches at the same movement.



ELECTRICAL SWITCH OPERATOR.

It is claimed that this operator is the only one which can supply an unlimited amount of current to the motor car while its trolley is on the 3-ft. trolley wire, and that when this operator is used with a Porter rocker switch both operator and switch will work winter and summer without care or cleaning.

The Porter Railway Switch Co. has its offices at 151-153 Jefferson Ave., Detroit.



MORRIS ELECTRIC CO.

Upon entering the exhibition hall, the first glance at the corner of the right hand balcony shows the large signs denoting the booth occupied by the Morris Electric Co., of New York, one of the most enterprising concerns in the country. Recently the American Union Electric Co. was incorporated to take over a number of other companies, among them the Morris Electric Co., the Fountain Manufacturing Co., the Electric Motor & Specialty Co., the Federal Manufacturing Co., the Falcon Electric Co., and the Refrigerating Machine Co., all of them more or less manufacturers of electrical appliances, but none of conflicting interests. The Morris Electric Co. is the predominant member of this big family. The exhibit here includes, in addition to a general line of railway goods formerly manufactured by the Morris Electric Co., consisting of rail bonds, fare registers, overhead line material, iron pulleys and brackets, a full line of switchboards for railway and power circuits, panel boards and switches for lighting work, junction outlet and a general line of conduit wiring equipment.

The factory has been increased to more than four times its previous capacity, and the concerns in the combine have been removed to Amperes, N. J. The plant is running with over 200 workmen on full time. In addition to the above products the Morris company makes an illuminated sign for the Mason Monogram Co. This is a large street sign with three slides showing at the same time. It has a revolving mechanism and each box contains eight signs. Mr. Elmer P. Morris states that the rail bond

business is in splendid shape, and that they now have a capacity of 18,000 per week. Mr. Morris also calls attention to the Buffalo car seat for motormen and conductors, the invention of Charles Coons, superintendent of the Buffalo Railway Co. It has an adjustable stool and may be either leather or wood. He gives his friends a very useful souvenir this year, consisting of an "Indian" ink stand made of pottery. Assisting Mr. Morris at the exhibit are Messrs. John Fountain, Jr., E. Packer, A. Avery and E. Woltmann.



THE STERLING LUBRICATOR CO., ROCHESTER, N. Y.

The Sterling Lubricator Co., manufacturer of force-feed lubricators, has a working exhibit of its lubricators in various sizes near the main entrance to the hall. The company believes that the force-feed method of lubrication for engine valves and cylinders or other machinery by means of properly constructed automatic pumps is the very best to be had, as lubrication is provided when needed and ceases when the machine is at rest. The Sterling lubricators are made of selected material, are of superior design and workmanship and have several valuable new features. The driving wheel is on the back of the lubricator and the shaft is enclosed and passes completely through the oil reservoir. The driving lever being on the back does not pass to and fro in front of the pumps, thus permitting free and easy access to them and the rocker at any time and while lubricator is in operation. The lubricator has a hand attachment which permits operation of the lubricator while the machine is at rest. The rocker on the lubricator is one of its most valuable and desirable features permitting a large range of discharge per stroke of the pumps, as any pump may be quickly and independently adjusted from zero, or no stroke, to full stroke or any intermediate point. The company is represented by Mr. J. Sherry.



GOLD CAR HEATING & LIGHTING CO.

The well known and always popular Gold heaters are shown in operation just at the main entrance of the hall. The new feature this year is a bank of 18 heaters suitable for elevated or interurban street railway cars. These heaters are arranged to provide gradation of heat and are controlled by a new and novel 3-point regulating switch. This switch is capable of handling with safety and certainty at least 75 amperes at 650 volts. A number of other styles of electric heaters suited for cars fitted with longitudinal seats are shown, also other heaters adapted for use on the outside of riser boards or in baggage cars were exhibited. The Gold company calls attention to its system of hot water circulation for use in street cars. This latter system is now being applied to several hundred cars throughout the country, and by its use it is possible to heat a car rapidly, uniformly, at an expense of not over 10 cents per day. The Gold company has just completed a contract covering electric heaters sufficient to equip all of the cars in Louisville and its suburbs. Edward E. Gold, president, John E. Ward and Frank Cahill are representing the company.



IMPROVED BRAKE SHOES.

The American Brake Shoe & Foundry Co. is showing improved types of street car brake shoes at its booth near the main entrance of exhibit hall. The shoes are manufactured under the "Diamond S." Lappin, Corning, Streeter and other patents, covering the approved types for all classes of railway service. The company's plants are situated at Mahwah, N. J., Bloomfield, N. J., Corning, N. Y., Buffalo, N. Y., Detroit, Chicago, Ill., Chicago Heights, Cincinnati, O., St. Paul, Minn., Denver, Col., and Chattanooga, Tenn.

Mr. F. W. Sargent, chief engineer, is in charge of the exhibit, assisted by S. J. Thompson, assistant engineer. Salesmen in attendance are Arthur Goumber of Columbus, O., W. W. Gardner of New York and H. S. Bradfield of Buffalo, N. Y.



Among the early arrivals yesterday morning were Mr. Putnam A. Bates, assistant secretary of the Crocker-Wheeler Co., and Mr. W. F. Sullivan, who represents the same company in Cleveland, O.

VERY ENJOYABLE TROLLEY RIDE.

The General Electric Co., by courtesy of the Boland line, was enabled to treat 65 guests to a very enjoyable trolley ride yesterday afternoon in one of the Boland interurban cars, which is equipped by the General Electric Co. The run was made on the Northwestern tracks as far as Farmington Junction and return. The party was in charge of P. H. Gale, of Schenectady, and E. H. Mullin, of New York, both representing the General Electric Co. Mr. Gale speaks very highly of the track construction in Detroit, which, together with the General Electric equipment, made some fast time possible.

BALL-BEARING TROLLEY BASE.

One of the most interesting exhibits is that of a ball-bearing trolley base, shown by President W. S. McDonald, of the Detroit Trolley & Manufacturing Co. The most noticeable feature of this appliance is the free and easy movement of the base, due to fifty 1-in. steel balls, running in two races, used in its construction. The base is made to wear and is guaranteed to keep the trolley on the wire, save the overhead construction and wearing on the trolley wheel, and to prevent the wear of the pole. Mr. McDonald claims that the life of the trolley pole will be lengthened about one-third by using this device, in consequence of doing away with binding on the trolley wheel. Aside from saving expense in repairs, conductors will be enabled to run on schedule time, which they cannot do now, says Mr. McDonald, on account of the trolley flying off the wire all the time.

UNIVERSAL SANITARY CUSPIDOR.

In order to supply the growing demand and to provide an absolutely sanitary cuspidor for street railway office and general purposes, the Universal Sanitary Cuspidor Co. of Worcester, Mass., is putting on the market an ingenious device which it is believed will come to very extensive use for street cars and all public places where expectorating on the floor is a nuisance. The company is showing samples of the cuspidors in the smoking room, and to show its faith in the cuspidor has placarded the walls with the unusual sign, "Spitting Allowed Here." The cuspidor is a receptacle made of gun metal designed to be set into the floor with the top of the cuspidor flush with the floor so that its contents can never be overturned. By an ingenious arrangement of piping and an automatic valve the cuspidor is flushed with clean water either continuously, as would be desirable in railroad stations and offices, or it can be arranged to be flushed at any interval of time desired. For street railway work the idea is to flush out the cuspidors at each terminal. The exhibit is in charge of Mr. N. R. Thibert, assisted by N. J. Beaudin. The company announces that since the convention opened, the Detroit United Railway has ordered 500 of the cuspidors.

NICHOLS-LANTERN SANDER.

The Nichols-Lantern Co., of Cleveland, Ohio, represented by Louis G. Wright, president, and William Lantern, general manager, had its well-known track sanding system in operation at space 17, with an auxiliary exhibit at the Ludlow Supply Co.'s space. A striking feature of the Nichols-Lantern system is that it is applicable to any and all conditions. On city cars without air equipment the use of a Nichols-Lantern foot compressor gives all the advantages of pneumatic force, enabling the placing of sanders at any point on car, without any mechanical complications and with absolute certainty of its operating at all times. It has been found to be a wonderful power saver when put on so as to sand one rail near the front truck and the other rail near rear truck. For heavy suburban service this company manufactures hoppers and special traps to accommodate any conditions existing on truck or car body. Mr. Wright says that sand cars, or the sanding of curves by manual labor, is expensive, inefficient, and unnecessary when this system is used. The company is making a specialty of equipping snow plows, and in view of the necessity of the highest efficiency at all times on short service apparatus the apparatus is valuable.

ARMISPEAR LAMPS.

Delegates are showing much interest in the exhibit of the Armispear Manufacturing Co., one of the features of which is a new trolley car tall lamp, especially valuable for interurban roads. The double steel guard, solid top lantern shown, also comes in for commendation. The frame is practically unbreakable, a fact which will be appreciated by those who pay for lanterns for the employes to hang about.

A USEFUL DISPATCHER SYSTEM.

The Union Stop & Signal Co., of Fall River, Mass., O. W. Hart, general manager, is displaying its union system of dispatcher signals for electrically operated railways. Briefly, this system consists of a telephone line and signal wire extending the length of the road, with telephone stations in suitable boxes, where easy access can be had by any employe, and he be connected with the dispatcher's office.

These telephones on single-track roads are generally placed at turnouts or sidings, while on double-track systems they are placed at convenient intervals. In conjunction with the telephones are placed the "Dispatcher" signal boxes, designed to set a signal from the dispatcher's office to call the attention of the motorman to the fact that a message is to be given his car and that the conductor is wanted at the telephone. As can be seen, the advantages of such a system are numerous.

"LONG LIFE CARBON BRUSH."

General Manager J. S. Speer, of the Speer Carbon Co., of St. Mary's, Pa., has succeeded in arranging samples of his company's product most attractively. The exhibit includes the "Long Life" carbon brush, which is something new in the brush line that is given a special treatment during the process of manufacture to close the pores of the carbon, the idea being to impart to the brush a dense and uniform texture and an absolute lubrication which will insure that the brush will not cut the commutator, it is claimed. The regular grade motor brushes made by this company are made specially for railway motor work, and its high-grade brushes are adapted for all classes of generator work and for high-speed machines where a very low resistance is required to carry the current without excessive heating.

AMERICAN CAR SEAT CO.

The American Car Seat Co., of Brooklyn, N. Y., has a very comprehensive exhibit under the supervision of Superintendent Louis Jansen, aided by Hiram E. Ackerly. This company manufactures push-over car seats in rattan, plush, leather, etc. The construction is simple, containing few parts, and the material is chosen for durability, as well as efficacy in other directions. The steel entering into the construction of the cushion frame and springs is especially manufactured for the American company. The back of this push-over seat is practically locked without additional mechanism and cannot be forced over by being leaned against. The seat also affords full seating capacity and is fitted with a patent "hold-on-handle" attachment, although, when desired, the corner grab handle is furnished. Particular attention is called to the longitudinal rattan spring seating, which is in great demand. For a souvenir the company presents an oxydized sterling match box, handsomely chased, and filled with wax tapers.

LARGE JEWETT CAR.

The Jewett Car Co., of Newark, O., yesterday morning put in place on the street trackage near the Armory the 66-ft. interurban car built by it for the Columbus, Delaware & Marlon Ry., which was fully described in the "Street Railway Review" for Sept. 20, 1902, page 568. This car, which is, we believe, the largest electric car yet built, presents an extremely handsome appearance and is attracting much attention from the interurban railway men at the convention. Mr. A. H. Sisson, general manager of the Jewett company, was one of the early arrivals.

PECKHAM HIGH-SPEED TRUCK.

The 66-ft. interurban car built for the Columbus, Delaware & Marion Ry., and exhibited by the Jewett Car Co., is mounted on Peckham high-speed M. C. B. No. 32 electric trucks made by the Peckham Manufacturing Co. This truck is shown in the accompanying illustration.

The side frames are of bridge truss construction, with a strong and deep truss, and are spring supported upon equalizing bars and also upon the journal boxes to prevent teetering. To prevent the tilting of the top frames, the spring base of the truck is increased by locating helical springs each side of and supported by saddles from the journal boxes. The pedestal springs are designed to carry a sufficient part of the load to prevent the tilting of the top frames, the greater part of the load being carried by the equalizing bar springs. The side and end portions of the top frame is all one piece of forging.

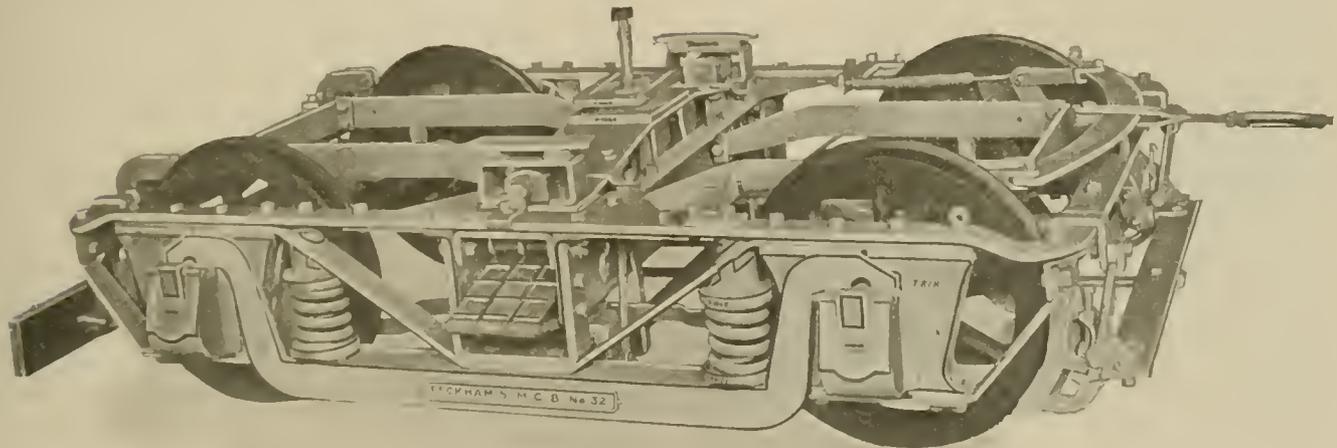
The transoms are bulb angles 10 in. deep, which extend full

crow bars, lanterns and all the tools and appliances that would be of service in emergencies or in the work of transporting supplies. The car is mounted on du Pont double trucks equipped with four Westinghouse motors. The car was more fully described and illustrated in the "Review" last year.



MICA EXHIBITS.

Eugene Munsell & Co. and the Mica Insulator Co., are represented at the convention by Charles E. Coleman, manager for both concerns at Chicago. Mr. Coleman had a very prominent location in the center of the hall. The "Micanite" and "Empire" insulating materials are exhibited in their various forms, and the company's circular matter is being distributed; this included a very neat blotter, which was put in the writing rooms of the various hotels. The company reports a heavy demand for all its mica and micanite specialties, and has just completed an addition to its already extensive works at Schenectady, which



PECKHAM HIGH SPEED M. C. B. NO. 32 TRUCK

size with the side truss frames to which they are rigidly secured. Gusssets of steel steel connect the transoms to the side frames and hold the frame rigid and square. The bolsters are all steel and the end sections are supported by full tripple elliptic springs. Straps secured to the transom and extending over the bolsters prevent the latter being lifted out. The king pin is 2 in. in diameter. The swivel plates are large in diameter, machine fitted, with a boss ground the king pin which prevents the escape of the lubricating grease.

The journal boxes are of the M. C. B. standard pattern with M. C. B. journals. The axles are 5 1/2 in. in diameter and the wheels 22 in. The pedestals are of cast steel machine fitted where they are in contact with the boxes and top frame, and all bolts are machined and driven in reamed holes. Each truck weighs 10,000 lb. without the motors which weigh 8,750 lb.

The wheel base is 6 ft. 6 in.



MR. FARMER'S SUPPLY CAR

The first car on exhibit as one walks to Convention Hall from Woodward Ave. is the general service and utility car designed by Mr. Thomas Farmer, superintendent of motive power for the Detroit United Ry., and built in the company's shops. One end of the car is enclosed, forming a cab, which is used as an office and also for sleeping purposes, there being two drop berths arranged to swing up against the wall when not in use. The "Carmen Hall" of the boys call the car, supplied all the power levers and craps with their dolly regulations.

The other half of the car is open and is provided with hand derrick for pulling up trucks, broken axles, armatures and heavy material generally. It is equipped with bars, jacks, wrenches,

will give it an increased capacity of 6,000 sq. ft. of floor space, enabling it to execute all orders speedily.



PETER SMITH HEATERS.

The Peter Smith Heating Co., of Detroit, has samples of its well known hot-water heaters especially adapted for interurban cars. No. 1 heater shown is a railway coach heater for the largest cars made. No. 2 is made for suburban and interurban cars. No. 3 heater is for city cars, being considerably smaller than the others. All of these sizes are designed to go in the vestibule, where they will take no paying room, or they may be placed inside the car if desired.

The Peter Smith heaters are standard on all the interurban lines of the Detroit United Railway, the Toledo & Monroe, and several hundred other roads. One feature of the exhibit is a large oil painting of a Smith heater shown in a gilt frame, surmounted by incandescent lights.

Mr. Peter Smith, president and manager, is doing the honors for his company.



Mr. J. A. Dawson, of J. A. Dawson & Co., Montreal, P. Q., visited the convention hall yesterday. Mr. Dawson is one of the largest dealers in street railway and electrical supplies in Canada.



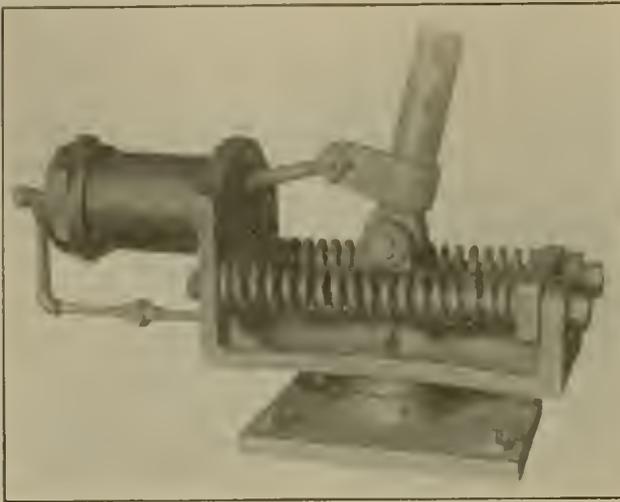
The National Conduit & Cable Co., of New York, has no exhibit this year, but its interests are being looked after at the convention by Mr. W. S. Eckert.



Manager J. P. Hell of the Hell Railjoint Welding Co., of Milwaukee, Wis., renewed old friendships by the score yesterday. Mr. Hell is very popular and, without a jolly good fellow.

AIR ELECTRO TROLLEY CONTROL.

One of the most interesting working devices in the exhibit hall is the "Air Electro Trolley Control" manufactured by the Pneumatic Railway Equipment Co., of Cleveland, O. This device, shown by the accompanying cut, is designed, as the patentee states, for the protection of overhead construction. By its use, the instant the trolley wheel leaves the wire it opens the circuit in a pair of electro magnets in the motorman's vestibule which control an air valve inserted in the line running from the air reservoir of the car, allowing the air to flow to a cylinder at the base of the trolley pole, throwing the pole to an horizontal position. The pole will remain in this position until released by the motorman or conductor, the appliance being operated from either end of the car. When the air is released the pole is allowed to rise rapidly or not, as desired. When the wheel makes contact with the wire it automatically locks the valve.



AIR ELECTRO TROLLEY CONTROL.

The device being under the control of the motorman at all times, all he has to do, in case of a fallen wire or other obstruction, is to open a switch on the valve box and throw the pole down to a horizontal position.

In switching around the car barn, where the trolley pole has to be handled the same as others, the motorman raises a lever on the valve box and cuts out the automatic attachment, so the pole can be handled freely. By means of a swivel joint the trolley rotates as freely as any in use without injury or inconvenience to anything.

The Pneumatic Railway Equipment Co. is represented here by Robert C. Beebe, the vice-president, and George R. Tomb, mechanical engineer. Mr. Tomb invented the control and Mr. Beebe helped to perfect it.



FRANK RIDLON CO., BOSTON.

The Frank Ridlon Co., of Boston, is showing its standard appliances and calling especial attention to its Weld babbitting device for babbitting bearings of various kinds. This method requires molding only, instead of molding and then turning out, thereby saving valuable time. It molds and finishes the bearings ready for the shaft in one operation and it is claimed that it finishes them so they will run smoother and wear longer than when bored on a lathe.

The Ridlon track drill and its track sanding device are also featured at the exhibit. For the drill it is claimed that it will drill $\frac{7}{8}$ in. holes in heavy rails for bonding, day after day, without breaking down. The drill is provided with an automatic friction feed. The track-sanding device is known as the Kilbourn. It uses any kind of sand with equal facility and deposits the sand in small scoops in front of the wheel as often as it is wanted. Many railway superintendents endorse the Kilbourn.

In conjunction with the exhibit is that of the Wilson Trolley Catcher Co.

Vice-President C. N. Wood and General Manager N. L. Wood superintend the Ridlon exhibit and take great pleasure in distributing "Ridlon's Representative," a breezy little publication inaugurated "for booming the business of Frank Ridlon Co., Boston."



KALAMAZOO TROLLEY DEVICES.

Manager F. B. Crockett, of the Star Brass Works of Kalamazoo, Mich., is kept busy impressing upon passers-by the merits of the Kalamazoo trolley wheels and harps. The Kalamazoo wheel, according to the new 1902 catalogue, is made of pure lake copper, treated by a special process which gives it the quality of softness combined with a remarkable degree of toughness. The result is a wheel which has extraordinary durability and yet causes no injury or wear upon the overhead wire. No scrap brass nor alloy is used in its make-up—only pure ingot metal.

The Kalamazoo trolley harp springs are so protected that they cannot be broken. As the friction of the wheel is borne entirely by heavy washers or lugs, there is no wear upon the springs.

Mr. Crockett points with pride to the record of some of his trolley wheels, one of which, now in service, has traveled nearly 35,000 miles. The wheels are adaptable for high speed roads or city lines. Mr. Crockett's son, L. M. Crockett, assists in entertaining callers at their booth.



NATIONAL TICKET CO.

The National Ticket Co., of Cleveland, O., is represented by Manager A. J. Reynolds and Secretary C. F. Bates. This company has been in existence only three years, but is already well and favorably known as manufacturer of railroad tickets and transfers. It publishes monthly, also, a clever little magazine for the general office, entitled, "The Electric Railway Interchange." Its convention number is being distributed at its booth in the balcony.



STANDARD VARNISH WORKS.

The Standard Varnish Works, of New York, London and Chicago, is represented by Mr. John C. Dolph, who has space just off the main aisle. Mr. Dolph is showing the samples of various types of General Electric and Westinghouse formed armature coils coated with insulating varnishes and compounds manufactured by the company. Both baking and air drying compounds are shown. As pointed out in recent issues of the "Street Railway Review," the general opinion among master mechanics seems to be away from the old practice of using linseed oil requiring from one to three days' baking at high temperature, and is crystalizing in favor of what are known as soft gum compounds requiring but little drying of the coils and no drying whatever of the completed armature. This class of varnish, it is found, resists the effects of heat and vibration. The Standard Varnishes are sold under the name of "Votalac" and "Baking Votalac." The souvenir of the company this year is a very acceptable aluminum match safe.



SUPERIOR GRAPHITE PAINT.

The Detroit Graphite Manufacturing Co., of Detroit, makes a protective paint that has had a very large sale for use on bridges and viaduct. It has proven to be entirely acceptable for this purpose as proved by constantly increasing orders and its adoption by many of the leading railroads of the country. Not only is it specified for new structures, but it is also being used to a very great extent in repainting old bridges where corrosion has already taken place. Consumers have testified that with proper precautions the "Superior" graphite paint arrests such corrosion and forms a permanent protective coating.



The Ohio Brass Co. is distributing a ping pong bat. This is a "bat" for the ladies and not for the men.

DEARBORN DRUG & CHEMICAL CO.

A street railway convention would be a dismal failure if the Dearborn Drug & Chemical Co., of Chicago, should forget to exhibit, for the representatives of this representative concern know well how to combine business and pleasure and not only furnish a good display, but also souvenirs to appeal to all tastes. This year, as usual, the Dearborn booth is crowded all day, and the amount of jollity that emanates therefrom would do credit to a pink tea. Seriously, however, the exhibit by this company is well worth noting. It includes barrels of its feed water treatment for boilers and samples of high-class lubricating oils and greases.

The Dearborn company is employed to test feed waters in a great many of the street railway power plants in the country, as well as many railroad, steamboat and other steam engineering plants. The company's plant in Chicago is one of the largest and most complete in the world. The company has offices in nine cities outside of Chicago. One of the most popular souvenirs given out is a bottle of perfumery for the ladies, the product of the Dearborn laboratories. Representing the company are Vice-President R. F. Carr, Eastern Manager W. B. MeVickar and Messrs. G. W. Spear and Otto Finiegel.



McGUIRE MANUFACTURING CO.

This company is showing a rotary snow sweeper with steel I-beam underframe. The sweeper is a "double ender" with full width brooms on both ends. It is one of 12 ordered for the Union Ry. of New York City. The interior equipment is the usual, furnished with McGuire plows and sweepers. A Columbia heater is shown in connection with the sweeper. The sweeper complete, without motors, weighs 2,000 lbs.

The company also shows a double truck street sprinkler built for the Newport News & Old Point Railway Co., Hampton, Va. It comprises steel tank 6 ft. 6 in. in diameter, and 18 ft. 6 in. long, provided with an air reservoir, 30x78 in., and an electric motor air compressor which stores air in the reservoir compressed to 80 lbs. The sprinkler is mounted on McGuire, 39A, double truck equipment and is complete with all necessary valves and appliances for sprinkling streets of 100 ft. or more in width.

The representatives on the ground are W. J. Cooke, vice-president, and B. F. Stewart, sales manager.

The exhibit also includes a McGuire steel truck and a sliding cushion fender.



CONSOLIDATED CAR HEATING CO.

The prominent feature of the Consolidated exhibit is a chair car heater designed for use on high speed interurban roads. It is fastened to the truss plank and extends nearly the full length of the car. It has recently been adopted by the Aurora, Elgin & Chicago, Chicago & Joliet, Canton & Akron, Detroit, Ypsilanti, Ann Arbor & Jackson, Lackawanna & Wyoming Valley, and is shown at the convention on car exhibited by the Jewett Car Co. It is also used on chair cars running between Albany and Schenectady. The company is also exhibiting one of these heaters with special finish, designed for private car for the Connecticut Railway & Light Co.



CONSOLIDATED CAR FENDER CO.

This company is showing prominently two of the latest fenders brought out by this company. These are known as Model "C" for city cars and Model "H" for high speed interurban cars. The fenders are shown attached to a stationary platform which is also fitted with the Millen car step lifter. At one side of the space are samples of the Campbell snow broom. All of these devices are well known to readers of the "Review." The exhibit is in charge of George H. Hollingsworth. The company is distributing a pocket writing tablet with leather cover. Col. Woodworth was unable to be present and was missed by the regular convention goers as there is no more familiar figure at the street railway conventions than Col. Woodworth.

NATIONAL LEAD CO.

The National Lead Co. is showing samples of its "Phoenix" and heavy pressure metals for bearings. On a table are shown specimens of armature bearings lined with Phoenix babbitt. One of the bearings shown has been in continuous service on a Detroit United Railway car since Aug. 22, 1901, and will be put back in service again as soon as this convention is over. Its exhibits comprise samples of armature bearings, motor axle bearings and car journal bearings, all of which have made phenomenal records. These samples were taken out of active service and brought to the hall for exhibition purposes and will go back into service as soon as the convention closes. The National Lead Co. is represented by F. B. Pierson, of Detroit; Walter H. Baker, of St. Louis; Mr. Arthur E. Jones, of Cincinnati; R. L. Weithas, of New York; Walter F. Marks, of Chicago, and Albert G. Marks, Detroit. The company's souvenir is a neat pocket knife bearing the company's name.



C. J. HARRINGTON'S EXHIBIT.

C. J. Harrington, the well-known New York dealer in railway supplies, exhibits in the annex, where he has the assistance of Mr. Frank Miller, his New England representative; Mr. P. R. Goldey, representing the Arco Circuit Breaker Co., and Mr. J. P. Heil, manager of the Heil Rail Joint Welding Co., of Milwaukee. Mr. Harrington's display is very complete and includes overhead material, gears and pinions, pipe brackets, lightning arresters, third rail arresters, commutators, fuse strips and wire, incandescent lamps, vitrified conduits, mica and numerous other devices.

The delegates seemed especially interested in the Heil cast-weld rail joint. It is claimed for this joint that it is cheaper to prepare and repair the track for welding the joints, that the joint is perfectly fused and perfectly welded, that it furnishes the best electrical conductivity, that it is the neatest and strongest joint, and that the joints, when welded, make a perfect track.



LUDLOW SUPPLY CO.

This company's space is located in the right hand gallery and the list of companies whose specialties it handles is a long one. Special attention is directed, however, to the "Automotoneer" of the Garton-Daniels Co., the pneumatic jacks of the Garry Iron & Steel Co., the Gore track drills, and the Johnson trolley retriever. The complete list of companies it represents is as follows: Morris Electric Co.; The Chisholm & Moore Mfg. Co.; Garton-Daniels Co.; Duff Mfg. Co.; Nichols-Lintern Co.; H. Gore & Co.; Frank Ridlon Co.; Garry Iron & Steel Co.; Dornier Truck & Foundry Co. The Ludlow souvenir this year took the form of a small envelope Co.; R. Bliss Manufacturing Co.; Lumen Bearing Co.; Crouse-Hinds Electric Co., and Detroit Trolley & Manufacturing Co. Ltd.

Among those making their headquarters at this space are Mr. W. E. Ludlow, president; Mr. J. B. Ludlow, secretary; Mr. A. J. Johnson, of the Federal Manufacturing Co.; Mr. J. V. E. Titus, of Garton-Daniels Co., and Mr. E. C. Powers, of Garry Iron & Steel Co. The Ludlow souvenir this year took the form of a small envelope opener bearing on the handle the familiar trade mark of the Ludlow Supply Co.



CONTINUOUS RAIL JOINTS.

The Continuous Rail Joint Co. of America shows a full line of joints for both girder and T sections of rails, together with a special display showing bonding for street railway uses. General Manager L. F. Braune, of Newark, N. J., superintends the exhibit, and other representatives present are B. M. Barr, of New York; S. P. McGough and J. H. Allen, of Chicago; W. A. Chapman, of Boston; P. J. Dalton, of Troy, and J. G. Miller and C. E. Irwin, of St. Louis.



Mr. J. S. Hamlin, manager of sales for the United States Steel Co., of West Everett, Mass., which makes the Neal duplex brake, is at the convention. Mr. Hamlin was formerly master mechanic of the Union Traction Co., Anderson, Ind.

SUPPLAEMEN'S DAY.

With associations set apart the whole of yesterday for an inspection of the exhibits and it was only necessary to walk through the Exhibition Hall, the Annex, the streets adjacent to the Armory, or the hotel parlors where exhibits were shown to see that delegates lived up to the program.



THEATRE PARTIES LAST EVENING.

There were two theatre parties last evening, one at the Detroit Opera House, under the espionage of the local committee, and the other at Temple Theatre, given by President J. M. Griffin, of the Wheel Truing Brake Shoe Co. There was a large attendance of delegates and associates, with their ladies, in each instance, and the entertainments provided were pronounced most enjoyable.



CROKER-WHEELER TROLLEY TRIP.

The trolley party given by the Croker-Wheeler Co. to the Rochester power plant on the Flint division of the Detroit United Railway was a most enjoyable affair. A large number of delegates were in attendance and the "run" was made in record time to the power plant which was inspected, after which everyone regaled themselves with refreshments which were served in abundance. Mr. Putnam A. Bates, assistant secretary of the company, was master of ceremonies and made it pleasant for all in attendance.



Mr. C. P. Wilson, general manager and chief engineer of the Camps Bay Tramway Co., Cape Town, South Africa, arrived early on Wednesday; he is now in this country on a leave of absence for a few months, and is making his headquarters in Milwaukee. Mr. Wilson has been in Cape Town since January, 1901, and reports that he is greatly enjoying the opportunity the convention gives him to meet his street railway friends. Mr. Wilson is one of the modern street railway men, young in years, but old in experience. Soon after his graduation from Cornell, about eleven years ago, he was superintendent of the 33d and Market st. lines of the Philadelphia Traction Co.; later chief engineer at Sioux City, Ia., and afterwards chief engineer of the Milwaukee Electric Railway & Light Co., which position he resigned to go to Cape Town.



Among the representatives of the Christensen Engineering Co. present at the convention are James J. Riley and W. H. Goble, both of New York.



Mr. Alexander V. Reed, vice-president of the United States Wood Preserving Co., 29 Broadway, N. Y., is here to introduce the wooden block pavement made by his firm. On August 5th the Railroad Commissioners of Connecticut rendered a decision giving the Hartford Street Railway Co. permission to lay wooden block between its tracks on Main St.



The Sterling-Meaker Co. is represented at the convention by its president, C. S. Ackley, E. F. Wickwire and E. B. McLean.



Mr. F. R. Spear, of the Spear & Miller Co., brake shoe manufacturers, of Chicago, is here renewing old acquaintances and making new ones.



Mr. A. B. Dalby, formerly president of the Hipwood-Barrett Car Fender Co., and now manager of the street railway department of the General Supply Co., New York, is an interested visitor at the convention. The General Supply Co. has just opened a depot for street railway supplies. It handles brake shoes, malleable iron castings, overhead material and track and shop tools.



The National Lock Washer Co., of Newark, N. J., exhibits the well known National Sash Lock and the National Curtain Fixture, among other products of its factory. Their exhibit is in charge of Secretary W. C. Dodd, assisted by Mr. R. L. Thomas.

THE BRILL EXHIBIT.

The Brill exhibit is in the annex just off the main aisle, and the cars and trucks displayed are attracting their full share of attention. The company has a large representation both at its exhibit space and at its parlors in the Cadillac.



WESTINGHOUSE EXHIBIT.

The Westinghouse Electric & Manufacturing Co. as has always been its custom, makes an elaborate display, its apparatus being classified into six exhibits. No. 1 is a 1,500-kw. rotary converter of the same design as those ordered by the Rapid Transit Subway Construction Co., of New York; 60 of these machines have been built or are on order since the first one was put out about a year ago. No. 2 is an exhibit of a complete multiple control apparatus for two cars with two No. 431 controllers and four No. 50 C. motors, all arranged on tracks for operation.

Exhibit No. 3 is devoted to railway motors and includes a No. 50-C, which is the type used by the Union Traction Co. of Indiana; a No. 76, such as is in use on the Rapid Railway System of Detroit, in two-motor equipments, and by the Toledo, Fremont & Norwalk in four-motor equipments; and a No. 81, a type of which 1,700 are used by the Brooklyn Height R. R.

Exhibit No. 4 is the Type X transformer, which has been designed to obtain good efficiency and regulation with all kinds of loads and high insulation. Exhibit No. 5 comprises three-phase Type C induction motors.

Exhibit No. 6 is given to detail apparatus including cell-type diverters as used for starting resistance in street cars; canopy switches for street railway equipments; automatic car circuit-breakers; automatic circuit-breakers for direct and alternating current, with laminated copper brush, swinging arms and carbon shunts at the top; iron fuse blocks for street cars; direct-current illuminated dial voltmeter and ammeter; and low-equivalent lightning arresters.

The company is represented by F. H. Taylor, L. A. Osborne, Arthur Hartwell, W. H. Whiteside, C. E. Skinner, A. Whitley, and J. M. Duncan, of Pittsburg; T. P. Gaylord, C. W. Register, and Irvin Dryer, of Chicago, and C. B. Humphrey, R. E. Drake, C. W. Underwood, W. E. Parker, Geo. B. Dusingberre, F. B. H. Paine, J. R. Gordon, R. S. Brown, N. S. Braden, D. D. Pendleton, B. T. Brady, H. B. Shute, N. W. Storer, S. W. Kier, H. P. Davis, P. N. Lincoln, C. Renshaw, H. N. Cheny, C. F. Medbury, W. B. Wriaks, M. Baxter, J. L. Crouse, from other of the company's offices.



CADILLAC HOTEL.

Nearly all the parlors on the second floor of the Cadillac are being used as reception rooms by manufacturers. Among those entertaining are: John Stephenson Co., Parlor A, in charge of E. J. Lawless, general sales agent, assisted by Thomas Carey, of the Boston office, and J. A. Hanna, of Cleveland; C. J. Harrington, Parlor E, in charge of Mr. Harrington, assisted by Frank Miller, New England representative, Samuel Haigh, Philadelphia office; Peckham Truck Co., Parlor D, E. Peckham, president of the company, assisted by J. A. Hanna and F. A. Richards, of Cleveland. In Parlor K the Christensen Engineering Co. is well represented by N. A. Christensen, F. C. Randall, manager of sales, J. T. Cunningham, J. F. Dickson, F. L. Hutchinson, R. T. Tell, J. H. Denton, Harry Ransome, W. J. Richards, C. D. Knight, E. Eldred, C. James, Wm. Powers, W. Waters, W. H. Gold, J. J. Nef, C. P. Tollman. The J. G. Brill Co. at Parlor J is in charge of Wm. H. Hollings, Jr., who is assisted by D. B. Dean, Samuel Curwen and G. M. Haskell.



LUMEN BRONZE.

The exhibit of the Lumen Bearing Co. is just at the head of the stairs leading into the gallery, and comprises bearings of various sizes and styles filled with the Lumen bearing metal, which has been described in the "Daily Review."

PLASTIC RAIL BOND.

Harold P. Brown has prominent space at the end of the main aisle. He has arranged a unique and very striking exhibit, consisting of apparatus for performing various tests on rail bonds. The chief feature is one joint of 75-lb. T-rail with two No. 00000 solid copper bonds in which the drop of 1 ft. of rail with 1,000 amperes is reported to be greater than the drop of 1 ft. of rail with the bonds; as also was the case when the current was raised to 3,000 amperes. The 3,000 amperes passing through the 75-lb. rail produced such strong magnetic field that a copper bond carrying the current past the joint was attracted from a distance of $\frac{1}{2}$ in. up to the web of the wire by magnetic attraction, an action that was doubted by practically every electrical engineer who called at the exhibit until he saw it actually done.

In conjunction with the exhibit was shown a new motorman's mirror, designed to afford a means by which the motorman can see the entire right side of the car and watch passengers getting off or on without doing more than slightly turning his head. The mirror projects about six inches beyond the side of the car but it is supported on a novel double swing spring hinge which permits the mirror to give in either direction if it is struck by a wagon or other obstacle, without damage to itself. The action permits the mirror to at once resume its normal position after the obstruction has been passed. The mirror itself is mounted in a backing of cork which effectually prevents breaking or damage.



WHEEL TRUING BRAKE SHOE.

The Wheel Truing Brake Shoe Co., of Detroit, exhibits two specialties,—its truing brake shoe and its commutator truer. In the brake shoe President J. M. Griffin declares that the flat wheel problem has been solved. That is, he does not mean to say that a means has been discovered of preventing flat wheels, but that his company's shoe makes it possible to true them up quickly and cheaply without taking the car or engine out of service.

The commutator truer not only cleans the commutator, but at the same time trues it up by removing any inequalities which may have formed upon its surface. This is done with an abrasive upon the same principle used by this concern in truing a flat wheel. The device is safe, is automatically adjusted to any diameter. It has a three point bearing and cuts truly. It is insulated and the abrasive is non-conductive. Mr. Griffin calls attention to an advertising folder that tells by means of illustrations and a conversation between a general manager and his master mechanic of the value of the company's products.



BALDWIN TRUCKS.

At the head of the street exhibits is the exhibit of the Baldwin Locomotive Works, consisting of two trucks, one a motor truck built for Westinghouse, Church, Kerr & Co., for the Lackawanna & Wyoming Valley Railway Co., and the other a trailer truck for the same people. The headquarters of the Baldwin Locomotive Works are at the Westinghouse exhibit in Convention



THE VAN DORN COUPLER.

The W. T. Van Dorn Co. exhibit of the automatic couplers that bear Mr. Van Dorn's name is in the building at 171 Larned street, near the entrance to the convention hall. The Van Dorn coupler is standard on many of the surface roads of the country. It is made in thirteen distinct patterns of different sizes, it is machine fitted and the links are milled with a milling machine, which makes everything absolutely exact. The Metropolitan West Side Elevated Railroad, Northwestern Elevated and the Lake Street Elevated of Chicago and the Boston Elevated are among large customers of Mr. Van Dorn. The exhibit is in charge of Mr. W. T. Van Dorn, who smilingly greets visitors and presents each caller with an aluminum cigar case.



Mr. Paul R. Goldey represented the Ar-Co Circuit Breaker Co., of Philadelphia.

THE CHASE-SHAWMUT FLEXIBLE BOND.

The Chase-Shawmut flexible rail bond is again attracting much attention as one of the latest types of soldered bonds. The advantages claimed for this bond are that it is easy to apply, that a high conductivity is guaranteed by the soldered contact, that the cost of installation is small, and when once in place it is very difficult to dislodge, and that it is always open to inspection.

The Chase-Shawmut Co., which is a Boston house, is represented here by Frank D. Masterson, its bond representative. Mr. Masterson wishes it known that his company will be pleased to send to all who request it a copy of "Electrical Data," a useful little handbook published by the company.



CHRISTENSEN AIR COMPRESSORS.

Mr. N. A. Christensen, of Milwaukee, is showing in the annex a Christensen motor driven air compressor for use in shops, power houses, etc., for furnishing compressed air for cleaning purposes, for pneumatic tools, etc. His shops are turning out these self contained compressors in sizes up to 175 h. p. The motor for driving the compressor is provided with automatic cut in and cut out control, which is positive in action, and throws the load onto the motor direct without resistance control.



KALAMAZOO RAILWAY SUPPLY CO., KALAMAZOO, MICH.

This company's display is in the balcony. The Kalamazoo Railway Supply Co. sells hand cars, inspection cars, trolley line cars, push cars, rail cars, track velocipedes, Kalamazoo trolley wheels and harps, cattle guards, friction jacks, jack screws, car replacers, railroad tanks, and a hundred other electric and steam railroad specialties.



THE LAST HORSE CAR IN DETROIT.

Detroit was the fourth city in the United States to have horse railroads, and was one of the first to abolish them in favor of electric traction.

The last horse car, No. 30, operated in Detroit was run on the Woodward line from the foot of Woodward ave. to the City Hall on Nov. 9th, 1895, at 3:00 o'clock p. m. At this point the horses were unhitched and sold to the highest bidder, the pro-



ceeds to go toward the Detroit Journal Explosion Sufferers' fund. The team brought \$200.00. The car was then attached to a motor and trailed up Woodward avenue to the end of the line. By the time it reached there, about all there was left of the car was the trucks, the body having been knocked to pieces by the crowds as souvenirs.



Mr. G. O. Nagle, manager of the Savannah (Ga.) Electric Co., is one of the delegates from the south. Mr. Nagle received a cordial welcome from all his old friends in the north and west. Mr. Nagle is accompanied by L. A. Powers, assistant treasurer.



The Eccleston Lumber Co., of New York, makes a specialty of ties, poles and cross arms. Its facilities are such that orders, no matter how large, can be promptly delivered from stock in the New York City yard or direct from the mills.

PANTASOTE.

The many attractive shades and designs in which "Pantasote" is made were brought forcibly to the attention of delegates by the exhibit of the Pantasote Co. in the balcony. As is well known, this material closely resembles morocco leather, and has worked its way into wide use for car seats, car curtains, head linings, etc. The material is waterproof, stain proof, grease proof and odorless, and is guaranteed not to rot, crack or stiffen in service. Mr. John High did the honors for the company.



JOHNSON CAR REPLACER.

This device is manufactured by the Johnson Wrecking Frog Co., of Cleveland, O., for the purpose of providing a means for replacing cars, trucks, locomotives or any other class of rolling stock that is liable to derailment. The devices comprise two steel castings, one for each rail, so arched as to lead the wheels of a derailed car from the paving or road bed onto the rails. Mr. O. W. Johnson is exhibiting the replacer. The castings will work on any size or shape of rail.



PECKHAM TRUCKS.

This exhibit occupies considerable space just outside the main entrance to the hall. It is made up entirely of trucks, the various types being as follows:

Peckham No. 32 M. C. B. truck, one of 20 now being built for the Columbus, Delaware & Marion Ry., and is also the type used by the Indianapolis, Lebanon & Frankfort Traction Co. and the Toledo & Indiana Ry. This truck is M. C. B. standard throughout with triple elliptic bolster springs and fitted with steel tired wheels. It is prepared for four 75 h. p. motors per car. This truck weighs about 9,000 lbs.

Peckham "Extra Strong" 14 B-3 short wheel base truck. This is one of 100 now building for the Cincinnati Traction Co., this being the third order for similar trucks. It is constructed for four Westinghouse 68 motors per car and has triple spring suspension with wheel base 4 ft. 6 in. The weight of each truck without the motors is 5,540 lbs. Four hundred of these 14 B-3 "Extra Strong" trucks have been furnished to the Massachusetts Electric Cos. of Boston. The company had intended to exhibit a new truck built for the Aurora, Elgin & Chicago Electric Ry. Co., but unfortunately the truck was delayed in transit and has not yet arrived. The Peckham staff of selling representatives and agents was out in force.



PENN. STEEL CO.'S EXHIBIT.

The Pennsylvania Steel Co. has a commodious booth where it displays models of the Long safety switch stand, the "Anvil Face" frog, adjustable angle bar re-enforced split switch, "Challenge" split switch and other devices. There are also shown some interesting blue prints of special work layouts and pictures of bridges, particularly the Goktiak viaduct of Burmah, India. In addition to giving callers a new catalog on special street railway work, the company presents each with a steel tape souvenir. The booth is attractively arranged and furnished with office equipment. R. E. Belknap, of Chicago, is in charge, and other representatives in attendance are W. C. Cuntz, of Philadelphia; J. G. Miller and A. F. Irwin, of St. Louis; Clifford J. Ellis and H. K. Parsons, of Chicago; Charles S. Clark, of Boston, and C. F. Alden, of Steelton, Pa.



THE CREAGHEAD PRODUCTS.

The Creaghead Engineering Co., of Cincinnati, is represented by its sales manager, Mr. A. E. Payne, who takes pleasure in detailing the excellent points of the company's exhibit. A full line of overhead material is shown, including the Creaghead incandescent lamp and the Bourbon strain insulator. To enumerate the street railway companies using the Creaghead manufactures would take a long time. The Creaghead company also handles the American Car Seat Co.'s products. Mr. Payne gives each caller a handy pocket rule.

JOHNSON'S TROLLEY RETRACTOR.

The Federal Manufacturing Co., of Cleveland, is putting on the market a device known as the "Johnson Trolley Retractor," which, as its name implies, is designed to afford protection to the overhead construction when the trolley pole leaves the wire. The machine consists of a rotatable casing mounted in frame and containing a tension reel provided with an automatic adjustable locking device, a retractor arm of proper length receiving the power of the springs through the medium of the arm and yoke. As the retractor springs can be wound up by the ratchet to agree with the trolley pole tension, the vicious action of unnecessary power in the start is obviated in case the harp should be pressed against the wire.

The action is briefly this: When the car is running and the trolley on the wire, the tension reel accommodates the variations in the heights of line, but when the trolley jumps from the line a sudden upward movement of three or four inches locks the reel and raises the latch. The arm then swings down like the action of a human arm and carries the trolley with it, the reel remaining securely locked while in that position, but is released when the arm is raised to upright position to replace the trolley on the wire. The device is in use on cars of the Western Ohio Railroad, the Toledo & Western, and the Cleveland, Elyria & Western.



HALE & KILBOURNE WALKOVER SEATS.

This year's exhibit by the Hale & Kilbourne Co., of Philadelphia, manufacturers of car seats, is much more elaborate than usual, there being a greater variety of "Walkover" seats displayed. The steel construction of these seats has been highly commended by many railway officials. The company showed several new features, among which is a bronze back band, instead of the old-style wooden back band so long used. Mr. H. T. Bigelow, of Chicago, extends a cordial welcome to callers.



A BURGLAR-PROOF VEST.

The Bellamy "Vestlette" for street railway conductors is exhibited in the balcony by Mr. O. N. McClintock, assistant manager of the Bellamy Vestlette Manufacturing Co., of Cleveland, O. The "Vestlette" is made of strong, durable material, with cloth finish of same color as the uniform and of a quality suitable for any gentleman's wearing apparel. It has nine commodious and convenient pockets for money, tickets, reports, pencils, punch, transfers, watch, etc. Owing to its peculiar construction, it is impossible for a pickpocket to get his work in undetected. Neither can change be lost in running to switches or jumping on or off cars.



THE "CLIMAX" STOCK GUARD.

Mr. H. S. Overstreet, manager of the Climax Stock Guard Co., Marquette Bldg., Chicago, who is at the convention, gives the following reasons why interurban roads should use the "Climax" guard:

Its own weight is all that is necessary to keep it in position with a 2-in. wooden cleat around the guard. It can neither burn, rust or decay, and is practically indestructible. It is cheaper than either wood or iron, and, in fact, has no competitor in price.

It does not require to be taken up at least twice a year, that the weeds growing through it may be cut; no weeds grow through this guard. The expense of installation is practically nothing, as it needs no special preparation to place it in the track; no excavation and no changes in the track beyond the possible replacing of seven ties, requiring the use only of ordinary section labor. It can readily be adapted to any gage and to any length of guard desired.

In case a wrecked car or train passes over it, or break beam strikes it, it sustains less damage than any other guard manufactured. Should any of the blocks be broken, they can readily be removed and new ones put in, leaving the balance of the guard intact. It is impossible for train men or others crossing the guard to be injured by falling on this guard or caught in it. In repairing or changing the track, it can be taken up and replaced without the slightest damage and at practically no cost.

OAKLEY STEEL TERMINAL RAIL BOND.

The Worcester Steel Foundry Co., of Worcester, Mass., is showing at the Chase-Shawmut booth the Oakley steel terminal rail bond fused joint, which embodies what is believed to be a new idea in electric railway bonding. The terminals are made of a special steel alloy very low in carbon and cast on the copper cable or ribbon, making a fused joint. When the terminal is expanded in the rail it makes a joint of high conductivity.

The steel terminal bond possesses many advantages but heretofore the difficulty in the way of properly fusing steel and copper has hindered development along that line. The inventors of the new bond claim to have discovered a way to form a perfect amalgam of the two metals.

The following letter has been received from H. B. Smith, professor of electrical engineering at Worcester Polytechnic Institute, Worcester, Mass., concerning this bond:

• • • "The two samples on which the most conclusive measurements were made consisted of cast steel terminals on a stranded copper cable of 49 strands of No. 16 B. & S. wire. The resistance of the two cast joints and steel terminals gave approximately .000038 ohm, in one instance, and .000021 ohm, in the second instance. By measurement, and in terms of the stranded cable itself, the resistance of the two joints and terminals was approximately equal to the resistance of 7.3 in. and 4.1 in. of cable respectively. These measurements were by the 'fall of potential' method and with as high as 100 amperes applied to the bond. Close inspection and tests indicated that these samples had an excellent fused joint of high conductivity."



A NEW STEPHENSON CAR.

The up-to-date interurban car exhibited by the John Stephenson Co., on Larned street, is attracting a great deal of attention. It is intended for use on the Muncie, Hartford & Fort Wayne road and is especially designed for high speed. It is a combination passenger and baggage car, the baggage compartment being equipped with folding seats in order that it may be thrown into a smoking compartment. The car is piped for the Peter Smith system of hot water heating; there is a toilet at one end; at the sides above the seats are racks for parcels; the floor is double; there are Stephenson spring bumpers at the ends, and in all respects it is much like a steam railroad coach. Between the seats in the center of the car removable card tables are placed. The interior finish is of mahogany, very plain, but not the less pleasing to the eye. The seats are of the Hale & Kilbourne rattan walkover pattern and the register is a Ohmer make. The trucks are the Stephenson No. 8, built expressly for high speed. The Stanwood car step is used. The length of the car over all is 55 ft., the car body being 45 feet, and the vestibuled platforms 5 ft. each. The car was built under the specifications and inspection of E. P. Roberts & Co., Cleveland, O. It is in charge of Mr. J. A. Hanna, the Stephenson Co.'s sales agent at Cleveland.



SQUIRES' AUTOMATIC FEED WATER CONTROLLER.

The Standard Steam Specialty Co., of New York, announces that after a thorough investigation it has taken the agency of the Squires automatic feed water controller. This device has been on the market some years, and is recommended highly by all of its users. It is so constructed as to allow a full opening of the feed valve, and it is claimed will maintain a true water line in surging boilers, either marine or stationary. It is simple in construction, and as a consequence of this will cost less for repairs and is less liable to get out of order. The operation of the controller being continuous, the greatest economy in coal consumption is obtained; because, adjusting itself as it does to the varying demands for steam, it keeps in the boiler just the amount of water necessary to most advantageously make steam, and no more. There is consequently no coal wasted in making steam simply to blow through the safety valve. Mr. F. H. Lovejoy represented the makers.



Dalzell & Co., of Philadelphia, distributed circulars and pamphlets descriptive of its supplies and specialties.

MOTORMAN'S SEAT.

The motorman's seat which has been adopted by the International Railway Co., of Buffalo, N. Y., and which was described in the "Review" for July, 1902, is to be found among the exhibits of the Morris Electric Co., of New York.

Managers who have motormen making long runs on interurban roads and have lost men because of sore feet would do well to see this seat.



WHEEL GRINDING MACHINES.

At 171 East Larned street, adjacent to the exposition building, may be seen one of the Springfield Manufacturing Co.'s car wheel grinders in operation, under the supervision of General Manager George W. Jackman, of Bridgeport, Conn., where the plant is located. The No. 2 steam and electric car wheel grinder made by this company is designed to grind wheels either on or off from axles, and is arranged to grind two wheels at one time. The emery wheels or rims are held by a patent chuck, which allows a very high speed and with perfect safety. By the introduction of these chucks the centrifugal strain is overcome and the danger of broken emery wheels reduced to the minimum. It is claimed for this machine that by having tail stock and wheel heads fastened to one bed wheels may be ground perfectly round, and when so ground will give a greater mileage and not become skidded nearly as quickly as when ground on their own bearings. The No. 1 grinder is equipped with 18x1½-in. emery wheels, and where a comparatively small number of wheels are to be ground a No. 2 wheel, which is practically the same as No. 1, is recommended. Mr. Jackman has the assistance at the exhibit of James Harvey, also of Bridgeport.



THE OHMER REGISTER SYSTEM.

The Ohmer Fare Register Co., of Dayton, O., has a very complete exhibit in the left hand balcony, where the workings of its improved dial system is frequently expounded daily. This system is adapted for all roads collecting two or more denominations of fares, and has been fully described in the "Review." In addition to the register, dials are placed on the front and rear platforms and, if the car have a smoking compartment, on each side of the partition. By this means each passenger can see all the fares registered. The classification of fares collected along the line are arranged on each dial.

There is also a trip number dial on one side of the register, which runs from 1 to 31, and on the other side is a dial that shows the month and the day of the month. Each conductor has an identification or badge key to correspond with his badge number.

In order to unlock the machine it is necessary that the conductor insert this badge key into the register and then insert an impression key below the other and take an impression of the register by turning the key once, which unlocks the machine and the register is ready for service.

The conductor, on the first trip out, will turn the trip dial to 1 and take the first impression under the head of "1." That impression gives the company a printed statement showing the reading of each classification of fare, also the month and day, the trip number and the conductor's badge number.

With the Ohmer machine the conductor has no knowledge of how many fares he has collected during the day. When he finishes his day's work he takes his own change out of the cash and turns the balance over to the company. He has no knowledge of how sold cash, tickets or paper will balance with the sheet printed in the machine. The totalizer on top of the register gives the conductor the actual number of fares collected and the sheet printed in the register gives the company the classifications. General Manager John F. Ohmer is at the convention and is assisted by Mr. M. McDonald.



The Hell Railjoint Welding Co., of Milwaukee, Wis., distributed flowers to all its visitors to-day, as did also the Knell Air Brake Co.

THE PASSING OF CADILLAC.

Two hundred years ago there was no city of Detroit. The site was occupied by a French military post, Fort Pontchartrain, under the command of one Cadillac, a gentleman of prodigious valor and a soldier of fortune who battled in the wilderness for the bubble reputation and was ruined in the quest of it. A row of rough log cabins, the homes of voyageurs and pioneers, lined the river, and in the midst of these Cadillac had built himself a manor where he affected as much of pomp and courtly fashion as was possible in such environment. His house was distinguished from the rest by the "gallerie" above the door and the maypole which fronted it, by the silver plate which adorned his table, and chief of all, by the presence of Madame Cadillac, a beautiful and admirable lady, who was the first white woman to take up her abode among the Indians and French soldiers at Fort Pontchartrain. On holidays the seigneur and his lady entertained, the hospitality of Cadillac being of equal degree to the severity of his discipline, and on such occasions strange scenes were enacted on the banks of the Detroit. The courtyard of the manor was filled with soldiers, voyageurs and Indians, in picturesque attire, and echoed to the racket of trumpets and drums, and to the song of the French adventurers:

"Grand Dieu, sauve le Roi,
Grand Dieu, venge le Roi,
Vive le Roi,
Que toujours glorieux
Louis victorieux
Voye ses ennemis,
Toujours s'unis,
Vive le Roi!"

The fleurs de lis of France fluttered from the maypole, around which the soldiers danced while Cadillac and his wife, and such other persons of quality as had followed the Seigneur to Fort Pontchartrain, witnessed the festivities from the "gallerie" of the manor. The Seigneur's wine was free to all, and all partook of it. After the maypole dance there were games and sports, becoming more boisterous, toward the close, by reason of the Seigneur's generous dole of wine. When the long merry-making had come to an end all paid homage to Seigneur and Madame, and departed, singing the praises of both, and petitioning the Virgin to defend them from "le petit homme rouge,"—a goblin of malevolent propensities, much feared by the superstitious as possessing the power to wreck the fortunes of all whose path he crossed.

Adjoining the manor was a long rose garden, in the cultivation of which Cadillac delighted. It extended from the river to the present site of the Chamber of Commerce in Detroit, and here all varieties of roses bloomed in profusion. Paths wound among the bushes under the shade of great trees, and lawns sloped gently to the river. When the Seigneur was oppressed with the uncouthness of his frontier home, and longed for the luxuries and refinements of the life he had led at the court of Louis, it was his custom to stroll through the rose garden arm in arm with his wife, for here were beauties which Versailles could not surpass. It is related that at the close of one of the maypole festivals the Seigneur and Madame Cadillac were thus strolling through the garden, when a dwarf, habited in red, crossed their path, and impudently addressed them. The Seigneur, being a man of quick temper and unaccustomed to forbear in punishing offenders, struck at the dwarf with his cane. The latter cursed him roundly, whereupon Cadillac thrust out his hand to grab him, but instead of encountering le petit homme rouge, his hand grasped a crimson rose on a bush near by. The dwarf had mysteriously disappeared, and the search of the manor servants through the garden and along the river banks, a search which lasted until morning, failed to discover him. The decline of the Seigneur's fortunes began from that day, and he and his wife, in all the subsequent times of financial disaster and banishment, never doubted that their ruin had been directly brought about by "the little man in red."

The story of Cadillac from the beginning reads more like an old romance than a bit of history. This man had a long and fanciful name, as becomes and generally falls to the portion of explorers and adventurers. In full it was Antoine de la Mothe

Cadillac, later Lord of Donaquee, and from the prowess of his deeds there is every reason to believe that the bearer of the name faithfully tried to live up to it. Cadillac was a native of Gascony, and, it is probably, the counterpart of those Gascony Cadets who appear so formidable and so amusing in *Cyrano de Bergerac*:

"The bold cadets of Gascony,
Brawling and swaggering boastfully,
With flaming feather that gaily prauks,
Hiding the holes in their hats, forsooth,
Eagle-eye and spindle shanks,
Fierce moustache and wolfish tooth,
Bold cadets of Gascony,
Brawling and swaggering boastfully."

This is what Cadillac may have been, before he learned the elegancies of the court of Louis XIV., for we are told that he entered the service of the king much scarred and hardened in the practice of self-defense, and it is certainly true of him that he indulged an inordinate taste for grandeur, as appeared at Detroit, where the pomp of the seignory, figuratively speaking, "hid the holes in his hat, forsooth," for Cadillac, though possessed of vast estates, was invariably in straits for ready money.

After being captain of the French marine service, Cadillac came to Acadia (now Nova Scotia) in the latter part of the 17th century. In all his seafaring expeditions he had had for a worthy partner, Francois Guyon, also in the service of the king. Guyon was the elder man, and he had, living in Quebec, a daughter of great repute for her beauty, wit and gentleness of disposition. Cadillac, on hearing these desirable qualities praised by Guyon, determined that she was the wife that the fates were saving up for him, and he immediately set out for Quebec with the intention of proving the correctness of his supposition. This he was successful in doing, as is evidenced among the archives of the cathedral at Quebec, where the marriage register of Antoine de la Mothe Cadillac and Therese Guyon are still shown to visitors. At the time of his marriage, Cadillac held both military and marine commissions from the king, was a lieutenant in the famous Carignan regiment, a seigneur of Acadia and Lord of Donaquee. A year later he was commissioned to lead an expedition against the English, piloting the fleet of Sieur de la Casiniere to the bay of New York. The expedition resulted disastrously, and Cadillac was summoned by the king to France. During his absence of more than a year, Therese, his wife, who was then but 18 years old, managed his estates and interests in the wilderness of Canada. Port Royal, in which place she lived, was attacked and burned by the British, and Madame Cadillac narrowly escaped death in the conflagration which destroyed her home. With the enemies of the French in pursuit she set out on a perilous journey for Quebec and reached her destination half dead from exhaustion and hunger. After many months' detention caused by his business and by the intrigues of his enemies, the Seigneur rejoined his wife and cheered her with agreeable news. He had regained the favor of Louis, and had won the esteem of the great Comte Frontenac, through whose influence he had been made a Knight of St. Louis, and expected to be made the commander of Michilimackinac. In the following year Cadillac obtained grants of Mount Desert Island and a large tract of land on the coast of Maine. He organized a patrol of boats for the St. Lawrence, and in recognition for this service to the crown his appointment to the post of Michilimackinac was ratified. Cadillac commanded there until 1697, when he returned to France and petitioned the king for the establishment of Fort Pontchartrain on the Detroit River. In 1701 Fort Pontchartrain was built and the Seigneur and Madame were installed in their manor with its gallerie, its rose garden and its maypole. It is said that on her arrival at Detroit, the Indians, who had never seen a white woman, pressed around her to kiss her hands, saying, "Now we know that the French mean to be friends with us, since they have brought a white woman to live in our country."

The day after the alleged encounter with le petit homme rouge Cadillac was appointed Governor of Louisiana. That was in the year 1712. During his five years' incumbency of this high office he became involved in many unfortunate affairs. He endeavored to work the silver mines in that part of the French dominions which is now Missouri, and lost his own and others'

fortunes in the venture. Equally disastrous was his attempt to open trade with Mexico. He was, however, successful in establishing forts among the Alibamons and Nachitoches, but by his unwise conduct incurred the hatred of the Indians and precipitated wars with them. For these reasons after the death of Louis XIV., Cadillac was in disfavor at court. He was commanded by the new king to return to Paris, and obeyed the command, Madame Cadillac accompanying him. The enemies of the Seigneur succeeded in securing his imprisonment on a false charge that had nothing to do with his misadventures in America, and subsequently his banishment. Madame Cadillac, who had so stanchly braved the terrors of the wilderness by her husband's side, remained loyal to him in exile, continually soliciting the king for his pardon and reinstatement as governor of the American provinces. She grew old in this vain service, and her death soon followed that of her husband in the year 1719.

But the malevolence of le petit homme rouge, though the failure of the fortunes of Cadillac be attributed to it, did not suffice to make his illustrious name forgotten, or to diminish the homage which is paid to the devotion and nobility of Madame Cadillac.



MR. JOHNSON HELD THE WATCH.

A street railway man in the Russell House lobby yesterday told a good one on Tom L. Johnson, that is too good to be lost to posterity. It will be remembered that Mr. Johnson was at one time considerably identified with the electric railway situation in Detroit.

As the story goes, Mr. Johnson was delayed down town one night at a meeting of the board of directors, and took the 12 o'clock car for his beautiful residence in the suburbs of Detroit. The walk from the car line to his house was rather a lonely one, and on this particular night, as he alighted from a car and it sped on its way, leaving him in the obscurity of a single electric light, Mr. Johnson noticed two rather dilapidated-looking gentlemen lurking in the shadow of a large oak tree. Now, Mr. Johnson enjoys the reputation of rather enjoying a good discussion, and besides, the car had gone, and there was no place to run. So buttoning up his coat, and taking a firmer grasp on his gold-headed walking stick, Mr. Johnson started up the street, past the two men, determined on the slightest show of hostility on their part to give a good account of himself. Much to his surprise he found the two men quietly smoking, and evidently merely enjoying the fine evening. As he passed, one of them asked for a match in a perfectly gentlemanly tone. Mr. Johnson handed him one, and went on his way, harshly criticising himself for being so suspicious.

He had not gone but a block, when placing his hand at his waistcoat pocket he found that his handsome gold time-piece was missing. Thereupon he began to criticise himself for being so easy, but he could not help but respect the quickness with which the light-fingered gentleman had removed the watch without attracting the slightest attention. The more Mr. Johnson thought of the matter, the angrier he became, and just before reaching the house, finally decided to go back, and if possible, find the two thieves and force them to give up the cherished time-piece. To decide was to act, and taking another hold on the cane he started to retrace his steps at a lively pace. Somewhat to his surprise he found the two in the same position at the tree, and they, probably noticing his foreboding attitude, started on a run for a near-by alley. Now assured that one of the men had taken his watch, Mr. Johnson raised his cane and started for the two culprits at a lively pace. Turning into the alley he unexpectedly stumbled over the two men, who were crouching in a dark corner. Seizing one of them by the throat, he demanded in strong terms the delivery of his watch. The robbers were now probably thoroughly cowed, for one of them thrust out into the darkness something that Mr. Johnson felt was his watch. Satisfied with the recovery of his property, Mr. Johnson once more started for home, with a very satisfactory smile on his face.

Reaching his mansion he was met by his wife, who had become exceedingly anxious at his long delay. "Oh! Tom," she

cried, "I have been so worried, and thought that something dreadful had happened to you."

Under the circumstances, Mr. Johnson could afford to be dignified, and assuming an injured expression asked his wife if she did not think he was old enough to take care of himself. However, once upstairs he could not resist the temptation to tell of his little encounter. As he got to the place in the tale where he forced the robbers to give up his watch, the look of acute anxiety on his wife's countenance changed to one of dismal dismay. Before the tale was ended, Mrs. Johnson had collapsed into a chair, and was weeping hysterically. By this time Mr. Johnson was also worried and unbended sufficiently to inquire the cause of this unusual outbreak. "O Tom, Tom, what will they do with you?" was all his wife could sob between her two hands in which her face was buried. "Do with me," replied Tom, "why, they won't do anything; they are only too glad to get off so easily."

"But, O Tom, you left your watch under the pillow this morning, and now they will arrest you for highway robbery."

This put a new light on the matter, and drawing out what he supposed was his recovered property, he found the watch was a very handsome one, but very different from his own. At this Mr. Johnson also became anxious.

Next morning a small advertisement appeared in the papers as follows: "If the two gentlemen who were relieved of a watch on Blank street last evening will address the undersigned, they can have their property back, and no questions asked or answered. Address P. D. Q., P. O. Box 24."

This advertisement evidently did not reach the eyes of the proper parties, and now Mr. Johnson is the possessor of two valuable watches, one of which he never wears, however. It rests undisturbed upon the top shelf of the attic closet.



Mr. William H. Sheldon, Jr., secretary and treasurer of the Miller-Sheldon Electric Co., Detroit, has been making many new friends this week.



Mr. Arthur S. Partridge, a St. Louis railway supply man, is enjoying the convention and exhibits thoroughly.



Mr. F. J. Coakley, western representative of the Samson Cordage Works, of Boston, came on from Chicago to see what's doing at the convention.



Stromberg Carlson telephones are shown at 171 Larned street annex.



Mr. Albert F. Schroeder, of Cleveland, is looking after the interests of the Globe Michigan & Stamping Co., which makes the King trolley stand and pole, the "Improved" trolley-harp, and Globe headlights.



The C. C. Wormer Machinery Co., of Detroit, general dealer whose factory floor space is about 300,000 sq. ft., is represented at the convention by Mr. P. H. Briggs, who is to be found at booth No. 59 in the balcony.



Mr. William Sutton, who was president of the American Car Co. for many years, was in evidence at the hall yesterday. Mr. Sutton is now associated with the St. Louis Car Co., where he will be pleased to meet all old friends, who are legion.



J. P. Heil, manager of the Hell Railjoint Welding Co., of Milwaukee, attended the convention and reports business for his company as being first-class. Among the recent orders are a complete welding outfit for Toronto, Canada, also a contract for 9-in. girder work for the Pittsburg Railway Co., the work to commence November 15th.



The Burroughs adding machine, manufactured by the American Arithmometer Co., of St. Louis, is exhibited by W. E. Weatherby, who has the space originally assigned to the Bishop Gutin-Percha Co.

JONES UNDER-FEED STOKER.

The Under-Feed Stoker Co. of America is represented at the convention by Mr. A. H. Charles Dalley, of Chicago, who calls attention to the good qualities of the "Jones under-feed stoker," as proclaimed in a special catalog designed for this occasion, and showing views of the Oneida street power house of the Milwaukee Electric Railway & Light Co. In this plant are installed 15 Jones stokers beneath 3,000 h. p. of Edge Moor water tube boilers. In addition 32 machines (6,400 h. p.) are being installed in the same company's new Commerce street plant, now building. Upon completion of this plant there will be 50 Jones stokers (10,000 h. p.) in the plants of this company.

Delegates and associates who may be interested in the subject of mechanical stoking are invited to visit some of the Detroit installations of the Under-Feed Co. They may be found in the works of Berry Bros., Ltd., Detroit Soap Co., Ireland & Matthews Manufacturing Co., Detroit City Gas Co., the Union Trust Co. building Hammond building and Stevens building. Across the river there are 10 Jones stokers in Uiram Walker & Sons' distillery and two in the Parke, Davis & Co. plant, both in Walkerville, Ont. In Windsor the machines are installed in the internally fired plant of the Canada Salt Co., Ltd.



A UNIFORM CAP DISPLAY.

F. H. Newcomb, the Brooklyn manufacturer of uniform caps, is on hand as usual with a fine display of his products, together with a very nice bill pocketbook that he gives to all old friends who call upon him at his booth in the balcony. Mr. Newcomb supplied the Brooklyn Rapid Transit Co. with 8,000 caps last year and says that orders are coming in from railroad and steamboat companies all over the country.



MAGANN AIR BRAKE CO.

The Magann Air Brake Co., of Detroit, is making an elaborate working test of the entire equipment as constructed by this company for the use of modern interurban roads. The exhibit includes a car equipment consisting of a Magann straight air storage equipment, the jam cylinder working against heavy springs so that actual service conditions are reproduced. Air for this equipment is supplied by a motor driven compressor having capacity of 14 cu. ft. of free air per minute. The compressor stores air at 300 lb. pressure in large steel cylinder tanks, the main storage tank being 36 in. in diameter and 15 ft. long and the surge tank being 18 in. in diameter and 7 ft. long. This is the equipment the company recommends for placing at a convenient point on the road so that cars can be charged with air to give the best results. It requires about one-half minute to charge a car from these tanks, supplying the car with enough air for 200 stops without recharging. The Magann air brake is now used on four of the interurban lines running into Detroit, also on the Kansas City & Leavenworth, Cleveland & Eastern, and many others. Among the recent orders is one for 40 equipments which have been placed on the new cars of the Schenectady Ry. Co., operating between Schenectady and Albany and Troy.

A feature of the exhibit which calls attention to itself is the whistle attached to the air brake mechanism, fed from the air tanks, which can be operated efficiently at the low pressure of 10 lb. This can be installed with the device or detached, as the buyer prefers. The company is represented at Convention Hall by E. C. Rutherford, W. E. Omick, F. Y. Harrison, and C. L. Main.



The G. P. Magann Air Brake Co.'s special car took a party out to Royal Oak yesterday. The car was among the number equipped with the Magann air brake, which was thoroughly demonstrated to the pleasure and satisfaction of the visiting street car men aboard. Among the guests were N. H. Heft, electrical engineer of the New York, New Haven & Hartford, and E. H. Keating, general manager of the Toronto Street Railway.



The pocket book given away by the American Steel & Wire Co. is useful as well as ornamental.

Mr. George C. Ewing, who is now located in Boston, dealing in electric railway material, was in attendance, and also represented the Nernst Lamp Co., of Pittsburg.



Mr. George E. Pratt, in addition to his duties as assistant general sales manager and contracting agent for Niles Car & Mfg. Co., Niles, O., will act in the future as purchasing agent for this company.



Mr. George C. Bailey, secretary and treasurer of the John A. Roebbing Sons Co., Chicago, Ill., was in attendance, meeting his many friends.



Mr. Eeeker S. Barnard, vice-president and secretary of the Standard Vitreous Conduit Co., New York City, was in attendance.



Mr. Carl M. Vail, secretary and treasurer of Westinghouse, Church, Kerr & Co., New York City, was in attendance, and while in Detroit inspected several plants that have been put in by his company.



Mr. J. B. Crankshaw, electrical engineer for the Electric Railway Equipment Co., of Cincinnati, Ohio, was in attendance.



Mayer & England Co. and Protected Rail Bond Co., of Philadelphia, were represented by C. J. Mayer, J. W. Gallagher, Wm. A. Armstrong, and W. A. Coekley.



A souvenir that appeals to visitors is a small celluloid dice box covered by mica, in which repose five diminutive and innocent looking bits of bone. It is the gift of the Ohmer Fare Register Co.



The Powell & Turner Truck Co., Troy, N. Y., is distributing an appropriately inscribed coat lapel button as a souvenir.



The Stuart-Howland Co.'s souvenir this year is a miniature bronze trolley wheel dependant from a coat button, or badge, which is inscribed "Stuart-Howland Co., Boston and New York," and in the center, "Detroit, 1902."



The International Register Co. is represented by President A. H. Woodward, Secretary and Treasurer W. H. Brown, and Messrs. F. B. Hall and E. T. Runge.



In the balcony on the right is a modest but none the less interesting exhibit of a model of the patent railroad crossing made by George W. Willebrands & Brother, 52 Jefferson avenue, Detroit. The action of this new crossing is automatic, responding to the movement of the car, and no matter in which direction the car is going a continuous rail is presented.



The exhibit of Mr. C. S. Knowles, of Boston, failed to arrive, so he surrendered his space to the Bellamy Vestlette Manufacturing Co. and the C. C. Wormer Machinery Co.



Dumee, Son & Co., of Philadelphia, would like to open correspondence with those who desire to buy franchises and rights of way of electric railways, also existing paying roads. The company has a number of first-class propositions which it would like to put before first-class parties who would be interested either in buying or financing.



Mr. W. J. O'Connor, general storekeeper of the Brooklyn Rapid Transit System, attended all the accountants' meetings.



Mr. Lehman B. Hoyt, district manager for the Bullock Electric Manufacturing Co., at Cincinnati, aided in distributing the company's souvenir medal.



G. S. Allison, of New York, dealer in second hand material, was represented. Mr. Allison has some bargains in railway goods.

ON TRAMWAY EXPOSITIONS.

It is evident from the following published in the Electrical Times, of London (with apologies to Mr. Dooley), after the International Tramways and Light Railways Exhibition held in London last July, that the social features were not entirely neglected.

"If there's wan thing I hate," said Mr. Dooley to Mr. Hennessy, "it's exposishuns; they're all th' same, fr'm canned pork Wur'ld Fairs to Baby Shows in West 56 street. P'inty iv moosic, good an' bad; lots iv drink, mostly indiff'rent; any amount iv things to see wid no connecshun to th' exposishun; an' lastly, stowed away in th' annexe, somethin' to give th' show a name. Phwat I say is this: exposishuns is run in th' interest iv the cigar, brass-band, an' liquor thrades, takin' th' bread away fr'm honest folk loike mesilf an'—"

"Divvle-a-bit it is I understand ye," said Mr. Hennessy; "eg-poshishuns is fr'th' good iv thrade—"

"Thrade be damned an' you too," cried Mr. Dooley, "fr' expressin' opinions whin ye don't understand. Exposishuns is got up be other nayshuns fr'to sell their rubbish, an' to find out phwat is doin' in this counthry. Whin they've had a free demonstrashun, they go home an' copy th' goods thimsilves, bad luck to thim. Have ye been to th' Thramway Exposhishun? No. Thin I have. Phwat d'ye knaw about it? As much as I do. Thin ye've been there,—Casey's been there,—Mike's been there; we've all been there some time or other. It's been a flower show, a dime wax work show, a food show, a charity bazaar, an Aztec circus. They're all alike."

"How did ye git there?" asked Mr. Hennessy.

"I wint to London fr'to see th' Coronashun," said Mr. Dooley, "an' just as I was lookin' th' rayturn journey—here, fill up your glass, take off that hat an' stand up, ye spalpeen; here's to King Edward, God bliss him, an' confound his pollities!"

The two cronies drank with enthusiasm. "As I was sayin' whin ye lutherrupted," Mr. Dooley went on, "I was bookin' th' rayturn billet, whin I picked up a yaller ticket fr' free admishun to th' Tramway Exposishun. They was lyin' about in thousands, so I shopped another week—"

"Another week?" asked Mr. Hennessy, in surprize.

"Another week," repeated Mr. Dooley, "an' if it had been you, y'd've stayed another month, with th' cigars an' whiskeys that was bein' handed around. Whin I got to th' gates I showed me yaller ticket an' th' minton bowed; he touched his hat to people with white tickets, took no note iv people with blue tickets, an' those who paid a shillin' he laughed at."

"They must have been fools," said Mr. Hennessy.

"Thru' fr' ye, so they were," replied Mr. Dooley. "Whin I got into th' Hall, th' on'y thing I could see was acres iv red signs hung fr'm th' roof with white letters. Those were th' names iv th' fur'rums exhibitin'; th' smaller th' show th' bigger th' sign. Aft'er me eyes were accustomed to th' dazzlin' display, I saw a few people movin' about. They was mostly small bhoys with yaller bosoms an' black elsewhere, fr' all th' wur-ruld like spadger-cannarin bur-ruds, sellin' newspapers which were bein' published iv'ry month, iv'ry week, iv'ry day, iv'ry hour an' iv'ry minute iv th' Exposhishun be th' promoters. These they couldn't sell was given away, an' th' circulashun was tremendous. There was lots iv tilygraph bhoys an' m'lsinger bhoys, an' th' r'ist iv th' people were tall men with red faces an' straw hats. Each wan had a cigar in his mouth, an' they all looked very hot. They was more of these people in the Exposhishun, excepting th' news-boys, than any other kind, but I saw a few ladies. Th' ladies was mostly teatin' th' magnetle brakes iv a kyar; they looked so happy an' unconcerned, ridin' in a kyar with so many convenient stops; an' th' motorman looked so proud, Hinnessy, I'm sure he must have sold thim dozens iv magnetle brakes. They was lots to see in th' thramway line—paints, writin' desks, sponges, shells, tailors' models, kyard-systems, typists, printin', engravin', an' many other things equally interestin'. Up in th' gallery a brass band was playin' Dutch moosic, an' over-all some billins lookin' an're lamps was throwin' a steady light. On th' fur'r'nd day th' Hall was full iv Dutchmen an' Reoshilans, an' Boogarlans, an' Turruks, an' Egetallans, wearin' bits iv ribbon an' medals, all talkin' to wanst with their hands an' feet an' shoulders, an' swearin' an' cussin' tur'rily; leantwys so it

seemed to me, although someone said they has havin' a quiet talk, tryin' to make each other understand. They was th' furrin dillygates who had come fr'to do th' copyin', an' they took miles iv notes; an' it was tur-rible to see phwat they could eat.

"Most iv th' sthands was kept be obligin' young men, though some iv thim had young women. Th' sthands kept be th' young women had big crowds around outside payin' fr' whiskey, but those kept be th' young men had th' crowds inside, gettin' whiskey an' cigars free. It was th' best exposishun I've seen, Hinnessy. I wint up to an obligin' young man behind th' sthand an' looked interesthed. 'Can I do anythin' fr' you?' he says. 'Yes,' I says, 'I want this invinshun explained.'

"'Right y'are,' he says, 'it is me own invinshun, an' th' on'y wan that's any good,' he says. 'It is so simple,' he says, 'an' no kyar should be without it. Thin there's this here,' he says, 'which is in use on ivry line in th' counthry,' he says, 'an' here's another fr'th' trolley, an' here's a spesul switch, all me own invinshun an' nawthin' else any good,' he says. 'Thru' fr' you,' I says, 'these are just phwat I've been wantin' fr'th' electric thramway in me back yard; give me all th' pa-apers ye've got,' I says, 'an' I'll send you th' order whin I git back.' He hands a bundle iv pa-apers into me bag, an' thin he says, 'Come round this way,' he says, 'an' have a dhrink.' 'I'm comin',' I says, an' he leads th' way to a little box behind th' sthand, full iv other fellows who'd been promisin' orders. 'I think ye'll like this cigar,' he says, 'an' here's to your health. These are me frinds iv th' Society iv Corporashun Engineers,' he says, an' we all shook hands. We were that comfortable we didn't like fr'to part fr'm such an obligin' young man; but they was other interestin' sthands to visit an' many invinshuns to see, an' so I wint round with some iv th' Corporashun Engineers. We found all th' young men so obligin', an' we promised lots iv orders, an' had a rare good time iv it. There was on'y wan rift in th' loot, as Hogan says. As I was comin' out, I see an' old chap workin' a sort iv lever like I've got in th' bar here, Hinnessy. Thinkin' as w'd had a lot iv dhrinks free, it would be fair to sthand treat, I says to him, 'I'm payin' fr'th' company,' I says, 'so look sharp an' ladle out,' I says, an' they all laughed. 'Young man,' he says, 'ye've made a mistake; this is my ever-dry seat,' he says. 'Well,' I says, 'we ginrally feel dhry in th' throat, but if ye've a likin' to go into that tank iv yours—' an' I was fr' puttin' him in there an' thin, but th' polis came; an' th' next I raymimbered was, was wakin' up in bed with a head-ache. It was a interesthin' exposishun, Hinnessy, an' th' electric thramways should benefit."

"But phwat about those orders ye promised?" asked Mr. Hennessy.

"Wait till th' Bill is passed," said Mr. Dooley.

In the smoking room will be found the comprehensive exhibit of vitrified clay conduit, both single and multiple duct, of the H. B. Camp Co. Mr. Charles C. Baird, of New York, is in charge of the exhibit and Vice-President H. H. Camp is expected to arrive to-day.

A convention of the A. S. R. A. would be incomplete without a representation by the Globe Ticket Co. This year its booth is presided over by P. C. Snow, the general eastern representative, and D. C. Griffiths, general western representative. Vice-President W. C. Pope will be here to-day, also. The interests of the duplicate transfer and rebate department are looked after by H. N. Brown, the gen'ral general manager. The Globe is presentin' friends with a useful cigar perforator.

The American Circular Loom Co. is represented at the convention by Western Manager Thomas G. Grier, who also exhibits the Nungesser electric battery. Mr. Grier has a section of the Standard Patent Co.'s booth in the balcony.

Mr. Arthur Hartwell, sales manager of the Westinghouse Electric & Manufacturing Co., arrived Wednesday, and met with a hearty welcome from his many friends, especially those in the west who do not see him as often as they did before he was promoted from the head of the Westinghouse Chicago office.

FROM THE DETROIT UNITED RY. WEEKLY.

The Detroit United Ry. has been publishing a weekly folder for some time that has been the instrument of bringing about a very friendly relation between the public and the company. The folder contains information as to schedules, new car routes, transfers, etc., and is intended to be a source of education and instruction to the company's patrons, on all subjects related to the company's business.

Here is a little item from one of the recent weeklies, that may be suggestive to companies who are interested in similar enterprises:

"We are a variegated lot—not in the matter of complexion, but of temperament. No two of us are identical by nature and our environments tend to increase the disparity. No two of us think the same way and no two of us have the same things to think about. An infinitude of human interests is pulling us this way and that. Sometimes we are bumped together, but Fate soon disentangles us and we go oscillating on until the tiny thread of each snaps in its vibration. The youth on your right has just had his salary raised and he is pulling out his chest and smiling at the sheer joy that he finds in living. The man on your left is not smiling. He is older. He is paler. There are lines in his face which are drawn and peaked. In the seat ahead he may be looking into the face of death or ruin, or grief, or the callow end of a futile struggle. They are both in your seat. The sun shines on both. Both feel the same summer breeze. Both hear the same laughter about them. But there is the gulf between them. They are swinging on different threads.

"The infinitude of swinging threads is what we have to deal with, for we are servants of the people. We serve all temperaments, all moods, all conditions—for you find them all on the street cars. Exuberant youth rides with us to the ball games, to the parks and excursions, and to work, and pays his fare with a laugh. Age rides with us—grief rides with us—foreboding, suspense. These, too, pay their fare, but usually they do not laugh.

"It's our task to find a path through this snarl of comedy and tragedy. The conductor must humor the mood, without knowing its extenuating cause. The conductor must propitiate hot-headed youths, needlessly excited old ladies, adventurous juveniles, grouchy maturity, pugnacious inebriacy, and all the rest of those swinging threads. He must be an altruist, a counselor, a cashier and above all a diplomat. He must enforce the rules for exuberant youth and disconsolate old age. The conductor is himself human. He, too, swings on a thread.

"We try to reconcile these extremes; to find a safe middle ground. Be charitable with us—for, at best, we all are swinging threads."



HAZEN S. PINGREE.

Of all of Detroit's many famous sons, none have attracted more wide-spread attention and prominence than did the late Hon. Hazen S. Pingree. Taking it all in all, he was one of the most interesting and picturesque characters ever produced in this country, and inasmuch as he interested himself, in more ways than one, in various matters pertaining to street railway operation, a brief sketch of his career is not out of place at this time, and may prove interesting.

Mr. Pingree was born Aug. 30th, 1842, in Denmark, Me., of the proverbial humble New England parentage. In 1856 he took his first position as mill-hand in a cotton mill at Saco, Me. Four years later he was working at a shoe factory at Hopkinton, Mass. In 1862, he enlisted in the First Massachusetts Regiment of heavy artillery. He was captured in 1864, and sent to Lynchburg, Va., and then to Andersonville; was subsequently exchanged, and rejoining his regiment served to the end of the war. After peace had been declared, he went to Detroit and became an ordinary shoemaker. By the display of remarkable energy and sagacity, he soon rose from the position of cobbler to that of manufacturer, and in the course of years became the head of the Pingree shoe factories, which now enjoy a world-wide reputation.

Without previous political training, in fact without previous political activity, other than the interest taken by the average

citizen in the local politics of his community, Mr. Pingree in October, 1889, was selected by the Republican party as the party's nominee for mayor of Detroit. Political reform had become the popular cry, and Mr. Pingree was selected almost without regard to party affiliations to fill the popular demand for a conservative business administration in the city of Detroit.

Mr. Pingree was elected mayor by an overwhelming majority, and assumed the duties of mayor of Detroit on Jan. 1st, 1890. His public career began on that date and lasted until his death. He served as mayor of Detroit through four terms, and was then elected governor of Michigan, in which capacity he served two terms.

From the first year of his political life to his death, in June, 1901, Hazen S. Pingree was an enigma and a surprise to friends and foes alike. Elected mayor as the choice of the conservative business elements of the city, he at once commenced a wild crusade on capital and vested interests. His hurricane ideas of municipal reform made necessary the coining of a new word, "Pingreeism" may be said to mean a change—no matter from what to what, so long as a change is made in existing conditions. Just here it must be inserted that in all the time Mr. Pingree was occupying his conspicuous position in the public mind, no one was able to bring a verified charge of dishonesty, fraud or deceit against him, and even those to whose interests he was most antagonistic are willing to admit that he thought he was right.

The second year of Mr. Pingree's office as mayor brought to light most of his eruptionary ideas for securing free everything for everybody. He declared the city was paying too much for its public light, and advocated a municipal lighting plant. He announced the gas company must reduce the price of gas or get out of business. He wanted to pave all the streets and put all telegraph and telephone wires underground. But the one all-absorbing object of his life was to secure municipal operation and 3-cent fares on the city street railways. For this he worked during all the latter years of his life. In his efforts in this direction perhaps he conferred a benefit on the country-at-large for he proved by actual experiment that in the average city of the United States 3-cent fares are impracticable and impossible from the standpoint both of the municipality and of the street railway companies. The history of this 3-cent fare agitation will be found in the "Street Railway Review" for Sept. 20, 1902, page 507.

Another of Mr. Pingree's ideas brought him the appellation of "Potato Pingree." This scheme was one for utilizing idle land in the outskirts of the city for cultivation by the poor in raising food for themselves. Donations of land were made by liberal citizens, and about 438 acres were accepted, plowed, harrowed and staked off into lots of from one-quarter to one-half an acre by a committee appointed by the mayor. Nearly 1,000 dependent families were assigned to these lots, and seed potato, beans and other seeds were furnished by the committee. Each family planted its own seeds and attended the crops, and the crops so raised were kept by the individual family for consumption during the winter. Several of these potato fields may still be seen in the outskirts of the city.

Mr. Pingree died in London, Eng., June 18, 1901, after an extended trip through South Africa.



The medallion souvenir given away by the Bullock Electric Manufacturing Co., of Cincinnati, was in great demand, and the supply was exhausted before yesterday evening. Mr. Frank G. Bolles, representing the company, was kept busy distributing the medals or else telling anxious inquirers that he hadn't any more.



Mr. A. A. Hilton, manager of the Fort Wayne Foundry & Machine Co., is in attendance. Mr. Hilton has a very extensive acquaintance among railway men, having been for six years general sales agent of the St. Louis Car Wheel Co. before going with the Fort Wayne company.



Among the early arrivals is Alfred Johnson, electrician for the Street Railway Co., of Quincy, Ill., who is also well known as the inventor of the "Reliable" trolley harp, a simple, cheap, yet durable contrivance, which has proven especially serviceable on large motors.



THE EXHIBITION HALL ON SUPPLYMEN'S DAY.

THE KUHLMAN CAR CO.

Appreciating the fact that presidents and general managers of large suburban roads would need the same accommodations as presidents of big railroads in the matter of their own private cars, this company has designed and built a private car which was shown on the street approaching convention hall. In finish, in design, and in general equipment, it would be difficult to decide how this car could be improved upon in any way.

The car is 17½ ft. long over all and 8 ft. 6 in. over sills. This car is set out of the center of the trucks 2 in. away from the devil strip side in order to allow it to be operated in cities where they have a narrow devil strip. In the center of the car is a private bed room and bath with a three-quarter mahogany bed, wash stand, bath tub and water closet. The interior finish is of Mexican mahogany, every piece of wood being selected for grain and quality. The ceiling is of the Pullman circular type with gilded mouldings, deck lights of cathedral glass and windows of ground French plate. The front part of the car is divided into a motor-man's room and observation room. The seating arrangements are movable cane seats with leather and plush cushions. The carpet is the best Wilton carpet and was selected to match the curtains and ceiling. The curtains are of silk. The car is mounted on Peckham trucks and equipped with Christensen air brakes, and is to have 4 General Electric 75-horse power motors with type M controllers. The car has a buffet at the rear end with leaded glass doors and ice chest for cooling purposes. On account of the delay in getting materials, this buffet does not

show in the car at present, but will probably be placed to-day. The lighting arrangements comprise 30 lamps arranged in clusters at convenient intervals.



R. D. NUTTALL CO., OF PITTSBURG, PA.

This company's well known line of gears and pinions forms one of the main features of its exhibit which is located just off the main aisle. The samples of gears and pinions include types of newer and heavier forms brought out by the Nuttall company to meet the conditions of modern high speed electric railroading. At the back of the space was shown a 5 ft. gear, 1 ft. across the face, demonstrating the ability of the company to turn out work ranging from the smallest to the largest sizes. The Nuttall trolley wheels were exhibited in various sizes for different grades of service. The well known trolley stand was also displayed and attracted a great deal of attention. As a souvenir the company is distributing a technical work on gears and their manufacture. The company is represented, in addition to its regularly appointed agents by Mr. F. A. Estep, George W. Provost, Arthur S. Partidge, Mr. McGill, of Chicago, the Frank Bidlon Co., the Mayer & England Co., and a staff of special representatives.



The Sherwin Williams Co. furnishes the paints used throughout the handsome Kuhlman car exhibited on the street.



Mr. T. E. Mitten, general manager of the International Ry. Co., returned home yesterday afternoon at 4 o'clock.

REGISTRATIONS THURSDAY, OCT. 9, 1902.

DELEGATES OF MEMBERS.

- Anderson, Ind. Chas. A. Bidwell.
Chas. Drum, John L. Minton, Union
Traction Co.
Ashtabula, Ohio—B. W. Baldwin, H.
A. Bivh, Peru & Ohio Ry. Co.
Buffalo, N. Y. J. W. Crawford, C.
K. Marshall, J. R. Beckball, W.
Caryl Ely International Ry. Co.
Butte, Montana—E. J. McDonnell, G.
Brink, Butte Electric Ry. Co.
Cleveland, Ohio—F. J. Stott, F. W.
Coom, E. K. Owen, R. R. Strehlman, H.
M. Smith, P. Heckler, F. B. Matthews,
A. C. Hoory, Lake Shore Electric Co.
Cleveland, Ohio—W. D. Carver, B.
Greenway, Cleveland Electric Ry.
Colorado Springs, Col.—A. L. Pond,
Colorado Springs Interurban Ry. Co.
Columbus, Ohio—Chris. E. Hott, Col-
umbus Ry. Co.
Counell Bluffs, Iowa—Frank L.
Brown, Omaha & Counell Bluffs Ry. &
Bridge Co.
Davenport, Iowa—Thos. Gowling,
Tri-City Ry. Co.
Dayton, Ohio—Harry P. Clegg, Day-
ton & Western Traction Co.
Daryville, Ill.—E. J. Wehrley, Dan-
ville St. Ry. & Light Co.
Greenburg, Pa.—W. D. Chapman,
Pittsburg, McKeesport & Greenburg
Ry. Co.
Huntington, W. Va.—J. C. Logar, H.
Wellman, Camden Interstate Ry. Co.
Hamilton, Ohio—C. E. Warwick,
Cin., Dayton & Toledo Trac. Co.
Indianapolis, Ind.—Hugh McGowan,
Indianapolis St. Ry. Co.
Jersey City, N. J.—C. M. Shipman,
North Jersey St. Ry. Co.
Kalamazoo, Mich.—E. C. Corey, M.
Myers, L. D. McElroy, Michigan Traction
Co.
Knoxville, Tenn.—C. H. Harvey,
Knoxville Trac. Co.
Kenosha, Wis.—W. L. Arnold, Ken-
osha Elec. Ry. Co.
Lancaster, Pa.—H. B. Rhoads, Cones-
toga Traction Co.
Louisville, Ky.—T. J. Minang, Samuel
G. Boyle, J. T. Frank, Louisville
St. Ry. Co.
New Brunswick, N. J.—Andrew Rudel,
Thos. F. Walsh, James Butler, D.
W. McGregor, Middlesex & Somerset
Traction Co.
Ottawa, Ont.—T. Ahearn, Warren Y.
Soner, Ottawa Electric Ry. Co.
Oakland, Cal.—I. G. Brown, Oak-
land Transit Co.
Saginaw, Mich.—F. D. Egan, Sagin-
aw Traction Co.
Springfield, Ill.—T. H. Minary,
Springfield Consolidated Ry. Co.
St. Louis, Mo.—W. O. Mundy, St.
Louis Transit Co.
Toronto, Ont.—M. Power, D. Suther-
land, G. H. Sweetlove, W. H. Moore,
W. H. Nix, R. E. Brown, Toronto Ry.
Co.
Terre Haute, Ind.—C. D. Wyman,
Terre Haute Electric Co.
- MISCELLANEOUS.
- Adams, H. E., W. G. Nagel Electric
Co., Toledo, O.
Alper, N., Great Western Smelting &
Refining Co., Chicago, Ill.
Avery, F. E., Columbus Motor Truck,
Columbus, Ohio.
Bergmann, William, John Stephenson
Co., Elizabeth, N. J.
Balon, Andrew, John Stephenson Co.,
Elizabeth, N. J.
Bickwell, Warren, Aurora, Elgin &
Chicago Ry. Co., Chicago, Ill.
Bender, Geo., C. L. & A. St. Ry. Co.,
Cincinnati, O.
Becker, G. F., H. W. Johns-Murville
Co., Milwaukee, Wis.
Burch, Edward P., consulting engineer,
Minneapolis, Minn.
Blood, John, Balch, Moline, East Mo-
line & Watertown, Moline, Ill.
Brandon, John, Automatic Car Brake
Co., Utica, N. Y.
Brandon, Chas., Automatic Car Brake
Co., Utica, N. Y.
Berry, Nicholas, Automatic Car Brake
Co., Utica, N. Y.
- Boyer, S. B., Dornier Truck & Four-
dry Co., Logansport Ind.
Bullock, Edward, Michigan Electric
Co., Detroit, Mich.
Butor, P. A., Crocker-Wheeler Co.,
New York, N. Y.
Crockett, W. P., Hart Mfg. Co., Chi-
cago, Ill.
Cookson, T. J., A. Sorge, Jr. & Co.,
Cincinnati, O.
Camp, H. H., The H. B. Camp Co.,
Akron, O.
Cookley, E. J., Samson Cordage Wks.,
Boston, Mass.
Clark, J. S., The Toledo & Western
Ry. Co., Toledo, O.
Cooper, H. S., Elec. Eng. & Dev. Co.,
New York
Cobb, John J., County Building, De-
troit.
Clyavestine, John H., Fairmount Park
Transportation Co., Philadelphia, Pa.
Dekson, F. F., H. Newcomb, New
York City.
Davis, Arthur V., Pittsburg Reduction
Co., Pittsburg, Pa.
Drake, F. S., St. Louis Car Co., Phila-
delphia, Pa.
Doss, Philip S., Electrical Review,
New York City.
Davis, C. H., Trenton Tower Autom-
obile Co., Columbus, Ohio.
Drysdale, Thomas, Edlison Ill. Co.,
Detroit, Mich.
Donaldson, John, E. L. Co., Detroit,
Mich.
Faber, Edwin C., Gen'l Electric Co.,
Schenectady, New York.
Field, E. R., Western Elec. Co., De-
troit, Mich.
Garton, W. R., W. R. Garton Co., Chi-
cago, Ill.
Ganzensbach, Ernest, Amora, Elgin &
Chicago Ry. Co., Chicago, Ill.
Goodner, W. C., Jewett Car Co., New-
ark, O.
Ganson, W. O., Columbia Lamp Co.,
St. Louis, Mo.
Hammond, Samuel F., Penna. Elec. &
Railway Supply Co., Pittsburg, Pa.
Heller, W. A., Wahash, Ind.
Hopkins, Wm. A., Emer Hopkins Co.,
Columbus, O.
Wendell, Jacob, Jr., Wendell & Mc-
Duffie, New York City.
Halting, Wm. J., American Elec. Co.,
Crocker-Wheeler Co., Detroit, Mich.
Howell, T. E., Kuhlman Car Co.,
Cleveland, O.
Hopewell, T. E., L. C. Chase & Co.,
Boston, Mass.
Harrington, A. C., Erie Rapid Transit
St. Ry. Co., Erie, Pa.
Hansher, Chas. S., Western Ohio Ry.
Co., Lima, O.
Hillin, N. J., C. E. & W. Ry. Co.,
Cleveland, O.
Harper, B. H., Western Elec. Co.,
Philadelphia, Pa.
Howard, F. K., Chicago Equipment
Co., Chicago, Ill.
Harvey, L. M., Stanley Electric Mfg.
Co., Chicago, Ill.
Hute, John W., St. Louis Car Wheel
Co., St. Louis, Mo.
Kerns, D. J., Toronto St. Ry., Toronto,
Ont.
Kis, S. Ritter, Wm. Eska Co., Benni-
fen, Ont.
Kellee, H. W., Kellee Mfg. Co., Potts-
town, Pa.
Lewis, Frank J., Victor Electrical Co.,
Cleveland, O.
Lucas, Geo. C., Fdry. & Crossing Co.,
Cleveland, O.
McConnock, Ira A., N. Y. C. & H. R.
R. Co., New York City.
McGill, J. H., Standard Ry. Materials
Co., Chicago, Ill.
McClintock, O. N., The Bellamy Vestib-
ule Mfg. Co., Cleveland, O.
McQuade, Jno. A. Jr., American Steel
& Wire Co., Phila., Pa.
Marsh, H. C., Westinghouse Elec. &
Mfg. Co., Cincinnati, O.
Marthle, John, Johnson Frog Co.,
Cleveland, Ohio.
Mayo, W. R., Hooven, Owens, Reut-
schler Co., Hamilton Corliss Engine,
New York City.
Mudler, R. S., Sawyer-Man Elec. Co.,
Chicago, Ill.
Meixell, A. E., Fairmount Park Trans-
portation Co., Philadelphia, Pa.
- Markall, W. B., Markall Elec. Co.,
Washington, D. C.
Oatman, D. P., Nernst Lamp Co.,
Pittsburg, Pa.
Oliver, K. G., The P. R. T. Co., Phila-
delphia, Pa.
Peterson, E. H., Mich. Elec. Co., De-
troit, Mich.
Pond, A. L., Coldwater W. W. & Elec.
Lt. Co., Coldwater, Mich.
Patenall, T. H., U. S. & S. Co., Pitts-
burg, Pa.
Pell, D. W., G. S. Hastings Co., Lima,
Ohio.
Phillips, W., Winnipeg St. Ry. Co.,
Winnipeg, Manitoba, Can.
Post, H. R., Chicago Brass & Copper
Wks., Chicago, Ill.
Priest, E. D., General Electric Co.,
Schenectady, N. Y.
Parmenter, Geo. A., Geo. A. Parmenter
Mfg. Co., Cambridge, Mass.
Pope, W. C., Glob. Ticket Co., Phila-
delphia, Pa.
Pierce, B. H., Pierce, Richardson &
Neller, Chicago, Ill.
Russell, F. D., Rochester Car Wheel
Wks., Rochester, N. Y.
Relder, H. C., Ohmer Cash Reg. Co.,
Cleveland, O.
Robinson, C. H., Bloomington Ry.,
Bloomington, Ill.
Richards, F. A., John Stephenson Co.
and Dekham Co., Cleveland, Ohio.
Rice, Thos. L., Hunter Sign Co., Cin-
cinnati, O.
Reckeper, S. S., Mfg. Records, Balti-
more, Md.
Schroeder, A. F., Globe Headlights,
Cleveland, O.
Stecker, Chas., Mich. Elec. Co., De-
troit, Mich.
Smith, A. H., N. Y. C. & H. R. R. Co.,
New York City.
Smethurst, F. A., Smethurst & Allen,
Philadelphia, Pa.
Schnelder, T., VanDorn & Dutton Co.,
Cleveland, O.
Sullivan, W. J., Crocker-Wheeler Co.,
Cleveland, O.
Spear, F. R., S. & M. C. Ideal Brake
Shoe Co., Chicago, Ill.
Sloat, J. M., Middletown Goshen T.
Co., Middletown, N. Y.
Straker, Chas., Elec. Steam Battering
Co., Detroit, Mich.
Sanville, H. F., Wadark Wire Co.,
New York.
Swink, Wm., Hunter Sign & Fender
Co.
Sanding, Henry, VanDorn-Elliott Elec-
tric Co., Cleveland, O.
Sutherland, J. D., American Steel &
Wire Co., Pittsburg, Pa.
Foote, C. A., VanDorn-Elliott Co.,
Cleveland, O.
Tyler, J. Hram, Globe Register Co.,
Dayton, O.
Froehlich, F. H., The Toledo & West-
ern Ry. Co., Toledo, O.
Van Deventer, C., Stanley Elec. Mfg.
Co., Chicago, Ill.
Wallace, C. D., Yost Writing Machine
Co., Bridgeport, Conn.
Wells, Chas. J., Fostoria Inc. Lamp
Co., Fostoria, O.
Williams, W. J., Chahall Water Tube
Boiler Co., Chicago, Ill.

LADIES.

- Mrs. P. A. Hinds.
Mrs. J. M. Jouns.
Mrs. E. M. Shipman.
Mrs. T. J. Minary.
Mrs. Andrew Rudel.
Mrs. Thos. F. Walsh.
Mrs. Jas. Butler.
Mrs. D. W. McGregor.
Mrs. J. Q. Brown.
Mrs. W. A. Heller.
Mrs. A. H. Smith.
Mrs. I. A. McConnock.
Mrs. E. R. Field.
Mrs. W. J. Halting.
Mrs. T. H. Patenall.
Miss Patenall.
Mrs. Camp.
Mrs. D. W. Pell.
Miss Bligsby.
Miss Brown.
Miss Williams.
Miss Thorp.

The Wayclark Wire Co., of New York City, is represented by Mr. H. F. Sanville, Philadelphia agent. The Wayclark company sells trolley and feed wire of all descriptions. Mr. Sanville also represents the Simonds Manufacturing Co., of Pittsburg, maker of the well known Simonds gears and pinions.

One of the most familiar faces at the A. S. R. A. conventions is that of Mr. E. Packer, traveling salesman for the Morris Electric Co. With two exceptions Mr. Packer has attended all the A. S. R. A. conventions. He missed Kansas City and Mon-
treal, much to his regret.

The Cleveland Frog and Crossing Co.

MANUFACTURERS OF

IMPROVED HARD STEEL CENTRE

SPECIAL WORK

FOR ELECTRIC RAILWAY SERVICE OF EVERY DESCRIPTION.
ALL SECTIONS OF GROOVE, GIRDER, GUARD AND T RAIL CARRIED IN STOCK.

PORTER ROCKING SWITCHES

Safest and Most Durable Switch for Branch-offs and Derails at Railroad Crossings.

Steam and Electric Railway Easer Rail Crossings and Track Supplies in General.

Main Office and Works,
Bessemer Ave. and Erie R. R.

Engineer's Office,
614 Cuyahoga Building.

PLANS AND ESTIMATES FURNISHED
ON APPLICATION.

CLEVELAND
OHIO, U. S. A.

G. C. LUCAS,
General Manager

A. P. RUGGLES,
Engineer

A WINTER'S TALE.

My greeting from No. 89, when I boarded his car a couple of months later, was a hearty one. At first I hardly recognized him; a new uniform, clean shirt, neat tie and well blacked shoes were pretty nearly as good a disguise as that of his friend the spotter. I looked him over carefully and something in the sheepish way he avoided my gaze gave me an inspiration.

"You've been getting married!"

"Somebody's been telling you."

"Not a soul—it was a pure guess."

"Well, you're a wizard! Yep, it's a fact. I thought I might 's well make use o' that v'cation o' mine so I got spliced, rented a house, furnished it an'—there you are!"

"Well, I congratulate you. Who is the lady?"

"That's her."

I peered into the car at the only "her" in sight and saw a nice looking woman of about 35.

"Pretty neat woman for a mucker like me?" And there was a self-satisfied smirk on No. 89's countenance.

"Better than you deserve, I guess!" was my uncomplimentary remark, but the smirk only deepened into a grin.

"Oh, I do' know! Me an' Bill Hendricks useter—"

"That reminds me," I interrupted, "what was that yarn about Bill's death that you were going to spin for me?"

The grin disappeared instantly.

"That's no yarn, sir. It's the gospel truth!"

"Well, let's have it."

"Can't tonight, sir; it's too long a tale an' this is my last trip in an' I've got to make up my report. But tell you what we'll do: You're a 'buck,' I take it, ain't got no women folks to sit up for you? Thought so! Well, go with th' woman round to the house—it's only a block away—an' I'll come 's soon 's I can an' bring a can o' beer an' the woman'll make some sandwiches an' I'll tell you about Bill an' what followed."

"But—your wife?"

"Oh, she'll be tickled to have you, I been tellin' her about you,

an' me an' her always has a bite an' a sup after I come home. Come in an' I'll interjuice you."

After a big, solid glass of beer and a well-mustarded "sam-wich" was in easy reach of each of us, I offered No. 89 a cigar. "Is this any kin to th' first one you g'in me—mos' a year ago!"

"No relation!"

"Then I'll lght her up an' tell you about Bill. 'T was that cold winter,—lemme see, must 'a been nigh onto twenty-five years ago, I ferget just the year—anyway, 't was most awful cold. He an' Bill had th' owl car that night an' it took in the whole length o' th' line, over five miles from the stand to th' barn. It was just perlishin' cold, a keen wnd an' little scales o' snow in it that cut like a knife when they hit your face. I was bundled up 'n everythin' I could lay my hands on an' even then I couldn't stand it on the platform so I come inside. Bill, he'd pulled down his cap an' pulled up his collar 'till there warn't nothing' of him showin' but his eyes an' he'd wrapped his legs around with the blankets off'n the hosses and sot up on his stool with his back again' the front door an' he started that team for all 't was worth. We didn't have a passenger th' whole trip an' first off I opened the door a crack once or twlee an' asked Bill 'f I shouldn't spell him a bit drivin' an' all I got was 'Get t'ell outer here an' shut that door,' so I didn't pay no more attention to him but jus' jogged back'ards an' forrards over the hay in the aisle an' hammered myself with my arms to keep from freezin'—it was me s' fearful cold!"

"Didn't you have a stove in the car?"

"Yes, but it went out on our down trip—never would burn 'n a wind, an' I had no kindlin' to start it an' Bill wouldn't wait at the stand for me to get any, said 't 'd be better to get to th' barn 'fore the hosses froze. Well, as I was sayin', we jogged along that way an' never stopped 'till we got to the barn an' the night hostler heard the bells an' swung the doors open an' Bill he never stopped to let me off nor nothin', but just salled right in an' I was so stiff with cold that when I went to jump off to go into th' office to sign up an' turn in my punch, I fell all 'f a heap. When I piked myself up I heard the hostler holler, 'Where 'n

THE NICHOLS-LINTERN COMPANY,

Track Sanding System

Saves

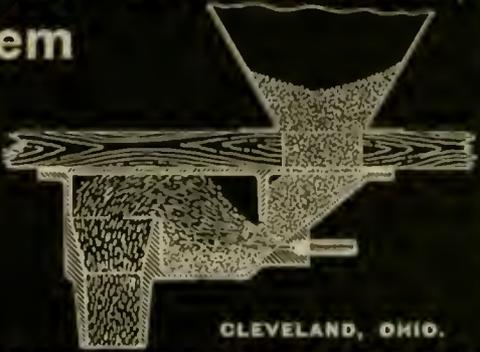
EQUIPMENT CURRENT

TIME AIR SAND

PREVENTS ACCIDENTS



ELECTRIC BLDG.,



CLEVELAND, OHIO.

blazes yer takin' that car, Bill?" but I didn't pay much attention to it, but jus' scrambled for th' office an' the fire. Well, I hadn't more'n got unwrapped when th' hostler comes tearin' in, his face like chalk, an' his eyes like saucers an' he yells out 'For God's sake come out here, som'n's th' matter wth Bill!

"Well, the watchman tumbled out an' I followed 's fast 's I could hobble an' there was Bill's car clean at th' end o' the track an' the hosses turned off agaln' the side o' the barn—dodgin' it same's they was useter dodgin' a truck in the street when it backed up on 'em. That seemed strange, 'cause Bill was a good driver an' careful of his teams gen'rally, so the watchman sings out 'What 'n the dickens 's the matter with you, Bill, tryin' to jam them hosses? Don't your brakes work? There wa'n't no answer from Bill an' the watchman says, 'Are you 'sleep.' An' we goes up to him an' the watchman gives his arm a pull an' Bill an' the stool comes over just like a tree a-fallin' an' then we was scared. I forgot all about my beln' cold an' me an' the watchman grabs him an' starts to haul him into th' office an' somethin' pulls him back an' there was the lines fast in his hand an' it stiffen' iron; we just had to cut them apart afore we e'd move him an' the whip in his t'other hand was the same way an' we carried him into th' office an' it a'wavin' in his hand. Well, we fetched a doctor, but 't wa'n't no good, poor Bill was deader 'n Hector—whoever he was! They had 'n inquest next day an' the doctor said 't was a weak heart 'su'ndooed by th' intense friggiditty o' th' atmispheer'—yes, he did, them's his very words! An' he said he must 'a been dead most an hour when we found him, he must 'a died soon after I last spoke to him.

"Well, you may jus' believe that broke me all up, me an' him had been on the same car for clos't onto three years an' always got on well, fer Bill was rough spoken but straight 's a string. The thing preyed on me for a good spell, I sorter blamed myself for my not makin' him come in an' lettin' me spell him a-drivin'—'t wouldn't 'a done any good I know, but you know how you feel about a dead person—sorter 's if you might 'a helped it 'f you'd 'a tried?"

I nodded.

"Well, that's the truth about his death an' you might say as there wasn't anythin' wonderful about that but it's what happened after that that I was goin' to tell you—you'll understand it better now 't you know about his dyin'. Lemme fill up that glass again, sir, it's dry work lis'enin', an' I'll tell you what come after.



HUNTER CAR SIGN.

Mr. Lytle J. Hunter, the sign and fender man, was just about as busy as he ought to be in the annex taking orders and describing the Hunter devices. Mr. Welling, superintendent, had charge of the display when Mr. Hunter was not there. The new vestibule sign recently put on the market by Mr. Hunter attracted considerable attention.

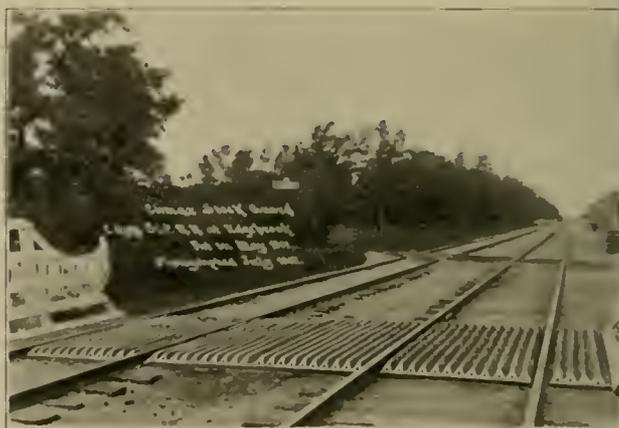


Everybody knows and everybody was glad to greet Scott H. Blewett, general agent of the American Car & Foundry Co., of St. Louis, who showed up smilingly in the exhibit hall yesterday afternoon.

THE CLIMAX STOCK GUARD

H. E. OVERSTREET, Gen. Manager,

714 Marquette Building, CHICAGO, ILLINOIS.



The following is a list of Sales for Four Months, ending August 1, 1902:

<p>Manufactured from Shale Clay, Burned Hard, Vitrified and Glazed. Blocks 24 in. long, 8 1/2 inches wide, 4 1/2 in. high. Material in ridges 1 1/4 in. thick.</p>	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr><td>Chicago, Milwaukee & St. Paul R. R.</td><td style="text-align: right;">250</td><td style="text-align: right;">Guards</td></tr> <tr><td>Aurora, Elgin & Chicago R y Co.</td><td style="text-align: right;">720</td><td style="text-align: right;">"</td></tr> <tr><td>Chicago & Milwaukee Electric R y Co.</td><td style="text-align: right;">45</td><td style="text-align: right;">"</td></tr> <tr><td>Atchison, Topeka & Santa Fe R y Co.</td><td style="text-align: right;">26</td><td style="text-align: right;">"</td></tr> <tr><td>Indianapolis & Plainfield Electric R y Co.</td><td style="text-align: right;">40</td><td style="text-align: right;">"</td></tr> <tr><td>Cincinnati, Dayton & Toledo Traction Co.</td><td style="text-align: right;">15</td><td style="text-align: right;">"</td></tr> <tr><td>C. C. C. & St. L. R. R. Co. (Big Four).</td><td style="text-align: right;">110</td><td style="text-align: right;">"</td></tr> <tr><td>Rockford, Janesville & Beloit Traction Co.</td><td style="text-align: right;">8</td><td style="text-align: right;">"</td></tr> <tr><td>Coal Belt Electric R. R. Co. (Marion, Ill.) ...</td><td style="text-align: right;">6</td><td style="text-align: right;">"</td></tr> <tr><td>Chicago & Eastern Ill. R. R. Co.</td><td style="text-align: right;">34</td><td style="text-align: right;">"</td></tr> <tr><td>Marcellus (N. Y.) Electric R. R. Co.</td><td style="text-align: right;">30</td><td style="text-align: right;">"</td></tr> <tr><td>Olean (N. Y.) Street R y Co.</td><td style="text-align: right;">20</td><td style="text-align: right;">"</td></tr> <tr><td>Cleveland, Elyria & Western R. R. Co.</td><td style="text-align: right;">40</td><td style="text-align: right;">"</td></tr> <tr><td>The Barberton & Akron Belt R. R. Co.</td><td style="text-align: right;">24</td><td style="text-align: right;">"</td></tr> <tr><td>Chicago, So. Shore Ry.</td><td style="text-align: right;">50</td><td style="text-align: right;">"</td></tr> </table>	Chicago, Milwaukee & St. Paul R. R.	250	Guards	Aurora, Elgin & Chicago R y Co.	720	"	Chicago & Milwaukee Electric R y Co.	45	"	Atchison, Topeka & Santa Fe R y Co.	26	"	Indianapolis & Plainfield Electric R y Co.	40	"	Cincinnati, Dayton & Toledo Traction Co.	15	"	C. C. C. & St. L. R. R. Co. (Big Four).	110	"	Rockford, Janesville & Beloit Traction Co.	8	"	Coal Belt Electric R. R. Co. (Marion, Ill.) ...	6	"	Chicago & Eastern Ill. R. R. Co.	34	"	Marcellus (N. Y.) Electric R. R. Co.	30	"	Olean (N. Y.) Street R y Co.	20	"	Cleveland, Elyria & Western R. R. Co.	40	"	The Barberton & Akron Belt R. R. Co.	24	"	Chicago, So. Shore Ry.	50	"
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1418

Western Ohio Traction Co. All needed for 110 miles track.
 Utica & Mohawk Valley R'y (Sept. 5) 250 Guards.

**NOT BAD FOR A NEW THING— IS IT ?
 LET US ENTER YOUR NAME IN THE LIST.**

TRENTON TROLLEY WAGON.

J. R. McCardell & Co., of Trenton, N. J., have a novelty in the form of a Trenton automobile tower wagon. The wagon itself is the standard Trenton type but the mechanism and running gear have lately been perfected by the Motor Truck & Vehicle Co., of Columbus, O. The motive power is furnished by a gas engine of approved type driving the axle through chain and sprocket wheel.



It was announced yesterday that the Bishop Gutta-Percha Co., of New York, which had secured booth 48, had decided not to exhibit, much to the regret of many friends of President Reed. The space has been assigned to the Burrroughs Adding Machine Co.

DAILY STREET RAILWAY REVIEW

PUBLISHED BY

WINDSOR & KENFIELD PUBLISHING CO.

65-69 Congress St., West

Detroit, Mich.

SUBSCRIPTION, PER YEAR, \$3.00

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Application made for entry as second-class matter.

VOL. XII. Saturday, October 11, 1902. No. 4

THE "DAILY REVIEW."

Although we are very modest we cannot refrain from pointing with pride to the four issues of the "Daily Street Railway Review" published in Detroit. In the four days we have published 132 pages of reading matter, giving a complete account of the two conventions and exhibits. Doubtless only men in the newspaper business appreciate the labor involved in a monthly journal moving its publication office so far from home and publishing a paper that comes out every day instead of once a month.

The success of the "Daily Review" has only been made possible by the efficient work of our printer, the R. L. Polk Printing Co., of Detroit, and the cordial co-operation of the secretaries of the two associations, Messrs. Pennington and Brockway, and the official stenographers, Messrs. T. E. Crossman and A. B. Weaver.

The prompt publication of the list of attendants was greatly facilitated by the courtesy of the Detroit United Railway in assigning a number of its employes to assist us.



THE FUTURE OF THE A. S. R. A.

This year the committee appointed to select the meeting place of the A. S. R. A. for 1903 was unable to report a decision.

The fact is that the association has attained such a size and the need of a large exhibit hall has become so imperative that there are but few cities in the country which are suitable meeting places. It is also true that the burden of entertainment imposed upon the street railways of the convention city is greater than most of the member companies care to assume.

One can count on the fingers of one hand the cities of the country that have the needed hotel and exhibit hall accommodations, and it would be unreasonable to ask that the railways of these few cities assume the entire burden of entertainment. The association will probably have to radically change its plans and in the future pay its own entertainment expenses, or let this privilege devolve upon the suppliers, as is done by the steam railroad conventions.

The organization of the master mechanics' association this week also indicates a tendency to differentiate which may result in an entire change in the scope of the A. S. R. A. and result in the parent association becoming a supervising body only, which will bear the same relation to the subordinate associations of master mechanics, mechanical engineers, maintenance of way men, and accountants that the American Railway Association bear to the M. C. B. Association, the Master Mechanics' Association, the Association of Railroad Accounting Officers, and the host of smaller steam railroad organizations. The subordinate bodies will recommend and the superior association will act.

The coming year will certainly be the most important in its history for the A. S. R. A., for upon the action taken by the incoming executive committee will to a great extent depend the future of the Association. It is a reason for congratulation that the men who will be in charge are among the ablest representatives of the member companies, and we may feel sure that they will act for the best interests of all concerned.

A. S. R. A. OFFICERS.

President—Jere C. Hutchins, President Detroit United Railway, Detroit.

First Vice-President—W. Caryl Ely, President International Railway Co., Buffalo.

Second Vice-President—W. Kelsey Scheff, President Cincinnati Traction Co., Cincinnati.

Third Vice-President—P. S. Arkwright, President Georgia Railway & Light Co., Atlanta.

Executive Committee—The President, the Vice-Presidents and H. H. Vreeland, President Metropolitan Street Railway Co., New York.

R. T. Laffin, General Manager Worcester Consolidated Street Railway Co., Worcester.

Andrew Radel, Vice-President Middlesex & Summerset Traction Co., Bridgeport.

Walter P. Read, Vice-President Consolidated Railway & Power Co., Salt Lake City.

Willard J. Held, General Manager Twin City Rapid Transit Co., Minneapolis.

Secretary and Treasurer—T. C. Pennington, Treasurer Chicago City Railway, Chicago.

**ACCOUNTANTS' OFFICERS.**

President—Henry I. Davies, Secretary Cleveland Electric Railway Co., Cleveland, O.

First Vice-President—Irwin Fullerton, General Auditor Detroit United Railway, Detroit, Mich.

Second Vice-President—D. Dana Bartlett, General Auditor Boston & Northern Railroad Co., Boston, Mass.

Third Vice-President—J. B. Hogarth, Auditor Denver City Tramway Co., Denver, Colo.

Secretary and Treasurer—W. B. Brockway, Consulting Accountant, Birmingham Railway Light & Power Co.

Executive Committee—The officers and H. C. Mackay, Comptroller the Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

O. M. Hoffman, Treasurer Conestoga Traction Co., Lancaster, Pa.

Elmer M. White, Cashier Hartford Street Railway Co., Hartford, Conn.

The fourth member left blank, to be supplied by the committee, pending the determination of the next place of meeting.

**MAIL AND TELEGRAMS UNCALLED FOR.**

The following mail and telegrams are uncalled for at the office of the chairman of the exhibit committee:

Mail: George W. Rounds, E. D. Hebbes, J. P. Doane, Wm. A. Snow and C. W. Powell.

Telegrams: Frank Silliman, W. A. Shirley, G. W. Hamilton, W. E. Jacques, Henry C. Doherty, C. O. Mailloux, H. M. Pease, and C. T. Maines.

**NOTICE TO EXHIBITORS.**

The exhibit committee announces that the Michigan Car Service Association has agreed to waive storage charges on all shipments brought in for exhibit purposes up to and including October 15th. This is an unusual concession and exhibitors will appreciate the efforts of the committee in caring for their interests in this regard.



The reelection of Mr. W. B. Brockway as secretary and treasurer of the Accountants' Association was eminently fitting and proper. No member of the association has worked harder for the welfare of the organization than Mr. Brockway, and we predict that his interests will continue to have his best care and attention. Mr. Brockway left last night for the east and will stop by the way at Cleveland to officially notify Mr. Davies of his election as president of the Accountants' Association.

J. C. HUTCHINS.

Mr. J. C. Hutchins, president of the Detroit United Ry. and the Rapid Railway System, was born in Carroll Parish, La., Oct. 13, 1853. As constructing and civil engineer he had years of experience in the early days of railroad building in Missouri, Texas and through the southwest, and was afterwards in newspaper work for a short time in Waco, Texas. He went to Detroit in 1894, and was made vice-president and treasurer of the Detroit Citizens' Street Railway Co., and later was elected to the same offices in the Detroit Railway Co. On the organization of the Detroit United Ry. Mr. Hutchins was chosen vice-president and general manager; he was elected president Jan. 21, 1902.

Since identifying himself with the Detroit United Ry. Mr. Hutchins has taken an energetic interest in its welfare, and many of the details of operation in all departments have been



J. C. HUTCHINS,
President A. S. R. A.

instituted as the direct results of his suggestions. He has been particularly interested in the welfare of the company's employes, the present system of reward by merit and demerit marks being one of his latest plans for improving conditions of the men. In selecting his heads of departments and operating men, he has believed in finding the best men possible, giving them free rein, and then holding them responsible for the organization and results under their respective departments.

Mr. Hutchins has been the official head of the company through the several mergers of the last few years, and in particular has been instrumental in bringing about the acquisition of outlying suburban and interurban lines. He has had supreme faith in the future of the United system, and recognizing the advantage of having all the roads about Detroit under one management, he has worked steadily to that end, and the result is the present efficient and well-managed Detroit United Ry. property.



MASTER MECHANICS' ASSOCIATION.

At an adjourned meeting of the master mechanics, held at 12 Woodward Avenue yesterday, it was decided to increase the committee membership with a view of effecting the permanent organization. The meeting adjourned to meet at Cleveland on Jan. 12, 1903.

H. J. DAVIES.

Mr. H. J. Davies, the new president of the Accountants' Association, is secretary of the Cleveland Electric Railway Co. He was one of the charter members of this organization and also one of its hardest workers during the first year of its life. It will be remembered that at the time of the Kansas City convention Mr. Davies withdrew from active street railway work and was then elected an honorary member of the association. Mr. Davies' many friends and especially his brother accounting officers, will welcome him back to active membership.



THE BANQUET.

The 21st annual banquet was held at the Hotel Cadillac, plates being laid for 400 guests. The toast list was as follows:

"The Growth of Detroit as I Have Known It," Hon. Wm. C. Maybury, Detroit.

"The F-30 Motor," Gen. Eugene Griffin, New York.

"How the People Would Run a Street Railway," Michael Brennan, Detroit.

"The Future Electric Railway," W. Caryl Ely, Buffalo.

"The Trolley: Its Future State," James T. Keena, Detroit.



A CURIOUS MISHAP.

Mr. Warren Bicknell, general manager of the Aurora, Elgin & Chicago Electric Railway, is in attendance at the convention, and is telling a story of an exceedingly curious accident which occurred recently on his road. He narrates:

"A gentleman waiting to take a car at a platform stop in the country upon a rainy night last week, was standing on the platform with his umbrella raised, when a car passed going at the rate of 65 to 70 miles an hour. The suction from the passing car filled his umbrella, carried the man off the platform, hurled him against a fence and broke his arm."

Mr. Bicknell is trying to decide whether the company is liable or not for the injuries sustained by this man. Perhaps some of the legal minds in attendance can answer this query.



A noteworthy feature of the Detroit convention has been not only that the registration is larger than any other previous convention with the exception of the New York meeting, but that almost the entire attendance was registered on the first day. This proves that delegates and supplymen have found the three days of the convention none too many in which to transact business, and are therefore arranging to be on hand at the opening hour. At former conventions it has usually been the case that nearly half of the total registration was made on the second day. We believe that at least four days should be given to the convention in the future.



One of the neat souvenirs at the convention is a silver match box distributed by the Crocker-Wheeler Co., the body of the receptacle being covered by celluloid upon which is printed the donor's trade mark in colors.



Never in the history of the association has there been so large a number of ladies registered and in attendance. This probably accounts entirely for the success of the meeting.



Mr. W. H. Gray, of Townsend, Reed & Co., with headquarters at Indianapolis, arrived in Detroit Wednesday morning and has seen the convention to the finish. Everybody remembers Billy when he was one of the Peckham Track men, and his new position of "magnate" has not changed him.



A feature of the convention was the force of "White Wing" street cleaners furnished by Public Works Commissioner Moreland to keep the Convention Hall and surroundings tidy and free from the usual accumulation of litter and refuse. Their spotless uniforms, business-like demeanor and effective work are evidently the results of careful training and discipline.

TWENTY-FIRST ANNUAL MEETING

AMERICAN STREET RAILWAY ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

FRIDAY MORNING SESSION.

President Vreeland called the meeting to order at 10:40 a. m. and announced that the first business this morning will be the report of the Committee on Standard Rules for the Government of Street Railway Employes.

Mr. Harrington, Camden: Mr. Brackenridge, the chairman of the committee, is not here, and it seems to be the sense of the committee that the rules which have been submitted express only the preliminary work of the committee on this subject, and we would therefore request that either the committee be continued, if it is your pleasure, or that a new committee be appointed.

President Vreeland: Your President has had some conference with the members of the Committee on Rules. It seems advisable that the work of this committee should be done in a very thorough way, before any set of rules is adopted. The matter of framing a standard set of rules, as you gentlemen know, took a great deal of attention for many years in connection with the work of other associations. The New York State Street Railway Association has a committee now working on this subject, and this committee recently made a preliminary report at the meeting of that Association held last month. It has been suggested that inasmuch as Mr. Brackenridge, of the Brooklyn Rapid Transit Co., has given up the operating department, that there be a substitution in his place, and that another gentleman be added to the committee so that the committee can go forward with the work during the next year. It is advisable, in the mind of the chair, that the same members of the committee, with additional appointments, should go ahead with the work this following year so that they will not lose the value of the work which they have already done. It has been suggested that Mr. E. G. Connette, of Syracuse, be appointed in place of Mr. Brackenridge, which will make two members of the committee, Mr. Mitten, of Buffalo, and Mr. Connette, of Syracuse, working on this proposition, each being members of the Committee on Standard Rules appointed by the New York State Association, which will undoubtedly facilitate the work of forming a standard set of rules; and the chair will appoint as the Committee on Standard Rules for the ensuing year Mr. T. E. Mitten, of Buffalo; Mr. E. C. Foster, of Lynn; Mr. W. E. Harrington, of Camden, and Mr. E. G. Connette, of Syracuse; Mr. Connette to be the chairman of the committee.

Mr. John I. Beggs: I would make a suggestion in connection with the work of this committee. I do it without any disparagement to those on the committee, but in the hope of hastening, if possible, the presentation of a report upon which action may be taken by this Association. There are a number of roads throughout the United States, among which is the road with which I am associated, that have been waiting for two or three years, at least, in the publication of rules to govern their employes, until this Association should have given the stamp of its approval to a set of rules that might give greater uniformity to the conditions under which our employes throughout the country work. I for one will feel compelled to take this report as a basis—or the report of the committee of the New York State Association, which I think is much better, and I say it without disparagement to this committee—because you will find in sections 52 to 55 of these rules as submitted a set of conditions—I do not know who is responsible for them—to conform to which, would in my judgment, make it absolutely impracticable to operate a street railway in any metropolitan city. These rules in question may be very well for an interurban line, but are absolutely impractical of application, in any city of any considerable size. I furthermore think that there should be some representa-

tive of this committee from a large city, like Chicago or St. Louis. We know that in different sections of the country there are different conditions confronting the operators of street railways, and this committee as organized is largely confined to the east. I am perfectly satisfied with the committee as it is now constituted, but I think there should be some one from a great city like Chicago or one of the western cities, to give expression to their views in the formation of these rules. I have read the rules very carefully. The rules Sections 52 to 55 inclusive, require a car to come to a full stop every time it passes another car; to come to a full stop before it crosses any other street railway intersection, etc. In a large city that would be absurd. It is absolutely impractical to carry out, and I cannot understand who would be responsible for four rules such as these. I simply throw this out as a suggestion of a criticism which might be made upon the work of this committee; and I would like to suggest, without the necessity of making a motion, that the committee be increased by at least one other member, who should come from, say, the city of Chicago. This would more nearly represent the practice throughout the west.

The President: The chair will very gladly do what Mr. Beggs suggested. It has been the experience of your chairman in dealing with the subject for many years, and on other subjects handled by committees, that it has been wiser in appointing a committee, to appoint the members of the committee from some section of the country where the members can get together and hold a meeting. Questions connected with other cities, as a rule, can generally be covered in a satisfactory manner by correspondence; but inasmuch as the appointment of an additional member will not make any difference to the committee, the chair will follow the suggestion made by Mr. Beggs and appoint Mr. Robert McCullough, of Chicago, as an additional member of the committee.

On motion the report of the Committee on Standard Rules as presented at this meeting was accepted.

[The report of the Committee on Standard Rules is so voluminous that want of space prevents our publishing them in this issue.—Ed.]

The President: In order to dispose of the reports of the committees, as some of the members of the committees find it necessary to leave the city rather early to-day, we will have the report of the Committee on Standards, of which Mr. N. H. Hefl, of Meriden, Conn., is chairman.

Mr. Hefl then presented the report of the committee and said:

I think I stated correctly that it is the unanimous opinion of the committee that this Association could adopt at this meeting the standards recommended by the committee, as they are in line and in most cases an exact duplicate of the M. C. B. standards for rails, axles, journals, brasses, wheels, journal boxes, brake heads, brake shoes, etc.

[As the illustrations accompanying this report are not available the printing of the text of the report has been deferred.—Ed.]

The President: Gentlemen, you have heard the report of the Committee on Standards. This committee was appointed for this important work with the full confidence of the Association in the value of their recommendations. There is no member who has to do with the larger questions connected with the present electric systems of operation, city, interurban and suburban, heavy city work as well as work outside of the city limits, but appreciates the fact that the standardizing proposition is an important one at the present time. In the light of the experience of the last half century of steam railroad operation, it is hardly worth the while of the members of this Association to go ahead spending money in as many different directions as there are

managers represented, because the era of consolidation is at hand, not approaching, and we will find ourselves with many interurban roads, through consolidations, which will have as many different standards as the ideas of the managers handling the property. You have heard the recommendation of the committee that this Association accept the recommendations contained in the report as standards, and inasmuch as the chairman stated that the standards selected by the committee are the established standards of the United States through the M. C. B. rules, it is hardly worth while to take up much time in the discussion of the report. However, the report is before you and the chairman will be glad to answer any questions. We would like to have any member who has anything to suggest to do so at once, as we have considerable work to get through with what we have to-day by an early hour this afternoon. If there is no gentleman who desires to discuss the report, a motion is in order that the report be received and the recommendations be accepted, and that the full report on standards as recommended by the committee be printed in the proceedings of the Association. The chair will be glad to have that motion made.

On motion the report was accepted and ordered printed, and the committee discharged, and the officers for the ensuing year authorized to appoint a new committee.

The chair appointed W. Worth Bean, of St. Joseph, Mich., and H. W. Dickinson, of Seattle, as a committee on resolutions.

Mr. Sniffin then presented his paper on "The Steam Turbine; Its Commercial Aspect," which will be found on page 723.

Mr. Beggs: I have read the paper on steam turbines with a great deal of care, for the reason that two years ago I postponed all progress in the construction of a power house in which we expected to expend a large amount of money on units similar to those installed by the Manhattan Railway Co. in New York, and now being built in our city for the Subway company in New York, because the matter of steam turbines was then being seriously agitated; and I did not wish to proceed with the work at that time and have some one say five years hence that it was a mistake to spend three millions of dollars on a power house with reciprocating engines when it was about to be demonstrated that the steam turbine was destined to displace the reciprocating engine. Consequently I have read this paper with a great deal of interest, and have gained from it some useful information. There is one point which has not been touched upon as fully as many others and that is the relative cost of the generator by itself to be connected to the steam turbine; in other words, you have left out apparently the differentiating cost as to the turbine itself and the generator to be connected to it. I would like to know whether your estimates of cost in the paper, when you say that the turbine costs less, means that the gradual or that the reduced cost is due to the reduced cost of the generator rather than to the turbines?

Mr. Sniffin: That question is not so material when you consider that these companies are either offering or expect to offer these turbine units as complete outfits. It makes no difference what the steam or electrical end costs individually, so far as we have the comparison of the cost of the complete unit. In a general way it may be said that the electrical end of the unit is lower in cost of manufacture than the large revolving generator that goes with a reciprocating engine. While the steam end itself is perhaps comparatively inexpensive, yet the price of the complete unit compared with the cost of the reciprocating unit, including its generator, is the comparison I made in my paper. It is not the purpose of the Westinghouse Company to furnish the steam turbine alone, but to furnish the generator with it as a complete unit.

Mr. Beggs: This is really a manufacturers' paper, and Mr. Sniffin has proceeded with the conclusions urged in that paper as a maximum cost upon lines which it will hardly be possible to be followed by those who are going to pay for these units. There are two or three concerns in the United States at the present time which are developing the steam turbine in connection with generators, but I do not think that those of us who are spending millions of money in the construction of power plants, are going to be satisfied to depend upon two electrical manufacturing concerns for the construction of the steam turbine, which is a mechanical device and entirely independent

of the electric generator. For instance, the largest manufacturer of steam engines in the world is located in the city of Milwaukee, the Allis-Chalmers Co., and I do not suppose for one moment I know as a matter of fact—that it would propose to have its business taken from it by even the Westinghouse or General Electric Co., and it is to-day experimenting on a large steam turbine. Therefore, it is important that we know what the difference in cost is, and know how the varying elements are reached in considering the expense of constructing a power plant, including that of the generator. One of the important points, which is entirely ignored in the paper before us, is the effect of the greatly reduced cost of the generator to be attached to the steam turbine because of the high speed at which it must necessarily run. I believe the lowest speed at which it is considered you can make a large turbine operate successfully is about 750 r. p. m. Is that correct?

Mr. Sniffin: Yes.

Mr. Beggs: Those gentlemen who know the difficulty we have had of getting the electrical manufacturers to build a generator of sufficiently low speed to operate satisfactorily with the larger types of Corliss engines that are now being built, know how much they have had to pay because of the slow speed. In this matter of the development of our power house, it became important whether or not we could cut down the revolutions of our engines, 7 revolutions, from 75 to 68 revolutions, which the builders of the engines said would measurably improve them from the operative standpoint; yet that reduction of 7 revolutions per minute added greatly to the cost of the generator to be attached to that engine. It likewise added to its weight and made it almost impractical to construct the units to run at 68 instead of 75 revolutions per minute.

I thoroughly understand the great desirability for the two or three large electrical concerns of compelling the purchase of the entire unit; but where there are only about two electrical manufacturers to-day that we might feel safe in—there may be a third in the future, and very likely a fourth, who can build a 5,000-kw. generator which we would be justified in making a contract for—there are almost a score of concerns in this country that can build a turbine to run at 750 r. p. m. because of the greatly reduced size and weight of the parts to be used. That is one point I think that would have been very valuable indeed to those of us who are interested in this new form of utilizing power that may come to displace the reciprocating engines, and it would have been very interesting for us to have had some information on that subject. If Mr. Sniffin has any data on that point, I would like to have him give them to us, because when I go into the market to buy a steam turbine I want to buy it as a piece of mechanical apparatus and not a piece of electrical apparatus. It becomes a very different proposition whether you buy it in two parts from two concerns, or buy it from one concern, if you have absorbed the saving in the generator that would be realized, and turned it in as an excessive profit on the turbine there is no advantage; we are looking at the commercial side of the subject, as well as the mechanical and electrical side of it.

Mr. Hefl: I would ask Mr. Sniffin what history the steam turbine manufacturer has behind him, and what he proposes to give to the purchaser in the way of a guarantee as to the cost of maintenance if we buy this steam turbine?

Mr. Sniffin: In my paper I believe that I said something about the cost of the maintenance that was found in a station in England, where something like a dozen turbines have been used. It is true the steam turbine has behind it not as many years of history as the reciprocating engine. It has, however, sufficient history behind it to show that there is no reason why a steam turbine, properly built, should not be less in maintenance cost than a reciprocating engine, which must be so by virtue of its very nature. I do not know what could be said about a guarantee of repairs; you could hardly get a guarantee of repairs on a reciprocating engine or any piece of moving machinery. That feature is gaged not only by its excellence of design and construction, but by the way in which it is handled. I think I can best answer that question by saying that the Westinghouse company in manufacturing a turbine is willing to make for it the same guarantee as to maintenance which it will make for any other piece of machinery which it produces. It will assume to be responsible for its sufficiency of design and construction and

will agree to make good any defects in it within any reasonable time after its installation. What more can you ask?

Mr. Heft: It depends entirely on how the contract was drawn.

Mr. Sniffin: Precisely; but that in substance is about all you can ask of any manufacturer in regard to his machinery. I might say further that there is no hesitation on the part of the manufacturer of the turbine in making guarantees of economy, that are a great deal more valuable as guarantees than warranties of economy made on reciprocating engines. We all know that it is common to ask and obtain guarantees on reciprocating engines, but they are almost a dead letter. The value of the guarantee is practically never demonstrated as far as the engines are concerned: the engines are constructed, partly assembled in the shop, wheels never put on, and it is a physical impossibility to test large engines at the works. The engine is shipped and put into service, and it is only once in a great while that we find efforts to make tests on these engines and when we do there are always many questions introduced affecting the actual results we get in such tests. Now, in the case of the steam turbine a guarantee is not only made, but it is demonstrated. If you purchase a 1,000-kilowatt turbine on the guarantees of efficiency, based upon different conditions involved so many degrees of superheating, so many inches of vacuum, and so much steam pressure, it is a fact that that turbine will be tested for efficiency under those conditions. At the particular works I know most about, there are facilities for making such tests, large boiler plant, superheating, condensing apparatus, and it will be found quite advisable and possible, and will be the regular practice, to put these turbines under service condition tests. I think, therefore, that the assurance had in that way is much greater than we have ever had on reciprocating engines, and I think it is a great advantage in the engine building practice.

Referring to the question of subdividing the cost of the steam turbine, I can only say that the turbo-generator unit itself is to be developed as a complete entity. You cannot have a good turbine and a good generator, and put them together and conclude they are going to make a good unit, unless they have been developed with relation to each other. As has been said, there are not many concerns in the turbine business at the present time. There will be doubtless many more. There are a good many generator builders, and doubtless many of them are expecting to find occasion to build generators for steam turbine use. Let them go ahead—the more the merrier. If any combination engine builder and generator builder can build a good steam end and a good electrical end, and put them together and make them run, that is all we want. So far the Westinghouse company has put money and time into it, and can give you a unit with the assurance of operating ability, economical performance, and I think reliability of service—all that can be had on the reciprocating engines, and at a first cost and under contract conditions that will be easily understood.

Mr. Heft: I think Mr. Sniffin should be commended for his frankness, but I think it would have been a great satisfaction to the members if he had brought some data here with some history behind it, so that we could look upon the question from the commercial side and not from the engineering side. I have been trying to get some data as to steam turbines for a year. I have gone to Hartford to see the plant that was erected there. I have been to Hartford three times, and every time I have been there the plant was not running. It was shut down because they were changing something. They told me that there had been some little changes which were necessary. I asked the General Electric people to direct me where I could see a plant in operation. They replied that they had one at Schenectady that they were experimenting with, and that they were taking many orders for steam turbines. That will not go with me. I have got to know what you are going to do before I will buy one. I will be very glad to be furnished with any history or data bearing up on the question of steam turbines, with a view of purchasing large units. I do not care whether Milwaukee builds the engines and you build the generators, I will take it as a whole on condition that I have some guarantee as to the life and efficiency of it—what it will do.

Mr. Beggs: Mr. Sniffin's paper carries with it a contradiction to a part of his statement. One of the claims made for the steam turbine is the greater reliability in its regulation, its ability to accommodate itself to varying loads. I believe that general statement appears in your paper, Mr. Sniffin?

Mr. Sniffin: Yes.

Mr. Beggs: If it does not, it is at any rate the claim that is made for the steam turbine, and I take it this discussion is for the purpose of directing the steam turbine to the attention of those who may be interested in either increasing their steam plants or in starting new ones on certain lines of thought and information which they are able to receive. I have had exhaustive investigation made of the steam turbine made for two years past. We have held up the construction of a power plant in which there is to be expended three or four million of dollars. I have had my chief engineer travel all through the East, visit the works of the Westinghouse company for two or three days, and likewise the works of the General Electric Co. at Schenectady. There is a steam turbine running in Michigan, and it is said that the installation of a number of them in various places is contemplated. However, as to what the steam turbine will do when it comes to large units is as much a matter of conjecture on the part of the manufacturers of to-day as on the part of those who are considering buying steam turbines. We do know what a reciprocating engine will do, because they have been built and are in practical operation, and have been developed to their present perfection by the gradual process of many years' practice and experience. Therefore, if the steam turbine is going to simplify the matter of regulation, and make it possible to run generators in parallel with a greater degree of success and a reduction of all the contingencies likely to arise which cause trouble, it seems a much simpler matter to build a generator to operate with that piece of apparatus, than it is to build a generator to operate with a reciprocating engine, the governing of which is such a delicate matter. Therefore, I take it that instead of there being one or two concerns in this country which will build steam turbines there will be a score of them. This is a very important matter to us; it is especially important when we come to consider that the price of a 5,000-kilowatt generator alone runs anywhere between \$65,000 and \$75,000. It becomes an important question whether a piece of steam apparatus is being developed which will cut the cost down to \$15,000 or \$20,000—of course, these figures are only approximate. It seems, however, that we shall require competition in the production of the steam turbine before we get the ideal condition. I have a fine buggy, but if there is only one concern in the country who can sell me a good horse, it puts me in a rather unsatisfactory plight. That is the position we want to avoid. I understand there is a 5,000-kilowatt turbo-generator now being built for a company in the city of Chicago. I am awaiting the installation of that apparatus with interest and curiosity, to see the tests on that steam turbine unit. There is no history back of them as to large units. They have some history as to small units. I believe the only data we have regarding the steam turbine is with units of a thousand kilowatts. I think the Association is indebted to Mr. Sniffin for what he has given us in his paper, notwithstanding the fact that the information is somewhat limited.

Mr. Heft: I want to say to the members that I am not opposed in any way to steam turbines, but on the other hand I am a believer in them; but I also believe that if all the manufacturers should attempt to sell these turbines; in other words, have the purchaser exploit the machine, they should do something themselves, and give us some data as to what the cost of maintenance and the life of these engines would be as compared to the reciprocating engine. If a man comes along to sell you a steam engine, he is offering you something with a record and a history; but you have no history behind the steam turbine. There are very few steam turbine plants in operation, and with those that are in operation, as far as I can learn, it has been necessary to make changes and the turbine has not come up to the expectation of the designers and builders. Yet I believe for the operating of generators they will eventually become a great commercial success. I believe a manufacturer coming before this body, should come here with some data,

some history, regarding the turbine, so that we might know under what conditions we were buying the machines.

Mr. Bean: If I had the money I do not know whether I would buy a steam turbine, but I think the gentleman is in the same position as the American Street Railway Association was before we adopted electricity. How did we know how this was going to work? But the turbine engine, like the electric motors and generators, is a new thing, and we should not be afraid to put our money in as we were obliged to before. That is the way we developed the other industry. Let us do that now with the turbine.

Col. Heft: That is all very well if you have the money, but I have had a very little experience developing the street railway motor up to its present standard. If I had not been in a position to contract with the electric companies in such a way as to bind them to exploit these machines at their own expense, they would have bankrupted the New Haven road. When I buy a machine to-day I want to know something about it. I want it as good as it can be made, and I want the fellow that made it to pay for the experiment.

Mr. Bean: The New Haven road has been playing second fiddle, and I am very glad to have Mr. Heft bring out this proposition. They have always been playing the second fiddle, and the small fellows have had to go into their pockets. I am willing to say, myself among the number, that there is a damned good many dupes in this Association.

Mr. Wyman: I cannot speak from a technical point of view as cleverly as Mr. Beggs or Col. Heft, who have spoken upon this subject, but we have made on the part of our company some investigation into this matter of steam turbines, both for the larger units and the smaller ones. We have been treated with the utmost courtesy by the Westinghouse people and the General Electric people. I think they have been good enough to give us the most of the information that they themselves possess. It has been acknowledged, I believe, by most of these gentlemen who are experimenting in this field, that it is yet somewhat in the nature of an experiment. I think, therefore, perhaps it is rather premature for us to demand the exact facts and exact statements as yet. We should rather applaud the experimental work which they have taken up in this direction. We should feel very grateful to them for having done as much as they have. While we may none of us be willing yet to make any very extensive investments in this new power, or rather method of developing it, we should aid in every possible way we can the progress of these investigations. I am aware that the Delburne people have already built some large steam turbines which have been shifted to the Delaware & Lackawanna road, and I am watching with interest the tests, or rather the experience, which the engineers of that road will have with those machines. I feel very certain that we are upon the eve of some very important developments in the line of steam turbines. I simply want to say that for myself I feel very thankful for this paper, and I am willing to wait until these gentlemen are ready to give us a little more.

The President: It is the purpose of the chair to give Mr. Sniffen an opportunity to reply briefly to anything that is suggested. It would be better if any of the members have anything to advance to say it now and let Mr. Sniffen's reply close the discussion. I will be very glad to hear from anyone on this important subject, that is, any new points to be brought out.

Mr. S. A. Palmer, Fall River: I would like to ask the gentleman whether or not the cost of the condensing plant for use of the turbines is greater or not than it is with engines?

Mr. Catta: I just want to ask Mr. Sniffen if the central condensing plant could be used in connection with a turbo-generator instead of independent condensers for each unit. For instance, in a small size, up to 750 kilowatts, or in a plant of two or three or less units would an independent condenser be necessary for each unit that is installed?

Mr. C. O. Mailloux, New York: I can answer the question of the gentleman who just spoke from my own information. I am now about installing a plant containing two units which is sought to be operated by the same condensing plant. I see no reason why myself it would not be possible to operate any number of units with the same condensing plant, though it

might in very large units have a condenser for each unit. The cost of the condensing apparatus as far as my investigations have disclosed it to be somewhat larger than the cost with an ordinary steam engine. This is due to many reasons. It is also a fact that the exhaust piping has to be done more carefully and is of larger diameter. That, however, is offset by many other advantages, one being the ability to use superheated steam of almost any temperature without mechanical detriment to the engine. I have had occasion to design large plants in which I have seriously considered the question of using superheated steam, and found much to my sorrow that there were many of the engines as at present constructed there is a limit to the temperature that can be allowed in a high pressure steam, owing to the difficulty when you reach a temperature of 500 Fahrenheit the steam will reach very near a point at which lubrication becomes almost impossible. With a steam turbine, on the contrary, there is no limit to the temperature of superheating that you may attain, its only limit being the melting point of the material of which the engine is made. I see no reason why you could not run a steam turbine at a point where it would be cherry heat, and glow in the dark, if there was any advantage in it. Of course, we all know there is a great advantage in superheating steam. I believe that the steam turbine in that respect is bound to be a very important element in a new way of using steam in steam engines. I have observed it carefully for the last five or six years. I first met it abroad and was surprised to see the extent to which it was used, although it was in smaller units. Until two years ago, I think, no units had been attempted which were of greater capacity than 300 kilowatts. The two units which I have ordered are 400 kilowatts each. My own observations lead me to believe that the larger turbines will be a much simpler machine, a more practical machine, as well as a more economical machine. I have been presented by the turbine people with a brilliant prospectus looking forward, in which we will have economies of something like 10½ or 11 lb. per indicated horse power, or the equivalent thereof. Now, gentlemen, I think you will all concede that such brilliant promises are worthy of investigation, even if we have to make a large discount on them, but still then we will be doing very much better than it is possible to be done with the very best reciprocating engines. The reciprocating engine is in a high state of perfection. It is not a machine to be despised, but I believe at the same time that the turbine is the coming machine. I am not prepared to say that I believe that it has arrived, but I believe in a very few years, perhaps in a year, it will be possible for us to say conscientiously that it has arrived and is going to stay. I have reached that conviction partly by discussing the matter with makers of reciprocating engines, who have all confessed to me that they are looking to the turbine with the greatest attention. Many of them stated that they believed themselves that it is the coming machine, and they told me with some satisfaction that they hoped to be able to go into the business themselves, if there were no great fundamental facts likely to interfere. Some of them assert that they believe there will be an opening for them to enter the field. Hence we as engineers and as users of steam engines and as companies also who have to install plants need not fear that there will be lack of competition that will be sufficiently keen to keep the prices down. One of the difficulties of steam turbines to-day is not so much mechanical as it is electrical. The fact is that the steam turbine cannot be successfully used with direct current generation. The defects of the machine are so great that in the case of large units where it is attempted to put the armature on the turbine shaft direct instead of putting it on the countershaft, the hope of making it successful appears to have been abandoned on the direct current machine. The turbine is admitted by its best friends to-day to require alternating generators. A further detail of the defects is the fact that these machines make considerable noise. That appears to be more of an electrical defect than a mechanical one. It is largely related, probably, to the design of the dynamo, flat poles and the cords, numerous slots, etc. This problem is receiving attention, and it is hoped that in another year or two it will be fully eradicated. You must remember that the first machines which were made, the first dynamo generators, or the first dynamos used

were imperfect, and they also had, in addition to their imperfections, the fault of making a great deal of noise. That fault has been greatly remedied until to-day we are not complaining on that score. I believe the turbine will doubtless be developed in the same manner. I do not think that there need be any apprehension on the part of regulation. I have myself watched carefully, both here and abroad, and find that the direct regulation of the machine will compare at least favorably with any of the existing reciprocating steam engines, and it is my opinion that on the score of economy we should use it to-day.

Mr. Sniffin: The last question seems to have been answered in regard to the character of the condensing apparatus. I would only add that we like to have the exhaust pipe large, and leading up in such a way as to get the steam away from the turbine readily, and so long as the pipe is tight and the vacuum maintained, I don't see that it makes any difference which method is employed. I think that the questions that have been asked and the answers to them will leave in the minds of the Association generally, a feeling that the turbine is still something of an experiment. I think I can disprove that. Col. Heft remarked about his visit to Hartford on two or three occasions when he found the turbine shut down, due to some changes they were making. I treat of that in my paper and I very frankly gave the troubles we had at Hartford. That turbine now has been running since the early days of its installation for some months whenever they wanted. It does enough to please the builders and I think it pleases the customers. I think if Col. Heft were to interview the people who bought that turbine, and who paid for it and have operated for some months, he could probably get a letter answer. I may say that that turbine was sold as a 1,500-kw. carries from 1,800 to 2,000 kw. and it has carried, without any apparent trouble, 2,800 kw. I think you have all seen the results of tests made by Prof. Robb on a turbine carrying about 1,900 kilowatts, running with 150 lb. steam pressure and giving a result of about 19 lb. per hour. That I believe would be admitted to be well within the line of the very best engine pressure. There is a turbine at Wilberton of 100 kw. which has run since the first of February and which has run ten hours a day carrying its full load, generating current for factory power and for light. The Westinghouse Air Brake Co. has four 400 kw. machines that have been running for about three years. That plant is running to-day and it is doing all the work of the factory. Its economy is very high and its repairs are practically nothing. You can see no evidence of wear in these turbines, and they are running to-day, that is, three of them about three years and one a little less. Now there is some history. History grows quickly. It has been stated that we did not know whether a 5,000-kilowatt turbine will operate. Up to three months ago we did not know that about a piston engine. So far as I am aware, there was not a 5,000 kilowatt generator driven by piston engine in this country until one in New York in the Manhattan power house. With the 1,500-kw. machine at Hartford, with the one at Wilberton, with the four at the Westinghouse, with the work that has been done abroad, with the work that is now being done and the history that will now be rapidly made, I think that the turbines can hardly be called an experiment. We are to-day building 1,000-kw. turbines. For the Rapid Transit Subway in New York, we are making three 1,250-kw. units to be used for lighting the subway. There are four 5,000 kilowatt turbines to be built for the Metropolitan District road in London, to operate the entire system; and we are building three 3,500-kilowatt for the Metropolitan Railroad, of London. The DeBeers Co., of Kimberly, South Africa, ordered two 1,000-kilowatt turbines and they will both be shipped within the next thirty or sixty days. Prof. Thurston, acting as engineer for the DeBeers Co., will conduct a series of tests of these engines before they go forward and I believe the data we get will be very valuable. We will have the result of tests on a 1,000 kilowatt machine in regard to superheating, steam pressure, and vacuum, and it will not be long before we will know more about turbines than piston engines. I may say that the Cleveland & Western Ry. is putting in two 1,000 kilowatt machines for driving its new trolley system. Turbines are being built. They have been built for people who have investigated turbines and seen

turbines in operation and visited the works and seen how they were put together and formed their own conclusions on which to act. I think that answers the two questions.

Col. Heft: I would like to suggest that at the coming meeting next year, that the other half of this large electric trust be invited to read a paper on turbine engines, because I believe there is some difference in the construction of the two, there being, however, no difference in the price. It would certainly be interesting for the gentlemen here to see the ingenuity that they would display in showing up to us the best machine.

Mr. Beggs: I think Mr. Heft's suggestion is a suggestion that the incoming officers might give some time to. I would like to add to that, that the manufacturers of reciprocating engines in this country likewise be given an opportunity to have their side of the case presented here, in order that we may have some of the views of the engineers of standing and reputation in this country, who do not think to-day that the steam turbine is going to successfully compete with the reciprocating engine.

The President: The suggestion of Col. Heft and Mr. Beggs are suggestions that necessarily must be made to the Executive Committee of the Association in considering topics for next year. The discussion so far as the turbine is concerned, is closed, by Mr. Sniffin's remarks, and the Association is very much obliged for his kindness in preparing this paper.

A vote of thanks was tendered to Mr. Sniffin for his very able paper.

The next paper was "The Adjustment of Damage Claims," by Mr. Starring, which is printed on page 722.

Mr. Beggs: There is not a single line in Mr. Starring's paper with which I can take issue. It is an admirably prepared paper. There are one or two points in Mr. Starring's paper that I particularly desire to lay stress upon, and that is, the maintenance of an absolutely rigid policy as to dealing with all classes of claims regardless of who may be affected or what influences may be brought to bear to compel or induce the company to make more liberal settlements. It is not an unusual thing to have influential directors of the company, influential politicians, and sometimes directors influenced by politicians attempting to prevail upon the agent to adjust some claim or to allow something in a case of some injury for which there is no legal liability. I may say, as far as that is concerned, if the entire board of directors, if all of the officers and all the politicians of the city in which I am located were to enter into a petition to make some adjustment more favorable than the conditions would warrant, I would not permit it to be done. But when that policy is known throughout the city, it has much to do with deterring the pettifogging lawyers from instituting suits against the company. I might say that in the history of the company I represent, my orders are that in every case, where there is a fair belief that the company is liable, to make a settlement, if it can be done on any fair basis, and to make it as quickly as possible. As an indication of that, during the year 1890 we had eleven cases tried in court, of which we obtained a verdict in nine of them. One of the two that went against us was afterwards reversed by the higher court. Last year we won nine out of ten cases, which was all we had to go to the courts. That is the best way of preventing pettifogging lawyers from sandbagging our companies. I commend this paper of Mr. Starring's to the careful perusal not only of those that may be immediately connected with the claim agents of the various departments, but with every officer and particularly every executive officer of the company, as there may be other principles involved here. One of the great difficulties to contend with in dealing with accident cases, is to know exactly what the facts are. This is sometimes rendered more difficult because of the inclination of the employe who may be responsible for it to attempt to shield himself even under a sworn statement. The practice of our own company is to require a sworn statement from both the motorman and conductor in every case. We prepare every case, no matter how trivial, as though it were to go to court, and we obtain as many sworn statements in the fewest possible hours, as is practicable, from as many witnesses as possible. One of the most serious cases that we have had to settle for two years, we were led into

unwittingly because of the perjury of the motorman on the car. It was a case of where the car was claimed to have made a sudden start, the woman was thrown from the steps and seriously injured. She was a woman of middle age. We proceeded upon the presumption that she had fallen from the steps. One of the most reputable firms of attorneys in our city was her counsel. When we began to get into this case we were confronted with the fact that there were three young ladies who were getting off at this stopping point, which was the young ladies' college of that city, but who were in Europe then. But, nevertheless, their depositions were there, to the fact that there had been a momentary jerk of the car that threw this woman off, which had not been noticed by any other passenger whose evidence we had, but whose evidence and the statement both of the conductor and the motorman were directly contrary to that. It developed afterwards, and the motorman admitted it, notwithstanding it was a case of perjury, that he had stooped down to take his pin, or something of that kind, out, and in raising up his shoulder for a second struck his controller handle, which gave the car a sudden lurch for only a fraction of a second, but sufficient to throw this woman. As soon as that came to my knowledge, I ordered a settlement made. We now brought up that man from St. Louis, where he was employed as a motorman, and he demanded \$100; for \$100 he would go on the stand and give evidence to the same effect as he had put in his affidavit. After some time we obtained a letter from him virtually agreeing to accept this \$100. Then I gave orders that we would not try the case at all. I wanted to get him on record, and we settled that case for a large amount of money. It could have been settled for \$100. In fact, an offer was made a short time after the injury to settle for that amount. We paid \$3,500, of which \$1,500 or \$1,800 had already been paid out in doctor's bills, nurse hire, and all that kind of thing. There was a case where our own employes misled us.

A number of us make a great mistake in looking only for evidence for the company. We always look for evidence, even the worst that can be said by the adverse party in order that we may be in possession of all the information that will enable us to determine whether we shall contest that case. My policy, in the treatment of accident claims, is that if we could settle a claim for \$10 which would require \$100 to defend it, we would far rather spend \$100 than to give to any pettifogging lawyer the \$10 which he is very willing to take and sell out his client. (Applause.) I will not permit the purchase of any pettifogging lawyer. That policy has been persistently pursued for two years with very beneficial results. This is a change of policy to some extent from what had been previously pursued. There are companies, unfortunately, which I think short-sighted, that will, if they can, pay one of these lawyers \$25 or so to avoid litigation. They say it may cost \$100 or more if it be contested. I say, if it costs \$500 go into court and beat them.

Last year our accident cost was reduced to a fraction over 2 per cent of our gross receipts. We carry 4 per cent of our gross receipts every month to the injury and damage reserve. Year before last it was about 2.9 per cent, I think. Last year we reduced it to 2.12 per cent. This year it is less than that, and it is largely due to this persistent pursuit of the policy of the application of fair common sense to the settlement of every case and permitting no case to be settled simply to get rid of it, if you do not feel that you are justly liable. Therefore, I say, gentlemen, do not permit the influence of boards of directors nor of politicians to affect the settlement of any injury or damage case. Cross-examine your own investigators and employes to find out the real facts in connection with it.

We are very often confronted with the evidence of the attorney for the plaintiff and we are dumfounded to know that we didn't know what was going on in our own cars. As I said before, we have only lost on an average one case out of ten, in the last two years. That we consider is phenomenal considering the juries before whom these cases are tried, who have the prejudice that exists against every corporation, particularly a public utility.

Mr. Sloan: I would like to ask Mr. Beggs whether or not he makes all his investigators notaries, so as to obtain the sworn statements from the witnesses. We find it very difficult in many cases to get the statement even signed. Witnesses object to it.

Mr. Beggs: All our investigators, in fact everybody connected with our claim agency, is a notary. Sometimes it is very difficult to get a statement, and we sometimes get a witness by one means or another into our office. A cross-examination goes on, the notes of which are being taken by a stenographer, unknown to them, in important cases, and this is afterwards submitted to them to say whether or not it was what was said. Every investigator in our service, and everybody connected with our department is a notary, and we try to have a sworn statement from every witness. Every motorman and conductor in connection with these cases, who makes a statement, has to be sworn to it, and sign it.

Mr. Bean: I would next like to ask Mr. Beggs whether, in a majority of the cases, the juries are from the city or from the country?

Mr. Beggs: They are nearly all city jurors. Apropos to notaries in the claim department, every division superintendent is likewise a notary. We employ counsel by the year, and pay them a large compensation to defend all cases of injury or damage of whatever kind, either to persons or property. We likewise employ a physician. While he does not give his entire time to the service of our company, it is largely given to it; and we pay him likewise an annual salary. That physician is usually on the ground in any case of injury to persons within a very few minutes after it has occurred. We usually try to get two or more investigators and our physician there in the fewest moments possible. Our physician is one of the most important agents we have in our service, being a level-headed, practical man. Even if the person is taken to the hospital—it may be the emergency or some private hospital—we try to have our own physician there as soon as the patient is. Furthermore, a policy which we inaugurated two or three years ago, was to render no medical attention unless there was a case of liability. We had squandered large amounts of money for several years in giving medical attention by our physician in nearly every case. Our policy now is not to render any medical or surgical service unless it is a case of liability. It has cost us a large amount of money.

Mr. Robinson: I think Mr. Beggs is to be highly congratulated on the very successful result which he has attained in Milwaukee. I have no doubt it is due to the peerless and courageous method he has taken for treating these claims. I hope his good work will continue. During the past year, the corporation that I have control of in New York tried 1,145 cases. Out of that number, we were successful in about 650 of them. With this great amount of litigation, of course it is very difficult to handle it as Mr. Beggs has suggested. I insist, generally, on the taking of affidavits of the motorman and conductor, but a statement in writing and signed, let alone under oath, is very difficult to obtain from a large number of witnesses, who are, as a rule, of the lower class. It is very difficult in handling a large number of cases to get these statements. Some days we have a large number of reports come in and it is very difficult for the claim agent to say from reading the report whether the injury is severe or whether there may not be some elements which make it a case of a liability on the company. The number of cases of injury some days runs as high as 110 or 115, so you will see it is impracticable at times to adopt all the methods suggested by Mr. Beggs. The only point that I think Mr. Beggs is mistaken in is that relating to the examination by a physician. It seems to me that in all cases, where the injured party is not known, nothing known about him, that an examination by a medical man should be made. One of the great difficulties we have to contend with in New York is the unscrupulous character of the doctors who attend the plaintiff. Old injuries of years' standing are tried to be palmed off on the company. Injuries which develop four or five months after the accident are made to relate back to the accident itself. And the greatest exaggeration is promoted on the part of the plaintiff's doctor in case there is not an examination by a surgeon of the company. We have in the company's employ, six physicians. Even with the hard work they do in all these cases, we very frequently have to try suits in court without a medical examination. I think the best method

(Continued on page 739.)

PAPERS BEFORE THE AMERICAN STREET RAILWAY ASSOCIATION.

Read Friday, Oct. 10, 1902.

DISCIPLINE OF EMPLOYEES BY THE MERIT SYSTEM.

By W. A. Satterlee, General Superintendent Metropolitan Street Ry., Kansas City.

The merit system of discipline, as applied by managers of steam railways throughout the country, has recently been brought to the attention of street railway managers, through able articles in the "Street Railway Review" and the Street Railway Journal, in such a way that the system is now receiving much attention. It has been adopted by a number of roads, and their experience with it has been such that it is surely worthy of deep thought and attention on the part of all street railway officials. It seems to fill a long-felt want in street railway discipline, and, in importance, is second to none of the recent improvements and betterments constantly being adopted and in successful operation.

I know of no single change made in the old methods of operation, unless it be the adoption of the Standard System of Street Railway Accounting, that should receive a more hearty support from all. Certainly no system has been adopted that is fairer to the trainmen, or is more likely to produce in them a desire to keep their records clean, and as many demerit marks from appearing against them as possible.

There are many trivial acts, small in themselves, committed by trainmen in handling passengers, that as a whole tend to produce a feeling on the part of the traveling public either favorable or unfavorable to the company, which once formed is hard to offset. Small acts of courtesy toward passengers by trainmen are felt by the management in ways unknown to the men who perform these acts, and are as far-reaching for the good of the company as small acts of discourtesy are damaging.

To teach employes to be guarded in their talk, their acts, and their deportment on duty toward those with whom they come in contact, is a problem nearer solved in the merit system than in any other way. The value of courteous, accommodating and careful trainmen to any street railway system is of such importance, and so eagerly sought for, that any method of discipline which will accomplish that end will be of so great worth as to make management of street railway property a pleasure instead of care and worry that breaks down the health of any but robust men.

As a rule, men who seek employment in the train service of street railway lines are inexperienced in the art of handling the public in the way an exacting public expect, and acquire the tact only by continuous contact and experience, after training under some system of discipline worked out by those who, for years, have watched the needs and exactings of a people who expect the same attention from an inexperienced street car conductor, who may have been in the service only a few weeks, that they get from a steam railway conductor who has been under a system of training with his company for from eight to ten years before he has acquired the position where he comes in contact with the traveler.

To give the street railway public the service which they expect, and which they exact, is the aim and desire of all managers, but is a well-nigh impossible thing to do. To come as near the goal as human ingenuity can, may be done through the different experiences and methods used by well-managed roads, and by discussions and friendly criticisms brought about through the several papers written by different parties for this convention, and it would appear to me that the subject assigned to my company is one that should call forth from all representatives present a most interesting and instructive debate.

In brief, the system consists of a debit and credit account with each trainman, kept in a book ruled for that purpose, or in alphabetical files, his violation of rules being charged against him by a certain number of demerit marks, the number for any one offense depending upon the seriousness of it. As an offset against these demerit marks, he is entitled to receive a certain

number of merit marks for acts performed which would be considered by the company worthy and deserving of recognition.

If at any time within one year the demerit marks exceed the merit marks by a certain number fixed upon by the company, then the party receiving them is liable to discharge.

The detail of the working of the system as practiced by the company with which I am connected, but which can be varied to suit the ideas of different operators, is as follows:

A list of violation of rules with the number of demerits imposed for each is posted in a frame at each reporting place, that trainmen may know in advance the penalty, and also a list of acts considered worthy of merit with number of merits given for each.

A blank notice, made in carbon copy which is filed in office, reading as follows, is sent to each trainman, with his name filled in blank space, whenever he gets demerits or merits:

METROPOLITAN STREET RAILWAY COMPANY.

Kansas City, Mo.....190....

DEMERIT MARKS.

Mr.....

You have to-day been given DEMERIT MARKS on charge No. contained in the merit system of discipline.

Date.....

Time.....

Place.....

Assistant Superintendent.



METROPOLITAN STREET RAILWAY COMPANY.

Kansas City, Mo.....190....

MERIT MARKS.

Mr.....

You have this day been given merit marks on No..... contained in merit system of discipline.

Time.....

Date.....

Place.....

Assistant Superintendent.

Another notice, without trainman's name, is posted on board at reporting place, as notice to all other men that a conductor or motorman has been disciplined, with the charge, and number of demerit or merit marks he has received.

METROPOLITAN STREET RAILWAY COMPANY.

NOTICE.

Kansas City, Mo.....190....

A.....on.....line has this day been given..... marks on charge No..... in merit system of discipline.

Assistant Superintendent.

Whenever a man's demerits exceed his merits by 100, he is liable to discharge.

The old system of lay-offs and fines has been done away with and the service much improved in the short time the new system has been in vogue, since June 1, 1902.

Merit No. 10 for conductors (No. 9 for motormen) is broad enough to cover many things coming under the observation of inspectors, that show good judgment and interest in handling the public, and in such cases a liberal giving of merit marks will be appreciated by trainmen, and will redound to the profit of the company. A little praise given any employe by an employer is worth more and is more productive of good work than

fold than any reprimand. We all, no matter what position we hold, are pleased with notice taken of our work by those who are our immediate superiors, and a word of praise coming from a superintendent or manager to any employe working under the merit system will certainly not be lost.

The trainman who takes off his coat and gets to work first in a lay-out caused by a broken-down car or a wire down, etc., marks himself right then and there as a man the company needs, and he should get merit marks. If he takes an interest in clearing up such trouble, it is safe to say he will take the same interest in other matters. Too many men wait for some other man to take the lead and in that way much valuable time is lost in blockades, when there is no incentive or reward to spur them on. Those with demerit marks wait for an opportunity to reduce the number by getting enough merits to offset their demerits, and come to the front in case of trouble, showing by their desire to render assistance an interest in company matters not shown before. Whenever men can be taught to take



W. A. SATTERLEE.

the same interest in their employer's business they would in their own business, then that employer will get the most perfect service possible, and when the employer succeeds in getting a system of discipline that will bring about that result, then he has what has long been sought for, and until some system has been discovered better than the merit system, the latter should receive the hearty support and assistance of all managers of street railway property. Good train service is the vital cord in operation and trainmen make it good or bad according to their training.

METROPOLITAN STREET RAILWAY CO.
MOTORMEN AND GRIPMEN—DEMERITS.

Immediate Discharge.

1. Disloyalty to company.
2. False statements.
3. Intoxication.
4. Dishonesty.
5. Gross ungentlemanly conduct.

Demerits.

6. Failing to report accidents..... 10 to 100
7. Missing—
 - First time 10
 - Second time in one month..... 20
 - Third time in one month..... 30
8. Smoking on duty..... 30
9. Failure to make safety stop at crossings where required 30
10. Incomplete and poor accident reports..... 1 to 5
11. Untidy condition of dress..... 2
12. Recommending unworthy men for employment... 5
13. Neglecting to pick up passengers..... 10
14. Running over circuit breakers and overhead crossings without throwing off current..... 5
15. Allowing unauthorized persons in front vestibule.. 5
16. Fast running 5
17. Front headlight not burning..... 8
18. Entering saloons in uniform without good excuse.. 10
19. Frequenting saloons at any time..... 50

20. Gambling 50
21. Drinking on duty or before going on duty..... 20
22. Disobedience of orders (if flagrant—discharge).... 10
23. Profanity on duty..... 5
24. Accidents when avoidable in opinion of superintendent 10 to 100
25. Unnecessary conversation with passengers..... 10
26. Talking to conductors on duty..... 5
27. Failing to report trouble with car..... 5
28. Not answering signals promptly..... 1
29. Feeding current too fast..... 3
30. Running away from passengers at transfer points 10
31. Not ringing bell in passing car..... 2
32. Running ahead of schedule time..... 3
33. Not slowing up in passing car..... 5
34. Skinning the cable..... 25
35. Starting car without proper signal, except to avoid collision 20
36. Following car in front too close..... 10
37. Starting electric car before closing gates..... 10
38. Opening electric gates before car stops..... 10
39. Running too close to wagons upon track before getting car completely under control..... 10
40. Bad judgment on special occasions..... 1 to 10
41. Leaving car without taking reverse lever..... 10
42. Flattening wheels 10 to 20
43. Injury to car equipment that could be avoided by proper care and judgment..... 10 to 20
44. Not stopping for passengers to get on (if at proper place) 10
45. Not obeying conductor's signal..... 5
46. Running crossings without proper flagman's signal where required 20
47. Cutting rope 25 to 50
48. Trouble with passengers when gripman or motorman is to blame..... 10
49. Garnishee—
 - First time 10
 - Second time 10 to 50
 - Third time 50 to 100
50. Assignment of wages or security deposit..... 25
51. Talking to others than proper officers of company about accidents 20
52. Careless and indifferent operating of car..... 3 to 10
53. Criticizing management of road in presence of passengers 3
54. Failing to report delays..... 2
55. Not having proper tools..... 3
56. Plugging car except to avoid accidents..... 5
57. Running without sand in sand box..... 3
58. Acts detrimental to good service in opinion of superintendent 3 to 20
59. Incompetency 25 to 100
60. Holding train with cable..... 10

MOTORMEN AND GRIPMEN—MERITS.

Merits.

1. Warning persons in act of jumping on or off moving car to wait for car to come to stop..... 2
2. Securing names and addresses of witnesses who saw accident, other than those on accident report 2 to 5
3. Politeness and attention to passengers noticed by inspectors 3
4. Assistance rendered in case of accident, such as to bring commendation from passengers..... 3
5. Informing company of matters in the interest of good service, etc..... 3 to 10
6. Complete and perfect accident reports..... 2
7. Good stop in avoiding accident..... 5
8. Good judgment and work in handling lay-out or blockade 2 to 5
9. Special meritorious act calling for recognition from company 10 to 50
10. Careful handling of car..... 5

CONDUCTORS—DEMERITS.

Immediate Discharge:	
1. Disloyalty to company.	
2. False statements.	
3. Intoxication.	
4. Dishonesty.	
5. Gross ungentlemanly conduct.	
	Demerits.
6. Failing to report accidents.....	10 to 100
7. Giving bells too quick.....	5
8. Smoking on duty.....	30
9. Error on trip sheet.....	1 to 5
10. Shortage.....	
11. Overage (except when pay check is turned in)	
Over six in one month, each.....	2 to 5
12. Missing fares.....	3 to 10
13. Failing to ring fares.....	5 to 20
14. Failing to properly flag crossings when required..	10
15. Incomplete and poor accident reports.....	1 to 5
16. Inattention to passengers.....	2
17. Trouble with passengers when conductor is to blame.....	10
18. Missing—	
First time.....	10
Second time in one month.....	20
Third time in one month.....	30
19. Dirty car.....	5
20. Untidy condition of dress.....	2
21. Recommending unworthy men for employment....	5
22. Back headlight burning except in case of fog.....	1
23. Reading on duty.....	10
24. Sitting down in car on duty (when running).....	5
25. Talking to motorman or gripman on duty.....	5
26. Letting boys change trolley.....	5
27. Entering saloon in uniform without good excuse..	10
28. Frequenting saloons at any time.....	50
29. Unnecessary conversation with passengers.....	10
30. Accident when avoidable in opinion of superintendent.....	10 to 100
31. Failure to announce streets.....	1 to 5
32. Profanity on duty.....	5
33. Disobedience to orders (if flagrant—discharge)....	10
34. Error in punching transfers.....	2
35. Deliberate punching of transfers to permit passengers to lay over.....	20
36. Gambling.....	50
37. Drinking on duty or before going on duty.....	20
38. Running away from passengers at transfer points..	10
39. Bad judgment on special occasions.....	1 to 10
40. Bad judgment or carelessness in regulating heat on cars.....	2
41. Criticizing management of road in presence of passengers.....	3
42. Neglecting to get transfers enough at barn to avoid borrowing.....	2
43. Talking about accidents to others than proper officers of company.....	20
44. Register not turned at end of line.....	10
45. Not in proper place on car.....	8
46. Careless and indifferent operating of car.....	3 to 10
47. Giving bells when not in proper place.....	5
48. Impolite remarks to passengers.....	5 to 25
49. Garmlahee, 1st time.....	10
2d time.....	10 to 50
3d time.....	50 to 100
50. Assignment of wages or security deposit.....	25
51. Failing to report register when out of order.....	3
52. Not going ahead and trying to locate cut rope or broken trolley when same is cut or down.....	5
53. Failing to report delays.....	2
54. Acts detrimental to good service in opinion of superintendent.....	3 to 20
55. Incompetency.....	25 to 100
56. Punching fares.....	5
57. Carrying people free.....	5 to 10

CONDUCTORS—MERITS.

	Merits.
1. Warning persons in act of jumping on or off moving car to wait for car to stop.....	2
2. Securing names and addresses of witnesses who saw accident, other than those on accident report.....	2 to 5
3. Politeness and attention to passengers noticed by inspectors.....	3
4. Assistance rendered in case of accident such as to bring commendation from passengers.....	3
5. Adjustment of shades and windows to please passengers.....	1
6. Informing Company of matters in the interest of good service, etc.....	3 to 10
7. Reports as to defects in equipment while operating car.....	1
8. Complete and perfect accident reports.....	2
9. Good judgment and work in handling lay-out or blockade.....	2 to 5
10. Special meritorious act calling for recognition from Company.....	10 to 50
11. Turning in passes or badges ordered up by Company.....	5



THE STEAM TURBINE: ITS COMMERCIAL ASPECT.

By Edward H. Sniffin.

The steam turbine is not as young as it looks. Although its application, in its present several forms, to commercial power generation, is the achievement of recent years, its principle is neither new nor novel, and it may be wondered that a century of effort should have been applied to the reciprocating engine— which became, indeed, more complicated as it grew, before the primal theories of the heat motor assumed corporate, practical form. It is true that later knowledge of materials, and how to work them, has made the way clearer; and the wider use of the steam turbine has in a measure depended upon the development of electrical practice, with which latter it is now so intimately identified.



E. H. SNIFFIN.

Much interest has for some time been centered in this type of prime mover and the possibilities of its application. The history of its development is quite generally known, and up to this time attention has been more particularly directed to its engineering and mechanical characteristics. It now seems appropriate to inquire into the controlling features of its commercial utility, and determine, if we may, whether the steam turbine, subjected to a somewhat careful analysis, is a machine still to be developed, though of ultimate promise, or whether it has been well tried and its advantages proved. What has it accomplished? What justifies its use? What otherwise unattainable results will it produce? What are its limitations? It is this aspect of the case on which the light is needed.

It is of little moment what the direct or contingent advantages

of the turbine may be, if its reliability remains in doubt. Offered as it is, in large units, and being apparently more related to the classes of service which impose the most exacting requirements, the demand is imperative that in this one vital respect there be little left to chance.

Before recurring to actual experience, it may be instructive to consider for a moment the general character of the turbine as a type of motor, contrasted with the piston engine. Fig. 1 shows the longitudinal section of the Westinghouse turbine. The steam entering the governor valve, arrives at the chamber "A," then turns to the right, passing first a set of stationary blades, then impinging on the moving blades, driving them around, and so on, until it arrives at exhaust chamber "H". And here is an interesting lesson in physics,—a demonstration of the conversion of heat into energy; for while the temperature of the inlet end is that of the entering live steam, the exhaust end, but three or four feet distant, is not so hot (about 126° F.) but that one may bear the hand. The illustration will show that the only

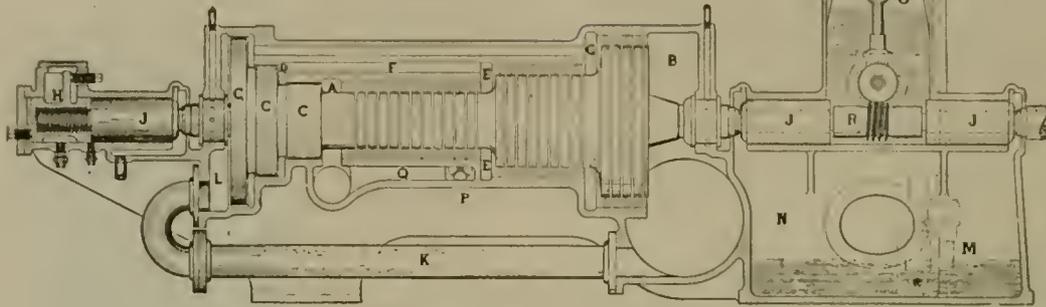


FIG. 1—SECTION OF WESTINGHOUSE TURBINE.

real moving part is the spindle, revolving in its bearings, the governor mechanism and oiling arrangement being comparatively insignificant. The blades do not wear, as the steam velocity—some five or six hundred feet per second—is not sufficient to affect them. The blades are made of a special material, and are caulked in such manner that the force required to pull them out would exceed the elastic limit of the material in the blades. They are subjected in regular practice to a stress of about one-fortieth of this amount. The actual pressure exerted on each blade is about an ounce. A complete description of the mechanism is not needed here.* It is sufficient to note its general character and to contrast its obvious simplicity and freedom from complication, with the recognized complexity of the piston engine. The inference is clear that in constructive opportunity, at least, the turbine should be the more reliable.

The steam turbine, before it had obtained any considerable recognition here, was not entirely without success abroad. Parsons and others had done much to prove its reliability. For instance, in 1897 the Newcastle & District Electric Lighting Co., operating 11 turbines of 75 to 130 kw. each, showed the cost of repairs and renewals on the entire plant, including turbines, generators, boilers, condensers, pumps, fittings, cables, etc., to be 0.26 cent per kilowatt per annum.

In this country the steam turbine is now operating in several plants. The first prominent installation was at the Westinghouse Air Brake Company's works, at Wilmerding, Pa., where the first unit was started in August, 1899, two more shortly after, and the fourth unit in April, 1901. Thus, the plant has been in service, for the most part, more than three years, and the fourth unit about eighteen months. The plant operates regularly 11 hours per day, the service being electric power and lighting. With the iron foundry running at night, one turbine is run 22 to 23 hours per day. In general, the units have run quite to their rated capacity—perhaps within 20 per cent of it, as a minimum. An interesting comparison has been made elsewhere of the efficiency of this turbine plant with the installation it supplanted, the latter comprising simple and compound engines, scattered about the works. After the three turbine units had been placed in operation, they were shut down and the steam engines previously in

use (not yet disconnected from service) were again started up and a test made. A test was then made of the turbine plant. These were based upon a week's run, careful measurements being taken of fuel and water. The saving of coal in favor of the turbine plant averaged 35.7 per cent during the day, and 55.4 per cent during the night. The saving in feed water averaged 29.8 per cent during the day and 41.1 per cent during the night. In round numbers, this meant a saving of about 40,000 lb. of coal per 24 hours. This improvement, of course, was attributable not entirely to the turbine itself, but also to the more efficient method of electric power transmission in comparison with the previous

scattered arrangement of steam engines, with long runs of steam piping, use of belts, etc. It is, however, instructive as indicating the results accomplished in a specific and prominent case, as between an old and still commonly used system of power transmission, and a modern method.

This plant at Wilmerding was the first of its kind. It naturally was not without its minor difficulties. The turbines themselves from the time of starting have been practically free from trouble of any kind. Some armature difficulties were at first experienced—not of enough moment to interfere with operating—and were readily corrected. Summing up the experience had with this first installation, undertaken somewhat experimentally at the time, the net result is that the plant has operated about three years in heavy daily service, that the work has not suffered interruption, and that the plant is to-day running with sustained satisfaction and with no visible signs of wear in any of the parts. Fig. 2 shows this installation, comprising four 400-kw. units located within a space 45x61 ft., the height of the engine room being 20 ft. 6 in.

The Yale & Towne Manufacturing Co., at Stamford, Conn., has a 400-kw. steam turbine furnishing 240-volt, two-phase current at 7,200 alternations. This outfit was started in operation Feb. 1, 1902. Since that time it has been in regular daily service, carrying about its rated load, operating 10 hours per day, furnishing current for electric motors and some lighting. Up to this time, therefore, it has been in service some 8 months, and its mechanical operation has been most satisfactory. No quantitative tests have yet been made of steam performance, but there is general evidence of its economical operation.

The Hartford Electric Light Co., at Hartford, Conn., has a 1,500-kw. two-phase, 2,400-volt, 60-cycle, turbo-generator unit, which was started in April, 1901. This, at present, is the largest turbine yet installed in this country. Put in, as it was, to relay the water power, it has not been in constant service, but has usually been required but one or two days a week. At such times, however, it has carried the full station load of some 1,800 or 1,900 kw. Reference will hereafter be made to its striking economy.

A great deal of interest has centered in this early installation of a good sized outfit in a prominent location, and its excellent performance is now generally well known. Some difficulties were

*See paper by Mr. Francis Hodgkinson before the Engineers' Society of Western Pennsylvania, November, 1900; Street Railway Review, Jan. 15, 1901, page 98.

at first experienced, nor were they entirely unexpected, for there had been no facilities, as there now are, for testing the unit before shipment, and it was merely run at the shop without load. Before the machine was successfully in operation, one trouble that developed was with lubrication. The packing glands around the turbine shaft leaked somewhat, and the construction of the oil passages with reference to these glands enabled the oil to come into contact with the steam, impairing its lubricating quality. This was easily overcome by modifying the vents and employing glands of different construction.

Some time was also required after erection to make necessary adjustments to relieve the turbine of longitudinal end thrust. This would have been corrected at the shop had the opportunity then been present for making a complete test. It was found, too, that the shaft, which had been designed to afford the utmost ease of dismantling, was subjected to a considerable unevenness of temperature under superheated steam, and means were taken to make the temperature at all points more uniform. Having

efficiency and determine if the standards of present practice may not be improved.

It is well that the makers of the turbo-generator have been compelled to adopt the practice of basing the steam consumption on the unit of output, so that their guarantees are given on the electrical horse-power or kilowatts delivered on the switchboard, and not on the indicated horse-power developed. This at once eliminates the factors of engine friction and generator loss, and thus more definitely establishes a measure of performance.

One is impressed with two distinguishing features of the turbine's steam efficiency, namely:—that it seems to vary but little over wide ranges of load, and, further, that the size of the unit has comparatively little bearing. It follows, then, that if good results are possible at all, they are neither restricted to the larger plants nor to the requirement of steady load.

Fig. 4 illustrates this. Herein are given the results of tests on a 400-kw. turbine, made at the builders' works before shipment, the machine having since been in daily operation some

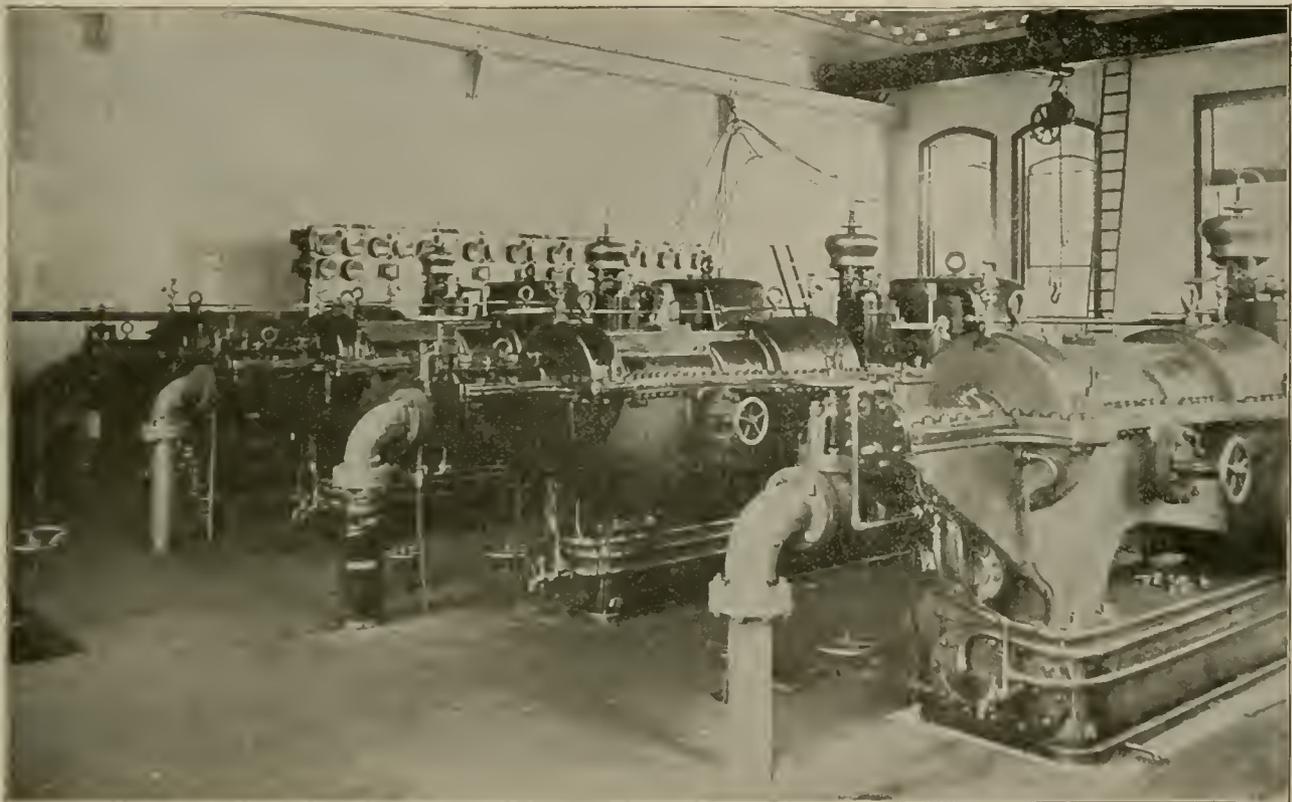


FIG. 2 STEAM TURBINES AT WORKS OF WESTINGHOUSE AIR BRAKE CO., FOUR 400 KW. UNITS

in due time overcome these local defects, which partook in no sense of functional fault, the turbine was then in serviceable condition, and its operation has since been most satisfactory. And the Hartford company, notably alert to adopt the newer thing if there seemed advantage in it, has found when the water supply ran short, that it paid to run the turbine and allow the corliss engines to remain idle. This turbine is seen in Fig. 3.

Is the steam turbine efficient? And what, if it may be so termed, is the character of its efficiency? Is it, like the various types of piston engines, peculiarly fitted to certain conditions which permit of little change if economical performance be retained, or is there evidence that the turbine has a greater inherent efficiency that is less affected by attending circumstances.

The interest of engineers in the turbine has, perhaps, been drawn chiefly to the evident possibilities of its steam economy, and to the data already acquired, with the discussion they have provoked, much more of value will be added. We may in a general way, however, without referring to its thermodynamics obtain from the evidence of actual results some knowledge of its

eight months. These tests were conducted under brake load, so that the figures are based on the brake horse-power developed. The rated load would be about 600 b. h. p. The steam consumption curve is seen to be very flat, gradually rising from 14.47 lb. at full load, to 16 lb. at half rating, and to less than 19 lb. at one-quarter capacity. The relation of the consumption of steam in pounds per hour to the brake horse power developed is also shown, this line being almost straight. In the tabulation may be observed the interesting comparative effect of vacuum and superheat.

If it is thus shown that with a unit as small as 400 kilowatts we may obtain a result of 14.47 lb. of steam per brake horse-power per hour, corresponding to less than 13¼ lb. per l. h. p., it is evident that moderate sized plants may with the turbine be sufficiently subdivided to give the maximum flexibility of service, with insurance of relay, and yet possess an efficiency heretofore identified only with very large units. Further than this, a fluctuating load is not incompatible with high economical performance.

As the units become larger the turbine is then brought into comparison with the best steam engine practice, where it still preserves its uniform efficiency, and where its practical advantages are no less evident. In a recent instance, a result of 11.7 lb. of steam per electrical horse-power per hour was guaranteed on a turbine of 750 kw. capacity, corresponding to about 10.17 lb. per i. h. p., which, though the size is moderate, is perhaps within the ability of but few engines, of any size or type, that have ever been built.

It may be pertinent to cite a few results obtained in regular service. The turbine at Hartford, under test conducted by Professor Robb, at an average load of 1,800 kw., with 155 lb. steam pressure, 27 in. vacuum and 45° superheat, gave a result of 19.1 lb. of steam per kilowatt-hour; or an equivalent of about 11.46 lb. per i. h. p. hour. An interesting comparison has been made at this plant of the relative efficiency, under regular operating conditions, of the turbine and the company's corliss engines. There are two corliss engines, one 18 and 31 by 48, and

averaging 95 lb., running condensing, and with 16.3° of superheat, the result obtained, at maximum load, was 19 lb. per kw. hour; or about 11.4 per i. h. p. hour.

Many other results have been recorded, but those given will probably be sufficient to show that under service conditions, the turbine has demonstrated its high efficiency.

But is its efficiency maintained? A question often asked, and a very important one, too. Looking at the turbine casually, it seems as though there would be little opportunity for any change in its mechanical functions. There is no complicated valve gear to get out of adjustment; no pistons to leak; no rubbing surfaces to set up excessive friction; little chance of misalignment; and altogether there seems to be no good reason why its original condition should ever be very much disturbed. The blades appear to be the vulnerable point, for they do the work, and there are a good many of them. Their number, though, is in their favor, and being loaded as they are to only about 2½ per cent of the pressure they are built for, they possess an ab-

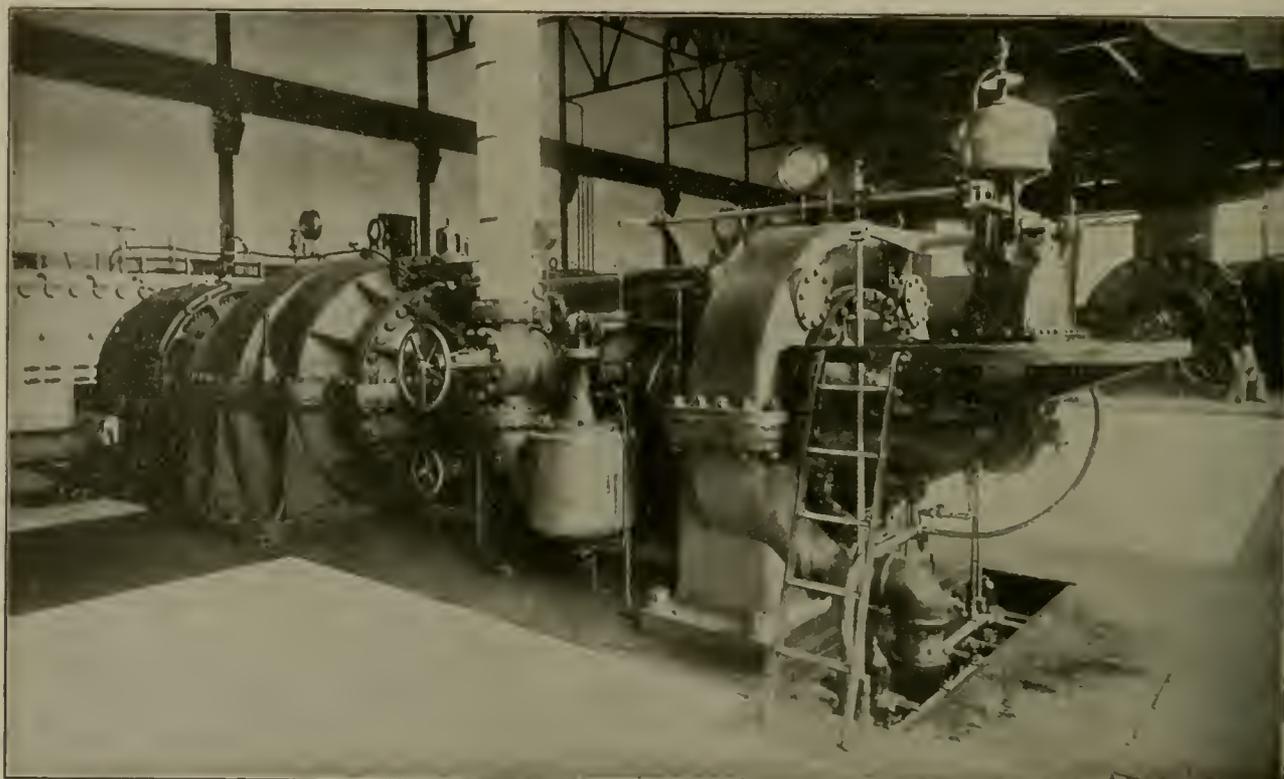


FIG 3—1500-KW. UNIT, HARTFORD ELECTRIC CO.

one 24 and 44 by 60, both cross-compound horizontal. These engines drive direct by belt one 400-kw. and one 600-kw. generator. The turbine is, of course, direct-connected to its generator. The company has made comparisons of operation based in each case on rather extended runs. It has been found that the turbine requires in delivering 1,900 kw. on the board about the same amount of coal that is used with the corliss engines to deliver 925 kw., the steam pressure and vacuum being identical in both cases; and this with the engines running at about their point of best efficiency, and known to be in excellent condition. Comparisons of this kind, while not scientifically exact, are perhaps of greater interest as a measure of commercial performance.

The data at hand of tests on one of the 400 kw. turbines at Wilnerding show a result of 16.4 lb. per electrical horse-power-hour at full load, with 125 lb. steam pressure and 26 to 27 in. vacuum. At half-load it is 18.2 lb.

At the Elberfeld Municipal Electricity Supply Works in Germany, two 1,500-h. p. Parsons turbines, which are run in parallel with two Sulzer horizontal engines, were tested by Prof. Schroter, Dr. Weber and Mr. Lindley. With steam pressure

normally large factor of safety. The experience has been that the turbine is less liable to depart from its original standard of performance than any other type of prime mover, and there seems little reason to suppose that it is capable of much deterioration.

A recent interesting investigation along this line was made at the plant of the Cambridge Electric Supply Co., Limited, in England, where there is a 500-kw. Parsons turbine. The unit was erected in January, 1900, and during the past year has been doing very constant work. After it had operated about eight months, a second one was installed. The first unit had been tested at the maker's works before shipment and showed a result of 24.1 lb. of steam per kilowatt hour, at 526.4 kw. And it was for the purpose of noting its performance after a year's operation, that Professor Ewing conducted recently a second test. (London Engineering, June 14, 1901.) In this latter test the turbine at 518 kw., under nearly equal conditions of steam pressure and vacuum, gave a result of 25.0 lb., and at 586 kw. 24.4 lbs. In the second instance the turbine, beside trouble experienced with wet steam, was driving its own air and circu-

lating pump, (a surface condenser being used) and the steam required to drive these auxiliaries was charged to it. In the test at the builder's works, the turbine did not drive its pumps. The results, to use Professor Ewing's words, give most satisfactory evidence that the turbine retains its character as a highly efficient generator.

It remains to be said in this general connection that there will be found in steam turbine practice a more satisfactory treatment of the economy question than has heretofore prevailed. There will exist not only a truer basis of measurement than the indicated horse power, but there will be opportunity for more thorough demonstration. It is now generally recognized that efficiency guarantees on large engines have little significance. The builder is physically unable to completely assemble and test such engines before shipment, and the user is seldom able or disposed to incur the distraction and expense which a field test involves. It is in the exceptional case, therefore, that actual tests are made, and there is still much to be known concerning the economy performance of large engines. It might be said, too, that while builders and engineers generally recognize the elements of design that conduce to efficiency, there is no unanimity of opinion as to what those elements will actually produce.

cylinder, gives about 1,400 i. h. p. It will be seen that the floor area of the turbine is about two-thirds that of the vertical engine and about two-fifths of the horizontal. Such comparison, of course, is limited in its application. With each set of conditions requiring special treatment, no standardization of space requirements can be established. Still, with the limitation of isolated experiences, it is possible without attempting to establish any universal laws, to make some reasonably close comparisons of the space required for the turbine as against the conventional types of engines. It has been thought desirable, then, to take a number of different sized plants, each composed of several appropriate sized units, the selections being as follows:

- 1,000 horse-power in two 400-kilowatt units.
- 3,000 horse-power in three 750-kilowatt units.
- 5,000 horse-power in four 1,000-kilowatt units.
- 10,000* horse-power in three 2,500-kilowatt units.
- 15,000 horse-power in four 2,500-kilowatt units.
- 30,000 horse-power in four 5,000-kilowatt units.
- 50,000 horse-power in seven 5,000-kilowatt units.
- 75,000 horse-power in ten 5,000-kilowatt units.

*In this size the horizontal engine is figured on 5-1,500-kw. units.

NUMBER OF TEST	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
BOILER PRESSURE	148	147	147	152	149	149	148	149	148.5	150	155	148	149.5	153	150	150	148	152
VACUUM REFERRED TO 30" BAROMETR.	27.4	28.04	27.95	27.06	27.35	27.4	27.2	26.7	26.7	27.37	27.54	27.3	27.3	26.94	27.35	27.5	27.3	27.3
% MOISTURE IN THE STEAM	2.3	2.3	2.35	1.6														
SUPERHEAT DEGREES FAHR.					7	9	8	9	9	17	20	18	20	20	33	37	37	33
REVOLUTIONS PER MINUTE	3687	3627	3603	3615	3686	3635	3626	3637	3618	3688	3639	3625	3638	3630	3690	3630	3626	3642
TOTAL WATER	280.5	435.4	515.7	922.7	722.7	450.7	558.7	256.8	91.2	68.7	432.1	54.35	72.49	87.89	663.9	419.0	512.9	718.5
BRAKE HORSE POWER	0	250	306	595	0	348	348	489	602	0	263	346	487	607	0	260	334	490
WATER RATE		17.4	16.3	15.5		17.05	16.05	15.45	15.26		16.43	15.7	14.85	14.47		16.73	15.35	14.67

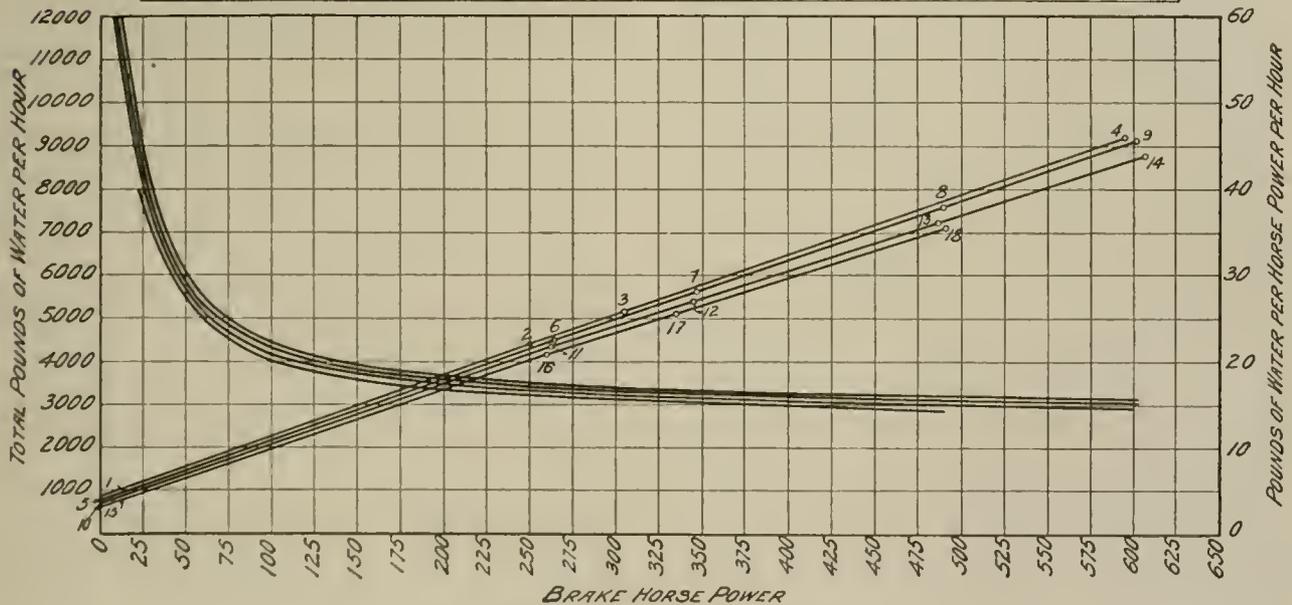


FIG. 1. RESULTS OF TESTS OF STEAM TURBINES.

It is, therefore, gratifying to know that one builder, the Westinghouse company, is now erecting a new testing room in which a complete plant of boilers, condensing and superheating apparatus will afford facilities for testing turbines up to 3,000-h. p. at all loads up to full capacity, and larger units up to this point, with practically any steam pressure and wide ranges of vacuum and superheat. Thus, the conditions to be met in practice may be approximated in the shop, and the information acquired will be of the highest value.

Turning now to one notable feature of the turbine, its compactness, Fig. 5, is a graphic illustration of the floor space it occupies, compared with the vertical and horizontal cross-compound corliss engines, the basis of comparison being a 1,000-kw. unit, including the direct-connected generator, the engine cylinders being 28 in. and 56 in. by 48 in. stroke, which, at 95 revolutions, with 25 lb. mean effective pressure referred to low pressure

These combinations were laid out for the turbines, and for the vertical and horizontal cross-compound corliss engines, all with their direct-connected generators. A clearance space of 7 ft. in all directions was allowed, and is probably a fair average. The computations were confined to the units themselves, with the clearance stated; the disposition of the rest of the plant being assumed to be unaffected by the type of motive power.

Fig. 6 shows the comparison of floor space. The curves show the turbine to require about 80 per cent of the space needed for the vertical, and not over 40 per cent of that wanted for the horizontal. In this diagram the vertical engine compares less unfavorably with the turbine than might generally be supposed, while the horizontal engine curve is about where one would expect to find it. The latter is not carried beyond 10,000 horse-power, this type of engine being practically limited in size to that required for the 1,500 kw. generator.

Fig. 7, showing the cubic yards of foundation material required, is at the same time a more exact and striking comparison. The turbine would appear more advantageously still if the actual foundations needed for stability had been computed. Instead, the foundations in all three cases were figured at 15 ft. depth to give space underneath engine room floor for condensers, etc., though for large engines this depth is usually inadequate. The only foundation needed for the turbine is that necessary to hold its weight, as though it were a tank, or some other stationary affair. It does not even require foundation bolts, there being no vertical or horizontal thrusts to be resisted. Comparing again the 1,000-kw. units, it is found that in actual foundation volume required, the ratio of the turbine to the vertical and horizontal engine is that of 1 to 9 and 15 respectively.

In Fig. 8 will be observed the comparison of engine room building space, in which the turbine appears to hardly less advantage, though in this diagram the horizontal engine, gaining in head-room what it lost in floor space, compares more favorably with the vertical. In plotting these curves sufficient head-room was allowed to accommodate a crane, leaving adequate clearance for handling any part.

Having noted, then, the marked advantage which the turbine appears to offer by virtue of its compactness, it would seem that the comparison might be carried a little further, and with assumed valuations of masonry work and building construction, as well as of land, the money saving to be effected in these important features of initial cost to be defined.

Still adhering to the same plant size and combinations of units, in Fig. 9 is found the comparative cost of foundations; the basis assumed being \$7.00 per cubic yard for concrete, laid. It will be seen that while the turbine seems to average a foundation cost of about 50 cents per horse-power, the vertical engine in the more frequent sizes is approximately \$1.50, while the horizontal is not far from \$2.50. Not forgetting that all three foundations are computed of equal depth, 15 ft., to provide space below, as above stated. In the instances where special foundation work is required, such as piling or otherwise preparing suitable bottom, or shoring up building walls to enable sufficient depth of excavation, the expense avoided by the use of turbines is obvious.

In Fig. 10, showing comparative engine room building cost, the basis assumed is 15 cents per cu. ft. of space inside of walls. Building construction necessarily varies widely with the size, design and materials employed, but the figure taken is perhaps not far from a fair average for building built of brick, with steel trusses and fire-proof covering. The curves show that the building cost for the turbine is about one-half of what is required for the horizontal or vertical engine, the latter two, apparently, not being far apart. In this comparison of building cost experience would differ widely. Architectural considerations and local conditions would produce varying results. Exigencies would, however, favor the turbine because of its smaller size and rectangular proportion, and it not infrequently happens that increased power may be supplied by locating the turbine in existing space, whereas an engine would necessitate building extension and perhaps the purchase of additional land. An instance of this kind arose at Akron, Ohio, where in the existing space no arrangement could be devised to accommodate additional engine power. It was found possible, however, by rearranging auxiliary apparatus, to provide space for one 750 and one 400-kw. turbo-generator outfit which will shortly be in operation.

Fig. 11 gives the comparative cost of land to accommodate the engine room space, the land valuation being placed at \$5 per sq. ft. Whatever may be the value of land, the relative comparison would remain unaffected. Land value, however, is never of minor importance, for desirable power house sites, with transportation and water facilities usually cost a good deal. And allotting about half a square foot of floor space to the horse-power of generating unit, it takes but little figuring, where plants are located on expensive ground, to show that the turbine in this respect alone may save a considerable part of its first cost.

The last diagram of the sequence, Fig. 12, summarizes the preceding curves, and shows, with foundations, building and land at the valuations given, how these factors of cost compare. The data will have served their purpose if they show that in a prop-

erly designed plant, using the steam turbine, far more money may be saved in these particulars than is ever represented by the difference in cost between machinery of high grade and that of inferior quality.

A case or two may be to the point. A plant was recently laid out to contain three 1,000-kw. units, with vertical cross-compound Corliss engines. Subsequently, three more 1,000-kw. units were contracted for, steam turbines being ordered. It was found that the turbine saved 900 sq. ft. of engine room floor space, and about 38,000 cu. ft. Had the whole plant been originally designed for turbines, the saving of space would have been double these amounts, and the cost of land, building and foundations been reduced about \$50,000.

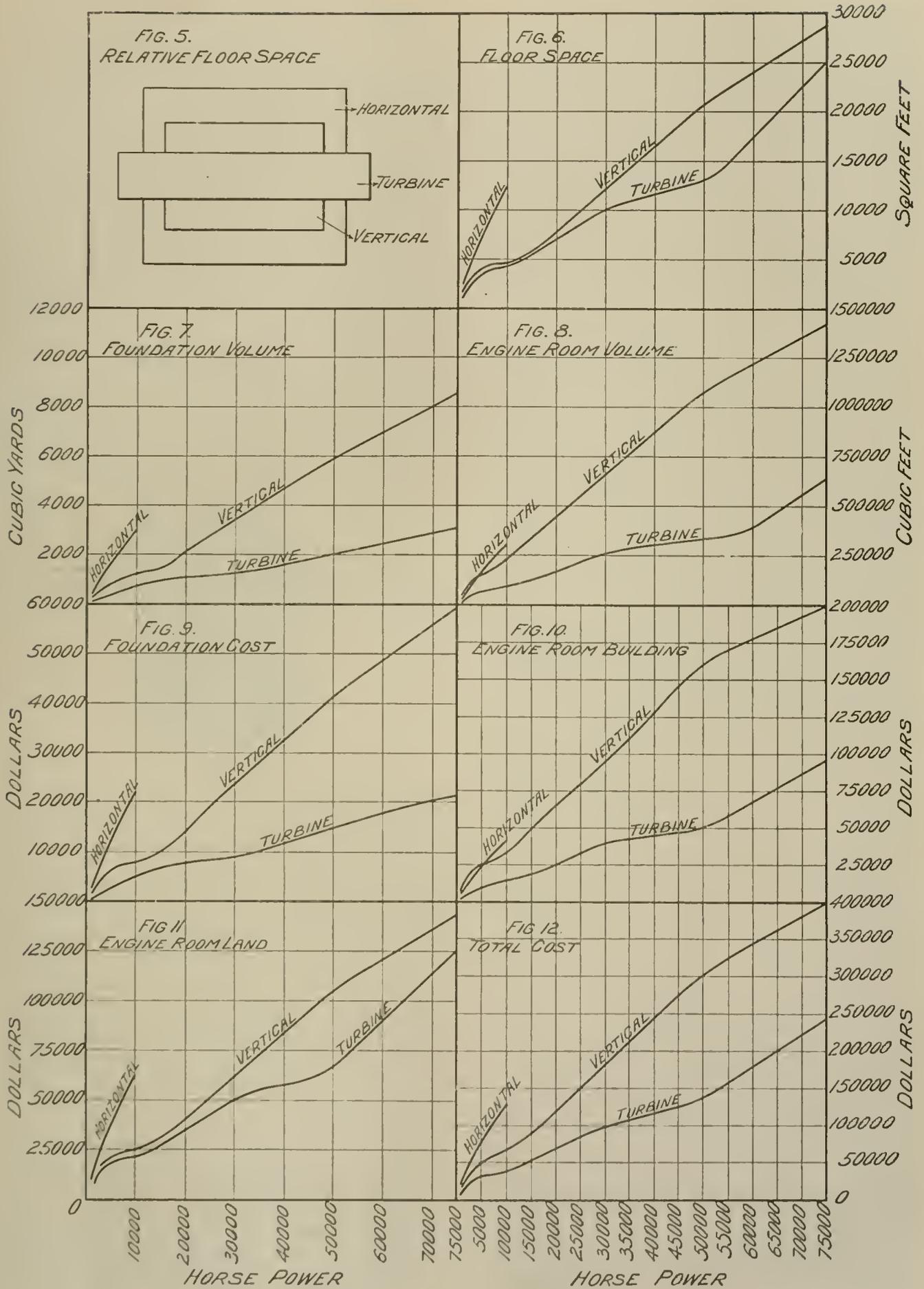
An electric railway plant in Ohio was some time ago installed, in which there are two 500-kw. generators direct-connected to cross-compound Corliss engines. Space was provided for two more units of the same size. For the increased power two 1,000-kw. turbine outfits were purchased, which will go in the space left, and leave room for another turbine of 2,000-kw. Thus, the engine room space planned for 2,000-kw. is found sufficient for 5,000-kw. It is estimated that the boiler plant extension will be reduced about one-third because of improved efficiency. It figured, too, that a saving of \$2,900 was effected on each 1,000-kw. foundation.

One other case, of perhaps greater interest, recently came to notice, that of a plant of 8,100-kw. capacity, laid out on modern lines, using vertical cross-compound condensing engines. There is no space for additional engine power, and any increase would require building extension and encroachment upon valuable land. It was shown that without going beyond the present building walls, and without disturbing the existing machinery, the plant might be doubled in capacity by installing turbines in the space available below the present engine room level and adding another deck of boilers. And it has been figured that this arrangement would effect a reduction of over \$3 per kilowatt per annum in the present interest charge.

With some measure thus obtained of the comparative indirect expenses of installation, we may turn to consider the cost of the turbo-generator itself. Is it high in price, or is its cost, if not an attractive feature, still within our common idea of value? The answer is that its price is reasonable; that, indeed, where the comparison is fair, the turbine will require the lesser first investment. It is, unhappily, quite as difficult to compare the costs of the turbine and piston engine as to compare the costs of engines themselves. A thing is, of course, high or low in price by comparison, but where the steam engine is concerned, to measure values were a hopeless task so long as there are held divergent views of design and construction and of engineering adaptation, with the builders themselves wide apart in their practice.

There are engines of good workmanship and of poor, of heavy proportion and light, and generous and scant proportioning of cylinder size and ratio, and of piston speed, to the work to be done. Perhaps, too, the voice of experience may protest that the buyer's insistence on his bargain is not always in keeping with the quality he would have, or should have, and it is not surprising that commercial necessity should sometimes affect engineering ideals. While the reliable builder will adhere to his high standards, there still will be found those whose more flexible practice will suffer impairment of quality to fit the price.

Proceeding with the comparison, however, it may be assumed that the larger field for the turbine begins about where the high speed engine leaves off. Its steam economy at once identifies it with the most efficient engine practice, and it therefore applies more appropriately to the classes of service where medium and large size units are used. The comparison, then, lies generally between the turbine and the slow speed engine. It remains merely to take an engine and generator of good construction, bring the engine efficiency as nearly as possible into parity with that of the turbine, also having it possess the same overload capacity, to find that the turbine is reasonable in price. And when we add the possible saving in foundations, buildings, etc., the first cost of installation is usually much in its favor.



There remain still one or two important features of electric power plant operation wherein the use of the reciprocating engine is attended with difficulty, and with respect to which the steam turbine offers unquestioned improvement.

One of these—the running of direct connected alternating current generators in parallel—has come to be a frequent requirement; but frequent as it is, and essential as it is, its accomplishment has been anything but an exact science. There has in fact been so little synchronism of method as to justify some wonder at the results that have really been obtained. There is no need here to particularize the complications of the problem. It obviously is not the work of the tyro to introduce into two or more units the identical conditions that will convert reciprocating motion into synchronous rotating motion, co-relating, as he must, the features of governing functions, inertia of reciprocating parts, fly-wheel weight and radius, and the like. And it becomes evident that where successful parallel running is achieved, it is the triumph of skill not only in design but in the handling of the machinery itself.

These difficulties cease with the turbine. In it there is no fluctuation of angular velocity. There is but one direction of motion, with no element to detract from even turning moment, and due to its speed there is stored up more fly-wheel effect than is present in the piston engine.

It is, therefore, found that not only do steam turbines easily run together in parallel, as hydraulic turbines have always done, but it may be expected that they will operate with piston engines and the performance of the latter in this respect be much improved. In electric railroad work especially is this feature of the steam turbine of much interest, for it is well known how irregular loads accentuate the difficulties of regulation. Furthermore, the question of operating high frequency apparatus in combination electric railroad and lighting service may be more satisfactorily approached.

The feature next in importance, perhaps, is that of superheated steam. It is now quite generally recognized that superheating is of advantage, though there is still much about it to be learned. Future investigation, however, in which the turbine will take important part, will reveal more precisely its economical status, and it may be hoped that before long the net advantages derivable from different high steam temperatures will be known. Meanwhile, superheaters are being installed, and collaterally the problem of handling superheated steam has assumed importance. Engine builders themselves are feeling their way, for while some appear to unrestrictedly offer the corliss valve for superheat work, others seem prone to confine it to the more conservative temperatures, and others still reject it altogether and hold to the poppet valve where superheat is employed.

The turbine may be used unreservedly with superheat of any feasible temperature. It has no internal rubbing surfaces, and there are no glands to become injured. Also, as no cylinder oil is required, there is no opportunity for lubricating trouble. Furthermore, there seems to be with the turbine rather more proportionate benefit from superheat than with the piston engine, because of diminished skin friction.

Having said that the turbine requires no cylinder lubrication, the inference follows that the steam is therefore uncontaminated with oil, and that the exhaust, when condensed, is pure distilled water. This is true, and while it is of little consequence where water supply is abundant and good and cheap, it becomes, where conditions are otherwise, of exceeding importance. In many sections of the country, where the water contains either mud or scale-making impurities the cost of repairs to boilers, with the expense in labor and interruption of service entailed by constant cleaning, is a besetting evil, and to alleviate this trouble large surplus boiler plants are often installed. As a usual thing, too, difficulty is experienced in attempting to extract oil from exhaust steam.

To recur once more to this feature of lubrication in the turbine, it may be remarked that it is an item of very little expense. The bearings are the only points requiring oil, the lubricant being circulated around under pressure. The reservoir being once charged, very little is needed to maintain the supply.

Finally, in this commercial consideration of the turbine, one

other question should perhaps not be omitted, one in fact which sometimes seems to outweigh almost every other, namely: How long does it take to get it? While the demand has in truth for some time exceeded the capacity for production, (there being now under construction at East Pittsburg some 41,000 kw. on order) so that the turbine has required about as much time to build as everything else, the extended facilities now nearing completion will better this considerably. Certainly, under normal conditions, these outfits, made of comparatively small parts, with no enormous pieces to be handled, ought to be quickly built, and what is quite evident, they can, when delivered in assembled condition, be so readily installed that the months sometimes required to erect large engines will be reduced to weeks.

If it is, then, seen that the steam turbine in all the essential aspects of its commercial utility appears to stand on solid ground, there cannot be yet attributed to it the virtue of universal application. It has its field chiefly in electric lighting and power work, though in small sizes it has been extensively used for driving blowers, pumps and other devices. Its speed, of course, prohibits belt drive.

But the direct-connected electrical generating unit has been the *sine qua non* of modern power development, and the reciprocating steam engine, under the stimulus of opportunity, has been brought nearly to its mechanical and thermal limit. With all the ingenuity and skill and patient effort that have marked its growth; with its notable achievement, symbolizing, as it does, the march of industrial progress, it still remains, even in its most advanced form, a wasteful and complicated means for converting heat into energy. If we are to exact further tribute from the agency of steam; if we would hope to reduce complexity, and by a more simple, reliable and durable method of operation reduce the interest and maintenance charge; if, in a word, we would improve the standard of existing practice and surmount many of its limitations, we must then change the character of our medium, employ different principles, and give to the generation of power a new and greater significance. The steam turbine seems destined to mark the way.



SIGNALS FOR URBAN AND INTERURBAN RAILWAYS.

By G. W. Palmer, Jr., Electrical Engineer Old Colony Street
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The many recent disastrous collisions on street railways must have convinced operators and managers that the use of an efficient and reliable signal system would add to the safety and facility of the handling of their traffic. As faster schedules and heavier cars come into use, there is imperative need of a system of operation which will guarantee freedom from accidents caused by cars meeting head on, or by one car overtaking another.

There is only one way to prevent these accidents; namely, to adopt such rules and methods of operation as will insure that but a single car will occupy any block or section of track at any one time; any signal system which will aid in accomplishing this result is worthy of consideration.

We believe that the steam roads in their early days were confronted with precisely the same problem in relation to signals as the electric roads are now contending with. The steam signals are now probably as nearly perfect as human skill and ingenuity can make them. They did not, however, spring into existence in their present perfect condition, which has been reached only after years of work and effort to eliminate the defects shown up in practical work.

Electric roads should not, therefore, say "show us a perfect system and we will adopt it." It is decidedly our interest to encourage the efforts of those who are endeavoring to work out something which will be accurate and reliable and to contribute whatever we can to this end.

It is obvious, however, that even a perfect signal system cannot, after its adoption and installation, operate a road. Careful management, and good discipline on the part of the men are still vitally necessary. We believe that no man should be given a second opportunity to disregard a signal set against him or to

break any rule which it has been found necessary to make to insure safe operation. The employment of such a man involves a risk which should not be disregarded.

When electricity was adopted as a motive power on street railways, and especially when lines were built between cities, in some cases paralleling steam roads, and invading a field hitherto occupied solely by the latter, many saw that methods which prevailed during horse car operation would not do under conditions of higher speed, heavier cars and greater volume of traffic.

The need of something which would show that a car was approaching from the opposite direction, or was a short distance ahead going in the same direction, was quickly perceived and the problem attacked by a number, on various lines, but all having a common end in view. Several systems of block signals were put upon the market, and have since their early adoption and use undergone a process of development to get rid of the faults which became apparent by their continued use.

We believe that all single track suburban and interurban roads should adopt the best obtainable block system together with a telephone system which will enable a dispatcher to reach any car crew at regularly established stations.

A signal to be reliable and efficient, should be quick and positive in action; it should be impossible to set the cautionary or permissive signal at near end of the block before setting the danger indication at the far end; incandescent lamps should not form a part of the main signal circuit, nor should the lighting and extinguishing of lamps be the only visual indication of the



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signal. This should be supplemented by the movement of an arm or semaphore blade which will move each time the signal is operated whether the lamps burn or not. The device will then be operative if the lamps burn out, as sometimes will happen. Manual control affords unauthorized persons a chance to interfere with the signal, and should not be used; the setting and clearing circuits should be closed automatically, and when the signal has been set at danger it should lock so that it cannot be cleared until all cars have passed out of the block. It should be possible to set the signal only one way by two cars entering a block from both ends at the same time.

Special attention should be given to freedom from damage by lightning. As the pressure is liable to fall considerably at the ends of long lines, and also on parts of the system when heavy local loads are carried, the signal should be able to operate through a wide range of voltage, and should not be liable to damage through crossing of the signal circuit with the lines.

There are several differing systems now in use on various roads: one using simply a circuit of lamps operated by a two way hand switch at either end of the block, part of the lamps being lit as a permissive signal at the rear end, while the rest indicate danger to an approaching car at the far end; this system is peculiarly susceptible to trouble from lightning, and also fails when any lamp burns out. As commonly used the switch and lamps are in the same box, and generally the car is run into a position where the conductor can easily reach the switch. In most cases the motorman then cannot see the lamps and depends on the bell signal from the conductor.

The proper method would be for the car to be stopped at a

point far enough to the rear of the box for the motorman and passengers to observe the character of the signal, the conductor going ahead and throwing the switch; where the blocks are many, this will cause an annoying delay, which could be avoided by having the switch separate from the signal box, at a point about a hundred feet to the rear of it, and at such a height that the switch cannot be reached from the ground. When permission to proceed has been obtained, the motorman should not enter the block until the conductor has struck two bells, thus making the men jointly responsible.

An improved method of operating the signal is by means of a circuit closer hung overhead and at a point sufficiently in the rear of the box, the circuit being closed by the passage of the trolley wheel; there are devices of this kind now obtainable which are reliable and effective in action.

A better system is one which uses a setting and clearing circuit separate from the lamp or semaphore circuit; most of these, however, can be cleared by the passage of any one car out of the block, and in case of running several cars together, all trolleys but the one on the rear car must be pulled down when passing the switch, or if the leading car clears the block, the car proceeding in the other direction must be notified of the number of cars following; this is an element of danger, as it should be absolutely impossible to clear a block while any car remains.

Some device should be used which will record the number of cars entering the block from either end, and hold the setting circuit closed until all cars have passed off the block. It should also be possible to clear the danger signal from both ends of the block, as it is often necessary for a car to leave a block from the same end at which it entered.

There are certain single track blocks on the Old Colony system which are operated by means of what is locally known as the "red stick." This is a small club or billet of wood painted red which controls the block to which it belongs, and no car is allowed to enter the block without it carries the "red stick." It being replaced by a red lantern at night. This is a safe but not very flexible system, the absence of the stick showing one that there is a car on the block, but not the direction in which it is going. Nor does it show when the block is cleared from the other end. In case of delay or blockade of cars going in the opposite direction the stick could not be carried back and all cars going in the same direction as the one which first entered the block would be held up. It does prevent effectually the "bunching" of cars at one end of the line.

Double track roads are also feeling the need of some system which will prevent rear end collisions. Where cars are operated on quick headway and a direct view of the track ahead cannot be had, there is always danger of a car overtaking the preceding one. This is particularly the case at night, and all cars operated on suburban lines should carry a rear end red lantern. This simple precaution is so obvious that it would seem as though it must have been adopted by every one. Such, however, is not the case.

There has been some work done along the line of cutting off the trolley current from a car which has not the right of way, thereby making it impossible for the car to proceed. This scheme seems to us to be a very attractive one and it is possible that it may be effectively developed.

Too much stress cannot be laid on the necessity of giving careful attention to the proper erection and maintenance of the signal lines and devices. In regard to the lines, their maintenance is more difficult with us than with the steam roads. We are forced to carry many of our wires in streets lined with thick and heavy trees, through which it seems almost impossible to obtain good and reliable construction. In all cases special attention should be paid to keeping the wires clear from the limbs and a tough and impervious insulation should be used.

Regular and careful inspection of all parts of the system should be made, and everything done which may be necessary to keep it at all times in the best of condition. No devices should be left without care until they fail to work, which they may do at a time when there is the greatest need of their reliable action. Efficient maintenance may be expensive, but one accident which might have been prevented may result in a loss far greater than the combined cost and maintenance of a good signal system.

THE ADJUSTMENT OF DAMAGE CLAIMS.

By Mason B. Starring, Assistant General Counsel, Chicago City Ry.

Not many years ago the caption of this paper was a subject which managers regarded in much the same light as that in which the modern horse first looked upon the automobile; it seemed sure enough an invention of the Evil One and dead certain to hurt something or somebody, but with the growth of the street railway and the community it supplies with means of transportation, that cancerous growth, yeapt, damage claims, which had already fastened itself upon the steam roads, began to develop in the street railway body corporate, and as it grew so grew the study and care bestowed upon its treatment, and all careful managements have long since commenced to place experts in charge thereof. The successful adjustment of damage claims depends largely upon the personal equation; the personality and mental characteristics of claimant and adjuster are the prime factors in all settlements. No matter how fair a corporation may be, may its adjuster be never so able, yet if the claimant is so constituted as not to know fairness when he meets it, or so determined to bilk the company that no reasonable amount will appeal to his sense of right, then an adjustment must fail, and resort be had to law; then, too, the question of locality must



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be taken into consideration. Some cities are pest ridden with the itch for personal injury litigation; in Chicago, for instance, there seems to be from five to fifty "drummers" for personal injury suits to every personal injury, or person willing to claim one, to be drummed; and its taxpayers are even now being asked to add a large number of judges to the already large bench of the county in order to secure the trial of cases within a reasonable period of time after their commencement—what that city needs is not more judges, but an enforcement of the laws against champerty, barratry and maintenance; if I am rightly informed my own fair city is not by any means the only one suffering from such necessity.

To further the proper adjustment of claims of this class, a proper foundation must be laid at their very inception; preparation for a lawsuit must go hand in hand with preparation for adjustment; the knowledge the claimant has that the adjuster is fully cognizant of all the details, not only of the accident which gave rise to the claim in question, but also of the surgical side of the case, and the etiology of those special ailments which the claimant alleges to have resulted therefrom, goes a long way toward making an unreasonable claimant reasonable. In preparing for the adjustment of a claim of this nature, it is always wise to ascertain so much as is possible of the antecedent history of the claimant, for, since the growth of the personal injury claimant business into an industry, it is no unusual thing to find one person with a record of several antecedent injury claims, some of them settled amicably and others adjusted at the end of the litigation; I have in mind at this writing the case of one woman

who, starting in Philadelphia, had, as westward she took her way, accumulated injuries and suits until the one which she prosecuted against the company I represent numbered seven upon her list, and it was her lucky number, too. It is very frequently found, especially in the claims of women, that prior to the occurrence of an accident there had existed certain obscure troubles which sooner or later must, by the progress of nature, force themselves upon the notice of their unfortunate possessor and his or her physician or physicians, but which had not aroused in the sufferer, up to the time of the happening of a street railway accident, sufficient attention to cause medical attendance to be secured; but when an accident happens which presages the recovery of damages, every ache and pain is then watched with interest, one might also say with desire, and each and every grunt, whether caused by an actual twinge or by auto-suggestion, is attributed to the "awful" accident, and to the wicked conductor who started the car at the supreme moment when an old lady had one foot firmly planted upon the car step and the other deftly poised in the air. Some physicians find it to their interest to humor their patients and having a natural distaste for antagonizing their patients by telling them that the complaints made by the patient and the conditions found by the physician have no reference whatever to the probable consequences of such an accident as that under consideration, leave them firm in the belief that all their troubles are due solely to the violence applied at the time of the alleged accident. This is especially true of pelvic and nervous disturbances of the fair sex; many a woman directs her doctor's attention for the first time to pelvic troubles subsequent to an accident, when her comfort and possibly her health for a life-time might have been subserved by consulting him promptly relative thereto when the first manifestations of disturbance made their appearance. Occasionally instances are met with where the courage to undergo voluntary torture for the sake of the few dollars that can be secured out of a claim, attains so abnormal a development as to amount practically to insanity. Of these strange phenomena an extreme example which came under my personal observation is so abnormal as to almost pass beyond belief by any person not confronted with proof. Shortly stated it was as follows: A woman physician, related to a fine family and of independent means, brought suit for damages. The only injury that she was able to show she sustained at the time the accident occurred was a slight sprain of one ankle. She was exceedingly heavy and in the course of the trial it developed she had had both breasts, weighing some twenty-eight pounds, excised, and upon being asked the relation this operation had to the accident to her ankle or why she had it performed, she replied that it was done in order to lessen the burden of weight which her "poor sore ankle" was compelled to sustain. It afterward appeared that at some time antedating the accident she had undergone an operation known as oophorectomy for the purpose of bringing on an artificial menopause, in order that the conditions which nature had imposed upon her sex should not interfere with her attendance upon her duties as a physician. Subsequently to the trial and disposal of this case, it was said, that having learned of an operation performed in France for the removal of flesh from the thighs she hid herself to Paris to try this operation.

Science has come mightily to the aid of the adjuster in throwing the tell-tale searchlight of the X-ray machine upon the human anatomy. This marvelous discovery is effecting great and good results in all personal injury departments of those corporations which have had the good fortune to come in contact with, and secure the service of, an expert in its use; many and many are the cases of fraud and imposition which it has exposed, and a great, great many show many I never have gone into the details to carefully ascertain) of the claims that bones have been broken or fractured in steam or street railway accidents have thereby been shown to be mere frauds, and that no fracture or fractures existed. Previous to the invention of the X-ray instrument it was much more difficult for the adjuster to ascertain the truth in regard to this point. A limb placed in a plaster cast is thereby put beyond the close inspection of a physician, and it is manifestly impossible to compel the removal of the cast for the direct

inspection of the wound; this afforded an easy and successful mask for deceit. Now, however, the X-ray reveals, almost at a glance, the real condition of the hidden bone. Could an instrument be invented which would as indisputably and as accurately determine the extent of injuries to nerves and muscles as this machine does to bones, the task of adjusting personal injuries would be greatly lightened and the uncertainty which prevents an always accurate decision would be very largely removed.

Not all the experiences met in the adjustment of personal injury claims are of the depressing order; some either in or out of court are relieved with touches of humor which serve to lighten the dreary routine of fighting frauds and imposters. For example: A homeopathic physician, of the female persuasion, brought suit against a street car, claiming that a fall received from one of its cars had caused her to suffer so severe a brain and nerve injury that her ability to discharge her professional duties had been seriously impaired. In the course of cross-examination she was asked if she had not fallen down a full flight of stairs in a certain department store. Without hesitation she replied:

"I did, sir, but this fall partially restored me to health. I have had no headaches since." With great suavity in tone she said to her tormentor. "If you were familiar with the great principle upon which my school of medicine rests, you would easily understand why this was a natural result."

Knowing the familiar motto of the homeopathic school, "similia similibus curantur," the company's attorney remarked:

"I believe your motto is—"

And before he could finish his sentence she interrupted him, "Simile similibus similitur." Bench and bar had hardly smothered their laughter when in reply to a question concerning the whereabouts of a certain patient of hers, she said: "He has passed beyond my jurisprudence." Certainly the originator of Mrs. Malaprop need not have searched beyond this good lady for a prototype. It may interest you to know that the verdict indicated that the jury thought that the practice of this physician had not been seriously damaged by the great and severe injuries she claimed to have sustained.

In making investigations leading up to physical disabilities, and dating accidents, with a view to ascertaining whether or no ailments complained of are a result of traumatism and are properly attributable to that cause or are due to other and pre-existing causes, much delicacy should be displayed so as not to unnecessarily annoy either the claimant or his or her friends or family—and in the trial of damage suits, however solid an array of testimony it may be possible to present reflecting upon the character of a man or a woman, a party to a contention of this kind, it must always be borne in mind that the natural chivalry of our race is prone to resent what may seem to the auditors of such testimony an unnecessary, or to some, mayhap, a malicious attack upon some person for or because of the presentation by that person of a damage claim. The arousing of such prejudices should be avoided, as, in most cases should the introduction of evidence as to intoxication, because, while it is true most of American mankind take a drink occasionally, few like to be charged with taking so much as to cause the enemy in the stomach to take away the wisdom in the head.

I think we will all arrive at the deduction that there is no department in the entire management of street or steam railway properties into which the personal equation more strongly enters, and that personality of the right stamp in the head of that department charged with the adjustment of claims, whatever his title may be—even when dubbed "Claim Agent," that title now so thoroughly despised more by reason of its adoption by that vast body of ghouls sometimes called "ambulance chasers" which preys alike upon the injured and the railways, than for any other cause—is the most essential requisite to the proper handling of this unfortunate part of our street railway machinery. My first precept, therefore, is "seek the man." Get a combination of absolute honesty and industry, with a moderate supply of brains, and you have a good man; let any one of this trinity be absent and the settlements he makes will be mostly unsatisfactory, if he succeed in making any at all. If the claimant possesses these same sterling attributes, the result will be an adjustment satisfactory to both parties, for in that event there must of necessity

be merit to both sides of the case, or no claim would be made, and no adjustment sought. If all claims were just, and all claimants fair, the matter of adjustment would be simple, but as a rule comparatively few claims are just, and fewer yet of the claimants are fair, so that the faculties and perceptions of whoever represents the company's interests must be ever alert not to be duped by dissimulation, exaggeration and guile, and to discover actual and intentional fraud whenever and wherever it exists. Some claimants possess honesty, but not enough to leaven the lump; many possess industry to some degree, and all possess a certain species of brain; most of them possess what might be justly termed a low order of cunning; the doctrine of our homeopathic friend, that like cures like, must not be applied to an adjustment.

Precept number two is "get facts." Facts are what win! He who can uncontrovertibly and openly place facts before a malingerer puts him at a disadvantage from which he can never recover. Facts, too, are the enemies of some physicians. Look out for the doctor who puts the plaster cast upon the unbroken limb. He is a stumbling-block in the path, but employ to meet him not one who has a beam to pluck from his own eye. Rarely should the attending physician, if honorable and a fair practitioner, be ousted from the care of his patient. Be the recovery of the patient never so good, if the company furnishes the surgeon who attends the injured person, by some perversion of mental vision it is claimed alike by patient, relatives and friends that he is and has been sent to the bedside of the patient to injure him in some occult way, and by so doing, affect detriment to his interests and protection to those of the street railway company, slight being lost of the fact that the complete and early convalescence and recovery of health of the patient is best for all.

A little book, lying on my desk as I write, says very appropriately of this theme: "Pettifoggers in law and empirics in medicine, whether their patients lose or save their property or their lives, take care to be, in either case, equally remunerated; they seize both horns of the dilemma and press defeat, no less than success, into their service. They hold from time immemorial the fee simple of a vast estate, subject to no alienation, diminution, revolution or tax; the folly and ignorance of mankind. Over this extensive domain they have long had, by undisputed usage, the sole management and control, inasmuch as the real owners must strenuously and sturdily disclaim all right, title and proprietorship therein."

Meet fairness with fairness; fraud with firmness. "Fighting fire with fire," avoid as you would His Satanic Majesty himself. Fire cannot be handled without burns, and burns are at least painful. Avoid a reputation for settling everything; it hurts stockholders' pockets; equally avoid a reputation for fighting, but when you do fight, win; settle all the grave cases that presage loss; litigate all those that possess little or no merit. It is a juster as well as a wiser policy—for once, at least, Justice and Expediency run hand in hand.

Very often I am asked to furnish copies of the form of release which is used in concluding an adjustment, and willingly comply; but one form of release is about as much like another as pens in the same pod, and in the event that a settlement is contested in court by an ignorant person, and especially by one having no knowledge of the English language, the more technical in its terms and the more involved in its legal phraseology a release is, the more apt a jury is to say that the person who signed it was totally ignorant of its contents and that the execution of the document was obtained by fraud.

Some time ago the writer had occasion to cause a release to be obtained from a German girl who had stepped from a moving car as it was coming to a stop for her to alight, while the car still had sufficient motion to disturb her equilibrium. The girl lost her leg, and an adjustment was made very shortly after the accident, while she was still in the hospital, and was not made because of any liability, but merely to avoid litigation. After she got out and around, she was very easily persuaded by somebody—we can all suspect whom—that she had been imposed upon, and the foolish woman went upon the witness-stand and testified, under her solemn oath, not only to a state of facts which created a liability on the part of the defendant company, but also

that she did not know the contents of the paper she had signed; that she could not read English, and that even if the paper had been translated to her in German (which, by the way, it was, although she denied the fact), she would have been unable to comprehend and understand what it meant; but unfortunately for her and her attorneys, who had a large fee contingent upon the result of her story, she had written in the German language in her own handwriting, over her own signature, on a portion of the hospital record which hung by her bedside, "I got one hundred dollars from the railroad company, and I know I can get no more for my leg." Certainly not a very artificially drawn legal document, but without it there is no doubt but what the very perfect release which was properly and understandingly executed by her would have been set aside. It is, therefore, fair to draw the conclusion that in settling with ignorant people, it is wise to have them express in their own way their understanding of the purport and effect of documents which they sign; and I have always cautioned adjusters to be particularly careful in this respect—never to make any misrepresentations, never to allow a person who has been drinking to sign a release, and wherever it seems wise to the adjuster, owing to the circumstances surrounding the settlement, to obtain from the claimant in claimant's own handwriting such a statement as that referred to above; and, in the event that claimant signs by mark, to obtain disinterested and reliable witnesses to the mark. Perhaps this little suggestion may seem to many discursive and entirely unnecessary, but to others it may exemplify, as it did to me, the need of the utmost care and precaution in concluding matters of this kind, for, generally speaking, the public maintains a double standard of morals—one for dealings with corporations, another for transactions with individuals. The man who holds himself bound to govern his relations with a corporation by the same rule of morals and ethics which regulates his relation with the natural instead of the artificial citizen, is fast becoming as extinct as the dodo. Almost the universal attitude is that a corporation is not entitled to receive that strict application of the law of good morals and common honesty which is shown to individuals acting in private capacities. Put into common parlance, the public code in dealing with a corporation seems to be that "A man is entitled to all he can get out of a corporation."

The atmosphere of such a feeling is typical of a very large share of the cases which come for adjustment before the metropolitan law or claim department. There is no escaping from the conclusion, enforced by careful observation, that men who could not be induced to deal dishonorably with private individuals, acting as such, do not scruple to make false representations as to the nature and value of any old claim against a corporation. This practice is so common that it may be classed as almost universal. And the men, or a decided majority of them, who justify and indulge in this kind of "sharp practice" in dealing with a railroad corporation, might safely be trusted with a private loan, unsecured, and amounting to more than the sum involved in their suits for damages.

Previous to a very few years ago, the steam and street railroad companies of every kind and the "common carriers" of various descriptions have been the main sufferers from this deplorable attitude of the public conscience which decrees one moral standard for dealings with the private individual and another and a much lower one for transactions with a corporation. Now the application of this double standard is being made to many other kinds of corporations. The municipality is the worst sufferer of all; but the manufacturer, even the smaller and the private industrial concern, is being brought under the application of this sentiment and practice.

Possibly, of all the varied classes of claims, with which the adjuster of damage claims meets, the most dreaded and difficult for him to handle are those which bring to bear the subtle influence of "pull." Not infrequently a conscientious adjuster finds that this influence has reached "above his head," and that the discharge of his duty brings him into opposition with others more easily influenced and of higher rank on the company's roster. Quite generally claims pressed with this kind of backing are either fraudulent or extortionate. Of course, there are exceptions to this rule; but the very fact that the claimant feels called

upon to exert a personal, or social, or political pressure, or add to his claim the weight of some powerful financial interest in the institution in question, is a strong presumption that the claim for which this influence is solicited is too weak to stand upon its own merits. In this connection it might be stated that corporate officers, and particularly those engaged in passenger transportation, are not unmindful of the public attitude of sensitiveness and quasi-hostility towards them, and are, therefore, willing to make a just and liberal settlement without any undue influence exerted upon them, and for that reason adjust rather than contest even doubtfully meritorious claims. But, to go back a little ways, let us always consider an adjuster's trials and tribulations and not make his pathway too hard, for if he learns that claims which he declines are subsequently increased by reason of the so-called "pull" he soon gets to thinking that if somebody is to be a "good fellow," why should not he be that somebody? And if his superior officers are so willing to give away the company's money to please their friends, or to make friends for other departments of the company's service, why is it not perfectly proper for him to do those self-same things? Thus the company soon finds itself with a vastly increasing damage account. It is a good rule for any company to adopt to reverse rarely, if ever, a decision of its adjuster. If upon consultation with an adjuster it would seem that on the merits of the case in question, some action different from that already taken by him should be had, let the adjuster attend to that in his own way; do not have him feel disgruntled and overriden. There is no excuse for inflicting personal humiliation upon a man who possesses your confidence, who has your money in his pocket and your best interests at heart. Many and many a good man has been spoiled, I fear, by the unfortunate proclivity on the part of his managers to yield to the so-called "pull." If a company has any friends to make, or debts to pay, let them be paid through some other department and in some other manner. Debts paid in this manner are never considered liquidated, and a person who has obtained something for nothing for some one, by reason of his influence, nevertheless, thereafter boasts of the amount he has saved the company and the obligation under which it has been placed to him by his getting this or that case settled for them. This brings to my mind the subject of "go-betweens." There is in every community a class of people which seeks its livelihood by preying upon both sides of personal injury claims. It seeks the individual and impresses upon him how much can be obtained through the go-between, and how little without such influence, embellishing the yarn with wonderful stories concerning that influence, often to the detriment of honest officers, trying to make the claimant believe he has some hold upon them and that they are corrupt, and trying to persuade the claimant to see that the sun of success rises and sets in the great and only negotiator, and his Svengali-like "influence." And should this creature be treated with any consideration he swells himself larger and larger, and as he himself swells, so swells he the head of the claimant, and at last, if he succeeds in bringing the opposing parties together, his grandiloquent attitude dwindles to the proposition tritely expressed in the words, "How much is there in it for me?" while he assumes all the time the attitude that without his invaluable services, claimant and claimee, if I may coin the word, never could have come together or have reasonably disposed of their differences. There is one claim department of which I know, into which such an individual is not allowed to enter. Some things, in the human race, are more despicable than this creature, but he is sufficiently low in the scale to make it unwise, unsafe and, to every fair-minded person, disgusting, to have any dealings with him. Perhaps it is not fair to our sex to use the pronoun he so often in this connection—many and many such a creature masquerades in petticoats. Much success depends upon the care and discrimination shown in selecting cases for trial, and while this paper should mayhap deal only with the "Adjustment of Damage Claims," a word or two upon the corollary thereof, the litigation of damage claims, may not fall amiss. To illustrate, given a company, which employs and enjoys the reputation of employing only the ablest counsel obtainable and prosecuting its every defense vigorously and uprightly, and which wins a great major-

ity of the cases which it tries, ninety per cent of the bar will seek settlements in terms not unfavorable to that company rather than meet it in court. Right here let me say another word about trials and their results. Never compromise the verdicts when results are unfavorable. If they ripen into judgments, make the best you can of them after they have been affirmed by a court of last resort, not before. The fact soon becomes known as to who will and who will not compromise for fifty, or some other, per cent of the amount of a verdict, after one is rendered, and that company or person having such contingencies to contemplate, and compromising upon verdicts in the manner heretofore suggested, will soon be confronted with the necessity of trying each and every case brought against it. The results are so much more satisfactory to the practitioner who gets fifty per cent of the amount recovered by suit and only thirty-three and one-third per cent, or less, in the event of settlement. Then, too, think of the disappointment this same gentleman feels when he cannot add mention of such compromise to his scrapbook of newspaper clippings reciting his recovery of a \$10,000 verdict against this company and a \$25,000 verdict against that one, which volume he so proudly displays when luring to employ him some unsophisticated, but possibly injured, person whose clientage he seeks, but who never saw or heard of him before his call. The sadness is appalling; weep with me, my hearers! Never, as the expression goes, settle "behind the back" of a reputable lawyer. If in rare instances circumstances compel such action, see that he receives a reasonable fee. On the other hand, never settle with the "ambulance chaser"; it is far better to pay the client of such an one a hundred dollars than to pay him ten. Try it and see.

In writing concerning the adjustment of damage claims, I have confined myself to those arising from injuries to persons and omitted referring to those relating to damage to personal property, realty, etc. I have also intentionally refrained from going into the detail of the different means of procedure advisable to be followed from the moment an accident happens down to the time at which any claim, or claims, arising therefrom are finally laid at rest. Every company, I take it, whose claims are sufficiently numerous and whose damages are sufficiently large to

restrained impatience, a reply requiring no straining of the ear to hear, "We don't want it any longer; its present length suits us very well."



NEW SHOPS FOR DETROIT UNITED.

A few weeks ago the Detroit United Railway purchased the old Pullman car shops in Detroit, which were abandoned in 1893, and since September 19th Mr. Farmer has had a large force of men at work remodeling the plant. When this work is completed the Jefferson avenue shops will be abandoned and their equipment removed to the new plant.

The site of the new shops occupies the block bounded on the north by Macomb street, on the east by St. Aubin avenue, on the south by Monroe avenue, and on the west by DeQuindre avenue, and is 644 ft. long by 225 ft. wide. The arrangement and dimensions of the buildings as they will be after the extensive remodeling now in progress is completed are shown in the accompanying plan.

The row of buildings on the north side, which are of a uniform width of 80 ft., will be occupied, beginning at the west end, as follows:

Two-story building, 28 ft. long; car washing room in lower story; upper floor which is served by elevator, used for cleaning sash and interiors.

One story, 288 ft. long; paint shop with 22 tracks running from north to south.

One story, 13 ft.; at north end oil and paint room, 50 ft.; at south end lavatories, 30 ft.

Three-story building, 109 ft. long; ground floor, mill shop; second floor, cabinet and pattern-making shops; third floor, storage.

Boiler room section, 19 ft.; boilers on ground floor; dry kiln on second floor.

Three-story building, 42 ft.; machine shop on ground floor;

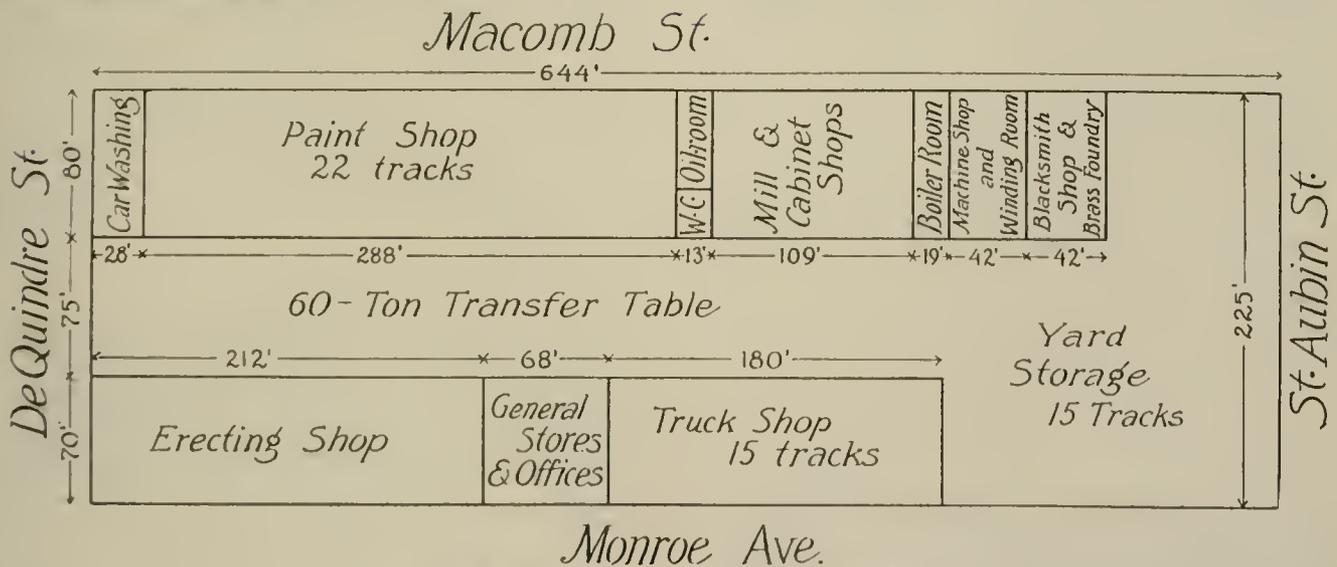


DIAGRAM OF THE DETROIT RAILWAY'S NEW SHOPS.

invite any special attention thereto has adopted careful, and one may say almost scientific, methods of caring for the injured person or persons, preventing fraud and starting immediately upon the happening of any occurrence which might give rise to a claim—the rolling of that ball of investigation which as it moves along grows and grows until it assumes and becomes a perfect and symmetrical globe of defense.

The temptation to overstep the bound of time and space allotted for this dissertation is so strong that it now becomes me to say, with the old dominie, lest like him I might fail to hold the interest of my auditors, "I can make this paper longer, but I won't." To which comes surging back on the tide of courteously

armature winding room on second floor; third floor for storage; building served by a hydraulic elevator.

One-story building, 42 ft. long; blacksmith shop on north side, 60x12 ft.; brass foundry on south side; in the southwest corner of the brass foundry will be a core oven 15x12 ft., above this will be the armature baking oven, this being adjacent to the armature room, which will be fully equipped with overhead trolleys, air hoists. The machine room will also have air hoists, and the pump pit will be located in the machine room.

On the south side, along Monroe avenue, are three buildings of a uniform width of 70 ft., beginning on the west or DeQuindre avenue end there are:

One-story building, 212 ft. long, to be occupied as an erecting shop.

Two-story building, 68 ft. long. The lower floor will be occupied for general stores, and the upper floor by the offices of the superintendent of motive power, Mr. Furmer, the chief inspector, and the superintendent's chief clerk, A. G. Thompson, and the drafting and clerical forces.

One-story building 180 ft. long with 15 tracks running from north to south, to be used as the truck shop. This shop will be equipped with lifts for removing car bodies from the trucks, which is the practice except with cars mounted on Brill trucks; for earling for these cars five of the tracks will be provided with pits, and equipped with hydraulic jacks. In the southwest corner of the shop will be located the wheel borer, the axle lathe, and the wheel press. The shop will be served with overhead air hoists with capacity for six tons and under.

All the shops are to be lighted by electricity and tools are driven in groups by motors. The heating is by steam.

Between the two rows of buildings is a space 71 ft. wide which will be served by a transfer table 52 ft. long with a capacity for 60 tons. The transfer table will receive loaded freight cars (coal, car wheels and supplies) from the railroad siding in Dequindre street and carry them directly to the boiler house, truck shop, or store room. The loaded cars are handled on the table by a dinky car electrically equipped.

The transfer table was ordered from the Taunton Locomotive & Manufacturing Co., through Geo. S. Hastings, of Cleveland.

The vacant space at the southeast corner of the lot is to be used for car storage, there being room for 15 tracks, this space being enclosed by an 8-ft. brick wall.

This plant is to be known as the Monroe avenue shops.



THE NERNST LAMP.

The place to see the Nernst lamp in detail and variety was at the Larned street exhibit of the F. Bissell Co., of Toledo, O., selling agents for the Nernst Lamp Co. This is the lamp that so brilliantly illuminated the Westinghouse and other exhibits. Its light is soft and light, there being no shadow or flicker, and it is operative on all alternating current circuits. It is highly recommended for railroad service. It comes in four sizes, one, two, three and eight-glower, running from 88 to 528 watts, or 88 watts per glower. Each glower is equal to three ordinary 16-candle power incandescent lights. The life of a glower is about 800 hours on 60 cycles and 400 hours on 25 cycles.

The "glower" is the life-giving element of the Nernst lamp. It is a small white rod about 1/32 in. in diameter and 1 in. long. It is a non-conductor when cold. Representing the Bissell company were M. S. Walker and C. M. Hamilton.

The Nernst Lamp Co. had the following representatives at the convention: A. E. Fleming, Pittsburg; G. J. Stanley, Pittsburg; Geo. C. Ewing, Boston; Walter Floyd, New York.



THE AMERICAN TRACKBARROW.

The American trackbarrow was shown in the ante-room and came in for favorable comment. Although used chiefly by steam roads, it is pointed out that it is an excellent tool for distribution of ballast ditching and cleaning tracks for electric railways. It runs on either earth or rail, the wheel being grooved for the latter. The American Trackbarrow Co., of Lowell, Mass., makes it, as well as very useful cars for carrying coal or ashes, tools, etc.



NATIONAL CARBON SPECIALTIES.

The National Carbon Co., of Cleveland, O., showed some interesting samples of Partridge solar and National carbon brushes. "Columbia" are carbons, "Columbia" dry cells, "Columbia" brushes, the "Auto Cell," Partridge plumbago for voltages under 220 and other supplies. There was a miscellaneous lot of special shapes in the brush line. The company is just introducing a new cell called "Special Columbia," which has nearly double the amperage of ordinary cells. The "Auto Cell" is designed for

automobile and gasoline work. It is a combination of small cells in a water tight case. There is claimed to be no possible chance for short-circuiting, and an amateur is in no danger of accident by careless handling. The company is pushing the "Columbia" brush, which is said to have exceptionally long life. It saves the wear of the commutators, also. The National was represented by Manager James Partridge, of Sandusky, and R. K. Mekey, of the general office.



THE VAN DORN-DUTTON AND THE VAN DORN-ELLIOTT EXHIBITS.

The Van Dorn & Dutton Co., of Cleveland, O., displayed gears, pinions, track cleaners, and other appliances, a special feature of the exhibit being an armature lift which was examined with interest by many of the railway men.

The Van Dorn-Elliott Electric Co., also of Cleveland, showed armature and field coils and commutators. It also exhibited re-winding armatures that came in for considerable attention.

The Van Dorn & Dutton and the Van Dorn-Elliott companies were represented by W. A. Dutton, K. N. Elliott, H. Ludwig, O. A. Foote and F. Schneider. They gave friends very neat souvenir note books.



TAYLOR ELECTRIC TRUCKS.

The Taylor Electric Truck Co., of Troy, N. Y., had a good exhibit in the annex, showing the Taylor heavy single truck, an up-to-date short wheel base double truck, with swing motion, a high speed double truck for suburban service and a regular swing motion truck. Mr. John Taylor, for the company, had charge of the exhibit and reported it altogether profitable.



THE ARMSPEAR LANTERNS.

The Armspear Manufacturing Co., of New York, exhibited a new trolley car tail lamp, which was described in the Wednesday "Review," a new steel guard solid-top lantern, a standard classification lamp, the "Armspear" marker lamp, the "Armspear" switch lamp and the "Armspear" semaphore lamp. Of the steel guard solid-top lantern it is affirmed that as at present constructed it has never been discarded by a road after having been adopted as standard. The frame is composed of flat metal rings and upright guards. No solder is used and a new feature is a brass hasp on the top, doing away with old-fashioned springs. It is a very strong lantern and cannot be broken by jumping on it. Mr. C. K. Freeman, of Freeman & Buckley, Chicago, and Mr. C. E. Nicol, of New York, had charge of the Armspear display.



STANDARD VITRIFIED CONDUIT.

The Standard Vitrified Conduit Co., of 39 Cortlandt street, New York, was represented by B. S. Barnard, the vice-president and secretary. This company showed samples of multiple and single duct conduit, as well as third rail insulators such as were installed on the Manhattan Railway system in New York and the Mersey Railway of London, Eng. Mr. Barnard states that he will be pleased to answer inquiries concerning the Standard products, feeling assured that investigation will result profitably all around.



AUTOMOBILE TOWER WAGON.

The Trenton automobile tower wagon exhibited on Randolph St., corner of Larned, attracted considerable notice. It is a Trenton trolley wagon, built by J. J. McCardell & Co., Trenton, N. J., combined with a special automobile gear designed by the Motor Truck & Vehicle Co., Columbus, O. In building the new gear the whole weight of the mechanism is hung low, which gives a greater stability and firmness to a high tower than is usually secured. During the past five years heavy trucks of the same design have been placed in severe continuous service and have successfully withstood all tests. The engine used for motive power is a modern high efficiency stationary gas engine of standard type. The transmission mechanism is very simple. Mr. M. J. McDonald represented the Trenton company.

SIXTH REGULAR ANNUAL MEETING STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Detroit, Mich.—Oct. 8—10, 1902.

FRIDAY MORNING SESSION.

President Mackay called the meeting to order at 10:45.

The President read telegrams of greeting from Mr. J. F. Calderwood, and from Messrs. Ross, of Montreal, Cooper, of Cincinnati, and Henry, of St. Louis; also from the Detroit Stock Exchange inviting the members to visit the exchange, which, however, owing to the want of time, the Association was unable to accept.

Mr. C. N. Duffy read the report of the Standardization Committee, as follows:

REPORT OF STANDING COMMITTEE ON THE STANDARD SYSTEM OF STREET RAILWAY ACCOUNTING.

To the Members of the Street Railway Accountants' Association of America:

Gentlemen:—Your committee on a standard system of street railway accounting beg leave to submit the following report:

We recommend that the classification of construction and equipment accounts remain unchanged, unless the convention directs otherwise.

We recommend the following changes in the classification of operating expense accounts:

Account No. 19, to read "Wages of Miscellaneous Car Service Employees," instead of "Wages of Other Car Service Employees"; Account No. 22a, "Hired Equipment." The insertion of this account to cover rental of cars, electric equipment of cars and other equipment.

Account No. 29, to read "Stores Expenses," instead of "Store-room Expenses."

Account No. 35, to read "Miscellaneous Legal Expenses," instead of "Other Legal Expenses."

Respectfully submitted,

C. N. DUFFY,
W. F. HAM,
J. F. CALDERWOOD,
H. L. WILSON,
W. G. McDOLLE,

Committee.

Mr. Duffy presented a communication from Mr. J. F. Calderwood suggesting the substitution of the title "Supplies Expense" in place of "Store Room Expenses."

Upon the conclusion of the foregoing report, Mr. Duffy gave a very interesting resume of the negotiations had with the Hon. W. R. Merriam, director of the United States Census; Mr. W. M. Stewart and Mr. North, of the Census Department, and Mr. T. C. Martin, the government expert on street railway and other electrical statistics of the forthcoming census, which negotiation on behalf of the Accountants' Association has been carried on thus far, though without any special authorization, by Messrs. Duffy, Calderwood and Ham. Mr. Duffy reported that the utmost amity existed between the latter gentlemen and the government representatives, in their purposes to make the work of the Census Department conform to the needs of the street railway interests, and, on the other hand, in the mutual co-operation of the companies and the government in facilitating the work in a way to satisfy the interests of all concerned. Mr. Duffy found the government officials conciliatory to the last extreme in the adoption of the suggestions made in the interest of the street railway interests, so as to impose upon the latter the least burden consistent with the obtaining of the practical results desired.

A vote of thanks was given Mr. Duffy for the interest taken by him in the matter and the services rendered.

Mr. W. M. Stewart was invited by the President to address the meeting, and in doing so corroborated Mr. Duffy's statement that

it was the desire of the Department to show every consideration to the electrical interests of the country in the work before them, and he at the same time expressed the appreciation of the Department for the co-operation which was assured in the work on the part of the Accountants' Association and the interests which it represented. Their conferences with the members of the Accountants' Association had impressed them with the necessity of adopting the form of accounting adopted by the latter; that system had been adopted and would be promulgated by the Department throughout the street railway companies of the entire country, and would be accompanied with a detailed statement of the Association's instructions as to the items which went to make up the totals for each of the subdivisions. He wished every one to appreciate that the Department was trying to get what the companies wanted, and to give the latter the statistics that would be of most assistance to them, which they regarded as one of the main objects of the census. Of course, another object in the work was the making of history. The history of our country was complete without statistics dealing with its material interests, and certainly the industries represented in this Association were among the important material interests of the United States.

President Mackay said he thought he spoke for the Association in saying that they could ask for no higher compliment than that which was conveyed in Mr. Stewart's remarks, and that the members of the Association would be glad to co-operate with the government officials in furnishing any information that the Census Bureau desired.

President Mackay then put the question on the adoption of the amendment proposed by Mr. Calderwood's communication, altering Account No. 29 to read "Supplies Expense," instead of "Store-room Expenses," and the vote resulted in the negative.

On motion of Mr. C. S. L. Tingley, the report of the committee was adopted.

Mr. Judson, of the New York State Board of Railroad Commissioners, was invited to address the meeting, and spoke briefly, assuring the Association of the desire of the Commissioners to join in the co-operation necessary to get a form of report that should be alike valuable to the street railway interests and to the public. He called attention to the fact that the street railway business was a large and growing industry. He thought the time was not far distant when all the railroads in the country would be electrically operated, and this Association should recognize that fact and make provision as early as possible to have their accounts so arranged that when the steam railroads got ready to change, there would be a system of accounting ready for them. (Laughter and applause.)

Mr. T. C. Martin was asked to say a word to the Association as the expert Census Statistician, and explained his relation to that work to be the clothing of the statistical skeleton in its application to electrical industry, with a view to elucidating the meaning of the figures when gathered. The United States was now turning out apparatus used in the various branches of this industry to the value of nearly \$150,000,000 a year, an enormously large proportion of which went into the hands of street railway companies, and it was a necessary sequence that the government and the public should like to know what became of that apparatus. When the figures were collated they would furnish a body of information which could not be surpassed in value in regard to any industry in any country in the world. He hoped that when the next Accountants' Convention met they should be able to have presented to them the gross totals and statistics of the art and the industry as a whole, and he could not help feeling that in adopting the system of the Association practically en bloc, they were assisting not only in putting this Association

on a higher plane than ever before, but were also doing for the street railway industry of the United States an incalculable service which would be better appreciated when their work was finished.

President Mackay said he thought as accountants they all appreciated Mr. Martin's remarks, especially what he had said as to the eliminating of such items as were considered unnecessary. They did dislike getting out unnecessary statistics.

The President stated that the next order of business would be properly a consideration of Mr. Tripp's paper, which had been read by Mr. Duffy. Mr. Tripp had been detained on account of the death of a brother.

At the suggestion of Mr. Duffy the Association directed its secretary to express to Mr. Tripp its regret at his absence and at the cause of his inability to be present.

The report of the Committee on Standard Form of Report for Electric Railways was then taken up for consideration, and discussed at length.

Mr. Judson, of the New York State Board of Railroad Commissioners, suggested the advisability of distinguishing more closely between freight and passenger business, and this subject was quite fully discussed; with the result that the arrangement proposed was generally conceded to cover all practical needs for the present at least, although it was suggested by Mr. Judson that the time would come when it would not be found adequate.

On motion of Mr. Burlington the classification of Car Earnings as divided under Schedule A was adopted.

Under the heading Miscellaneous Earnings, Mr. Smith offered an amendment striking out the words "has been" and "is intended to be" so as to cover only real estate that "is being used for the operation of the property." He moved this amendment because he believed that real estate which never had and never would be used in the operation of a road, but was bought for purposes of acquiring right of way, etc., should not be included.

Other members cited instances in which real estate formerly used for horse barns, but now rented to other parties awaiting the earliest opportunity to sell it, and being of no service to the street railway company, were not in any sense used in the operation of the road.

After further discussion Mr. Smith's amendment was adopted.

Secretary Brockway announced that the place of the next meeting of the American Street Railway Association had been referred to the Executive Committee of that Association, with Chattanooga the only city from which an invitation had been received, which would have its bearing on the action of the Nominating Committee of this Association, in view of the rule that at least one incoming officer must be from the next place of meeting.

A recess was then taken until 2 o'clock, central time.



AFTERNOON SESSION.

President Mackay called the meeting to order at 2:30 p. m.

The consideration of the report of the Committee on Standard Form of Report for Electric Railways was resumed, and Schedule A, Miscellaneous Earnings, further discussed.

Mr. Tingley, on behalf of a member who could not be present, brought up the question of including sale of power, the point being the advisability of swelling the gross income from conditions brought about by consolidations, thereby making a false return in that respect and subjecting companies to taxation for income that really was not earnings.

Mr. Judson thought the first thing to be decided in connection with the report was whether it was correct as to principle, and then stick to it all the way through. As far as taxation was concerned, it did not make much difference where these items were put, such as sale of power, for instance. If the tax assessors made up their minds that they wanted to assess advertising, sale of power and so on, they would find those items and tax them, regardless of where they were put in the accounting.

Mr. Ham called attention to one very important principle embodied in the report, which, if departed from, would destroy the entire plan reported; the committee took the ground that gross income represented everything that came in, without deduction. That gross income consisted of two items, gross earnings and

miscellaneous income. If deductions were made from either one of these items, it put an absolutely incorrect interpretation upon the word "gross."

Mr. Longyear maintained that if all items were excluded from earnings except operating earnings, it would amount to making comparisons with other roads, and that comparison could not be made in any other way.

Mr. Duffy saw no reason why earnings per car-mile or per car-hour of the Chicago City Railway could not be compared with those of the Brooklyn Rapid Transit as per Schedule A, as reported, if Mr. Longyear would fill out the report.

After further discussion, the Miscellaneous Earnings portion of the report, under Schedule A, was adopted, as revised on the previous amendment.

The President asked for any further criticisms that might be offered to the balance of the Income Account.

After discussion, Mr. Ham moved the adoption of the Income Account in its entirety with the accompanying schedules, with the following changes: That under Miscellaneous income, "and terminal's" be omitted, so as to make the account read "Rent of leased lines"; and under Deductions from Income, the same change to be made; that under Rent of Land and Buildings, "Miscellaneous Earnings," it shall read, "This refers to real estate that is being used for the operation of the property;" under Advertising, that that instruction be omitted entirely. That embodied page 12 of the report in its entirety, with the accompanying schedules.

Report adopted.

The form of Comparative General Balance Sheet was considered and adopted.

Schedules D and E, covering construction, were adopted without discussion, as was also Schedule F, carrying Capital Stock and Funded Debt.

"Description of Road and Equipment," "Mileage Traffic, Miscellaneous Statistics," and "General Information," were adopted, after a brief discussion, which indicated that the conservatism of the committee in refraining from including too much statistical detail, was to be commended.

On motion of Mr. Duffy, the consideration of the paper of Mr. G. E. Tripp, of the Stone & Webster's companies, on "Chart of Street Railway Blanks," was passed, owing to the absence of Mr. Tripp, for reasons heretofore referred to.

The Nominating Committee then presented its report, which will be found on page 713.

On motion the rule was suspended and the secretary cast one ballot for the nominees reported.

In the absence of the president and first vice-president-elect, Second Vice-President-elect, Mr. Bartlett was conducted to the chair by Messrs. Wilson and Duffy.

Mr. Ham offered a resolution thanking the Committee on Store Room Accounting for the splendid work done by them and for the able and valuable report which they had submitted, and the motion was carried unanimously.

On motion of Mr. Wilson, seconded by Mr. Smith, one hundred dollars per year was allowed for the secretary and treasurer to pay the necessary expenses to which he is put for stenographic and clerical help, etc.

Mr. Smith moved that the Committee on Standard Form of Report for Electric Railways be continued, and allowed to agree to such corrections as the Railroad Commissioners may require.

After some discussion as to the advisability of delegating this authority to a committee, and on the other hand, the necessity of clothing the committee with such power as would be needed, in its further conference with the committee of the Railroad Commissioners, to arrive at practical results, Mr. Smith's motion was adopted, with one negative vote.

On motion adjourned.



Aside from the very excellent exhibit of trucks by the Peckham Manufacturing Co., three other of its standard products were shown in conjunction with the interurban car exhibit. The Kuhlman car was equipped with a high-speed Peckham No. 15, the Jewett car with a No. 26 truck, and the Boland car used for the General Electric trolley parties had 11-A Peckham trucks.

A. S. R. A. PROCEEDINGS.

(Continued from Page 730.)

of handling this class of claims which come in in large quantities is to have an examination made of every one of them by a medical man.

There is one point in the paper which has been presented, which I think is of interest, and I think in view of the progress made by this Association that they should consider it and take a step in advance—that is to say, the execution of the general release by the injured party. I think it must be conceded that it is quite a ridiculous position to put to the ordinary class of man the general release which is the standard in the United States, containing the legal verbiage such as bills, specialties, and judgments of whatsoever demand and nature, etc. A great many lawyers learned in the profession would have some difficulty in explaining it. It seems to me we should formulate a release which would take care of all these propositions without the great use of verbiage which is used in the present document. I do not know all the decisions in the United States, but we have had in New York cases which went to our Court of Appeals and which were decided in some very early cases. In one case of Kuhn vs. Kanpp, the receipt read as follows: "Received forty dollars in full for damages done to us, for all demands, on the thirteenth June last." The Supreme Court held this to be a full release, and could not be attacked by the injured party, and the only claim on it was to recover the amount of compensation set forth in the receipt. In another case, I find the following language was used: "Received fifty dollars as a compromise for the full amount of my claim." The court said in that case the use of the word compromise was sufficient to make this appear as a settlement, and there could not be any demand made except to recover the fifty dollars. It seems to me that this Association might do well to draft some form of general release which might be used by all its members. I have no doubt there would be litigation, but I think in most of the states they have settled that some form of release would be upheld and be for the benefit of the corporations and greatly facilitate all claim agents in taking care of these matters.

At this point Mr. Beggs asked to be excused from the meeting so that he could meet an engagement in Milwaukee on Saturday. He expressed his gratification with the convention.

The next paper was on "Signals for Urban and Interurban Railways" by Mr. George W. Palmer, Jr. This is printed on page 730.

Mr. W. B. Potter, Providence: What provision is made in the signal system for the second or third car?

Mr. Palmer: I have no signal system. I am not here as the advocate of any signal system. I am simply here as an operative man.

Mr. Potter: I had reference to something I supposed you were using on the Old Colony System.

Mr. Palmer: I think, for any system to be reliable and safe, that it should be absolutely impossible to clear the car while there is another car on the block from one end to the other. We have also in use a system which is simply a circuit of incandescence lamps, part at one end, and part at the other end of the block, and which with us is more efficient as a lightning arrester than as a signal. I do not know that it should be considered a signal.

The President: Mr. Wason, whom I asked to say something on this subject, was unexpectedly called home last night. I then asked him if he would not before he left briefly give some of his views on this subject, and they largely agreed with those of the writer of the paper. Mr. Wason prepared a paper which I will read, as follows:

DISCUSSION BY MR. WASON.

Any system of signals that will prevent accident is most desirable street railway work. This is one of the most serious problems the railway manager has to contend with. In trying any new scheme the question at once arises, if the signals fail to work, will the results be more dangerous than at present? I think that is the general feeling among railroad men. They are anxious to find a signal, but do not feel warranted in trying new inventions.

I do not believe any employe should be discharged on the first offense. He may be an old man in the service, and before you are able to educate a new man he has cost the company much money. I think men running urban and interurban cars should be well paid for their services. You cannot get something for nothing. Men with capacity to fill positions on fast running cars cannot be hired at the old horse car rates. A signal system, to be satisfactory, must work at all times and in all weathers, and with any number of cars running in either direction. As lightning frequently burns out lamps on the trolley any system depending upon the main line current must be unreliable.

On double track roads the end-on collision is eliminated, but rear-end collisions occur even under the best management. The red lantern ought always to be carried on the rear of the car. I think it is required by law in some cities. When a car follows the regular, a green lantern should be carried on the regular. Where an electric headlight is used the throwing of a portion of the rays in a perpendicular direction often shows the motormen the location of other cars. In this connection, it seems to me that too much attention cannot be given to the braking equipment of the car. This, of course, includes the sand-box and contents. Money spent in eliminating the curves of a road is well invested in more ways than one.

The President: Mr. Ira McCormack, now with the New York Central, promised to make some remarks on this question, he being familiar with signal systems. Mr. McCormack has been in attendance at the convention, but he also found it necessary to leave last night. He promised he would prepare a paper in connection with the subject. He has done so and left the paper with us; his paper is largely of a statistical nature, and he makes quotations from several authorities on this subject. The paper will be of considerable value in connection with the proceedings of the Association, and we will order the paper printed in the proceedings.

I want to call attention to one point of many in connection with this paper, and that is the recommendation with reference to the proper signal on the rear of cars. On three railroads, of which I was asked to investigate the physical and operating conditions of the property during the past two years, they were operating cars under steam railroad conditions that prevailed fifteen years ago, as to speed and everything that went with it. With reference to each of these systems I recommended that they put on proper signal systems—I am now speaking of electrical railroads—to compare with the steam railroads with reference to lights for extra cars, and particularly the rear lights. My recommendations were not regarded in any of the three instances, they being considered as the views of a steam railroad man rather than of a street railroad man, and each of the electric railroads in question have had accidents from rear-end collisions, of which the least cost was \$10,000, and now they are carrying the rear lights and also the other signals that go with them. There are many methods of signals that are open for inspection in various parts of the country; and I say, gentlemen, based upon twenty-five years of operating experience in steam and street railroads that there is no more important question to you (more important than track construction and car construction) than that of proper methods of car dispatching and protection of cars on these high speed interurban roads. As I said at the last convention, there is no collision in the transportation world that can compare with a collision between two electric cars in its dire results. I have had any number of collisions and wrecks to clear up with steam trains, but in all my steam railroad experience I have never seen as bad a collision as occurred between two electric cars. There are two enormous bodies of steel, baggage or express cars—interposed between the points of contact and your passengers on steam trains. In our electric railroad work generally the front ends of the cars are of the flimsiest construction and that is the point where the motorman rides, and on many roads the passengers are allowed to ride on the seat back of the motorman. In two or three collisions which occurred in New York State last year, and in other parts of the country, there were more people killed and injured than in any steam railroad wreck in the properties I have had to do with, simply for the reason that every one in the front seats were killed in

the collision, there being nothing between them and the contact of the two high speed cars. I would rather, if I were operating a railroad, have two steam trains come into collision at fifty miles an hour than two electric cars at twenty miles an hour. I am satisfied the results would not be so disastrous in the case of the steam cars. It is very important in the interests of interurban operation before you are compelled by state and municipal regulations to do these things, to take them up and constrist them and do them yourselves. The history of steam railroading is open to you. It is not the theory of anyone. It is a scientific development. It has developed from the staff system, up and onward. I operated as a conductor 25 years ago under the staff system, the system of signalling spoken of in the paper. The little points in connection with these things come back into a man's mind. When the staff system was spoken of it reminded me of something that occurred on the New Haven road where they used the staff system across one of the bridges, single track, and there was positive orders that no trains should proceed over the bridge unless the engineer had the staff in his possession. It was a brass staff. A train came across the bridge and the fireman handed the staff to an engineer on a train which was about to proceed over the bridge and the staff fell through the trestle and went into the river. The road was tied up until some method was discovered of getting across the bridge without the particular brass staff that had been used. Col. Heft will undoubtedly defend the New Haven road.

Mr. Heft: What you say is true. It only goes to show what a perfect system we have on the New Haven road.

Mr. Bean: Had someone experimented with that staff before he adopted it?

Mr. Dickinson: They came from Europe originally. I might say I have had considerable steam practice myself, and there seems to be a mistaken idea given out here that the steam roads have a perfect system of signals. They have not; neither have the street railroads. They all depend on the human agency, and that will fail sometimes. In the steam practice the desire and the effort have been to reduce the number of chances of misunderstanding by reducing the number of people who control the movement of trains. With us in Seattle we are doing the same thing. We originally installed our interurban service with a telephone system for signalling, and we are about to take the telephone out and put in the telegraph, because we find it impracticable to protect our train orders by telephone. Persons who have no right to answer the telephone will do so, and the dispatcher will send orders and they get mixed up. We are going to run under the Standard Rules governing train orders, both as to lights and signals; fuses, rear lights—all in accordance with the standard system of train despatching.

The next paper was, "Discipline of Employes by the Merit System," by W. A. Satterlee, which will be found on page 721.

Mr. Harrington, Camden, N. J.: The paper just presented by Mr. Satterlee is a valuable contribution and is a clear and concise statement, indicating the tendency of recent practice in disciplinary methods. The interest taken in the subject of discipline, the method, the rule of procedure and the relation the employer should bear to the employe has never been greater than at the present time. The individuality of the employer has as much to do with the results of any system of discipline if not more, than the system itself. A system is not the panacea. It is conceded by all that the old method of suspension for violation of rule is not fruitful of results. The reasons for this conclusion are too well known to be discussed here.

Certain facts have become patent as being essential to any system of discipline, to wit:

A. The keeping of a thorough history of each employe from the date of his employment, showing clearly all irregularities, violations of rules, relation to complaints, accidents, and secret service.

B. The employe to receive a hearing, to be treated with consideration, to be given opportunity to explain under proper conditions and surroundings his position, before discipline be accorded.

Any system in which the employe is disciplined conforming to

the above features will conduce to better feeling and be followed by generally better results.

Experience has dictated that in exercising discipline great care must be observed in not passing judgment until all facts have been thoroughly investigated.

Experience has furthermore demonstrated that the various misdeeds, violations of order, breaches of discipline of the employe, in some way or another, are brought to the attention of the employer. Whereas, the commendable acts, the little refinements of courtesy, tact, observance of duty and rules, that may be the practice of the employe are seldom known of and are really and legitimately expected.

Threats are not conducive to good discipline, to good results. What good can possibly come from balancing bad against good? When bad is from the very nature of things bound to crop out and be known, while good is less apparent, less known and never as strenuously obtruded upon us. Wherein does the good, conscientious, able, trustworthy employe profit from a system of merits and demerits? It does not seem that the merit and demerit system reaches the core. I have in mind men who would not care in the slightest whether they had ten or one hundred demerits, or merits, they will run the chances of detection in just the same fashion certain conductors will run the chances of detection in the matter of irregularities in fare registration; however, let these same men actually lose something, though it be but a little, in their standing in the grade, class or seniority—it need not, and in fact better not, be an action that would eventually hold out the threat of discharge—what is the result? The punishment is immediate, the penalty is made at once, the evildoer suffers, and what is more advantageous, the worthy, painstaking employe receives immediately what he is entitled to, recognition and advancement.

I have tried the suspension system, the merit and demerit system, and abandoned them both after careful and persistent trial and effort. The demotion system was first put into effect upon our railway just about two and a half years ago and has been gradually developed into a thoroughly operative, practical system and conducive to the best results. Under this system an employe for any irregularity is notified that he will be demoted one or more points on the seniority list if proper explanation be not made on or before a specified date. This notice with an account of the irregularity is posted on the bulletin boards at the meeting places of the men. This usually results in the men whose names are posted arranging to meet the general manager, affording an excellent opportunity to exercise judgment in enforcing discipline. The wholesome effects are most noticeable, and efficient and reliable employes under this system forge gradually and surely ahead, obtaining the best and most profitable runs at the disposal of the company, and in such men the general stability of the working force is maintained against any possible disaffection upon the part of the men suffering from demotion. It can be seen that this system, while not directly taking cognizance of the efficient employe, in fact does take the most pronounced action in his behalf.

The President: The secretary will issue a request to members, asking for suggestions as to topics for papers, and we hope the members will give the subject careful consideration, and that when they suggest subjects they will also indicate a proper person to write on the subject.

Mr. John G. Holmes, of Pittsburg, one of the past presidents of the Association, to whom I extended an invitation to be present at this meeting, sends a letter in which he regrets his inability to be present on account of business engagements, recalls his many pleasant acquaintances among the members and wishes to be remembered to them.

Secretary Pennington: I desire to thank personally the writers of all the papers for their promptness in forwarding copies of their papers so that they might be printed in ample time before this meeting. This helps the work of the secretary very greatly. I received all of the papers about five weeks before the date of this meeting and had them in the hands of the members fully two weeks before the convention.

The Committee on Resolutions then reported a resolution thanking President Hutchins, Mr. Fry, chairman of the Exhibit Committee, and their associates; the local committee, the supply-men, the press and others contributing to the success of the convention.

This report was unanimously adopted.

The committee on nominations and the next place of meeting reported the nominations, and that it would recommend that the choice of the next meeting place be referred to the incoming executive committee with full power to act.

Mr. J. W. McFarland, superintendent of the Chattanooga Electric Railway Company, Chattanooga, Tenn., appeared before the committee and extended an invitation on behalf of his company and the city, but owing to the limited information in possession of your committee, it did not feel warranted in recommending Chattanooga.

On motion the secretary cast the ballot of the Association for the officers named by the nominating committee. (The officers chosen are given on page 713.)

Adjourned until the banquet.



BRILL EXHIBIT.

The J. G. Brill exhibit this year comprised the following:

A Brill semi-convertible car, shown in the street exhibit. This car has been fully described in previous issues of the "Review" and continued to attract the attention and approval of street railway managers.

The interior exhibit was in the annex and comprised in addition to a full line of trucks, three sections of the Narragansett semi-convertible and convertible cars.

The truck exhibit consisted of the following: A Brill No. 27 truck for fast city and suburban service; a Brill No. 22 Eureka maximum traction truck which is the standard on the Metropolitan Street Ry. of New York and the Brooklyn Rapid Transit Co. of Brooklyn, N. Y.; and a Brill No. 21E truck. All of these trucks have solid forged sides and in addition an exhibit board was shown on which were mounted four samples of Brill solid forged truck frames.

In addition the company showed its "Brill-lant" sign which was described in the "Daily Review" for Wednesday.

The exhibit also included a line of track scrapers, Dedenda gongs, the Brill brake handle, and Adams's patented broom, round corner end seat panels, safety gates and other of the Brill appliances for electric railways. The company had a large staff on the grounds, including Samuel Curwen, W. J. Heulings, Jr., Dwight Dean, George Haskell, and J. Elwood Brill.



AUTOMATIC FEED WATER CONTROLLER.

The Strong, Carlisle & Hammond Co., of Cleveland, through its Boston representative, Mr. F. H. Lovejoy, showed to excellent advantage its specialties, the Squires automatic feed water controller and the Squires pump governor. In no uncertain way Mr Lovejoy proved to many inquirers that the automatic feed water controller is a good thing and the company's offer to transport and install its device for a free trial, and to pay the freight back if not satisfactory, was most convincing. Both appliances are the invention of Mr. C. E. Squires, of Cleveland. Messrs. Sales & Broad, of 86 Jefferson avenue, Detroit, are the company's sales agents in that section.

The great value of the controller lies in the fact that the main feed valve is handled by direct boiler pressure, making it positive in all its operations and allowing it to be opened to the full extent, thus making it unnecessary to carry an excess pressure of more than 10 or 15 lb. for feeding. This is made possible by the introduction of an auxiliary valve, for the successful operation of which a movement of not over 1/64 in. is required, this motion being automatically produced by the expansion and contraction of copper tubes composing the harp which is part of the invention. The operation of the Squires controller is very simple. There are but few working parts and these are so arranged as to be subjected to but little wear. It is the only controller that works without floats. It works on marine engines and there are 60 in use on the lakes. There are 400 controllers out already and among those recently installed is one at the Brooklyn Heights Railroad plant, of which Mr James Anderson is chief engineer. Other installations have been: Hotel Manhattan and St. James Building, New York; Walworth Manufacturing Co., Boston; Parker & Taft, Providence; Sals & Wyckoff, Springfield, Mass.; Foskett & Bishop, New Haven; Curman

& Thompson, Lewiston, Me.; Rutter & Co., and J. H. Horn & Sons, Lawrence, Mass.; H. R. Barker, Lowell, Mass.

The Squires pump governor is for use on steam pumps for feeding boilers of every description.



STANLEY ELECTRIC MANUFACTURING CO.

The Stanley Electric Mfg. Co., of Pittsfield, Mass., had at the convention an extensive exhibit of its standard apparatus for a rotary converter sub-station. This consists of one 300-kw. rotary converter and switchboard. The switchboard has three panels as follows: One A. C. panel equipped with a 450-volt voltmeter, a 600-ampere ammeter, and one phase indicator. At the top of the board above the instruments are mounted the synchronizing lamps and below the instruments is the voltmeter plug switch for connecting the voltmeter on any one of the three lines. Below this is mounted a three-pole single-throw 500 ampere main alternating current switch. Upon the sub-base of this panel is mounted the handle which operates the high tension oil switch and circuit breaker standing back of the board.

The second panel is a D. C. panel. At the top is mounted a circuit breaker and directly below it a 750-ampere ammeter and field rheostat. Below the rheostat are mounted four switches: One field transfer switch for connecting the fields of the rotary directly to its own brushes for self-exciting or to the trolley circuit for separately exciting at the starting up; one main single-pole single-throw positive switch; one starting switch connected to an iron grid rheostat back of the board; one double-pole single-throw field switch equipped with resistance for taking the field discharge upon opening.

The third panel is a double feeder panel for the 500-volt circuit. This panel is equipped with two circuit breakers, two ammeters and two single-pole double-throw switches. The direct current voltmeter for this board is mounted upon a swinging bracket at one side of the board. The instruments and switches upon the board are positive and the negative lead is brought from the rotary to the negative switch mounted upon a separate pedestal.

Back of the board stands a Stanley 15,000-volt three-pole single-throw combined oil switch and circuit breaker. This circuit breaker is attached to the board and is operated by a handle projecting through the sub-panel of the A. C. panel, as above described.



The company was represented by Dr. F. A. C. Perrine, D. B. Rushmore, S. T. Dodd and H. R. Wilson, of Pittsfield, Mass.; R. D. Lillibridge and B. K. Hough, of New York; C. VanDeVenter, L. M. Harvey, W. V. Bergenthal and Ward S. Arnold, of Chicago; J. E. Lockwood and M. W. Thomas, of Detroit.



TIES FOR TROLLEY ROADS.

The Eccleston Lumber Co., 29 Broadway, New York, has been rushed with orders all along, especially for ties, which it makes a specialty of furnishing to trolley and steam roads. All kinds and sizes of ties can be shipped promptly, the company being especially well equipped to handle business of this nature. It also does a large pole and cross arm business, furnishing poles of long leaf yellow pine, octagonal or square, Juniper or Southern white cedar, chestnut and cypress. President J. B. Eccleston states that it has been an unusually prosperous season and the outlook for 1903 is better than ever.



AMERICAN RAILWAY SUPPLY CO.

One of the most attractive exhibits was that of the American Railway Supply Co., of New York, under the direction of General Manager Walter Chur. In a large oak frame surrounded by another of ornamental brass were shown on a red plush background the various cap and coat badges for which this company is so favorably known. Manager Chur said that he was very well satisfied with the convention, having received many requests for samples and prices, and promises of business. In fact, it was the best convention he ever attended. For a souvenir Mr. Chur provided a hat pin to please the ladies. The head of the pin was marked, "A. S. R. A., Detroit, 1902."

STANDARD TRACTION BRAKE CO.

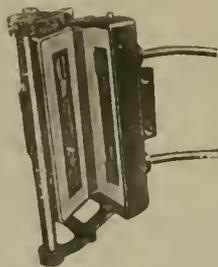
The Standard Traction Brake Co.'s display, which was in the Westinghouse section, consisted of 32 exhibits, as follows: Westinghouse magnetic brake installed on a Brill pivotal truck No. 27 F; Westinghouse magnetic brake on St. Louis Car Co.'s M C B type No. 23-A; standard independent brake controller interlocked with a K H controller; electric heater used in connection with the magnetic brake and as applied beneath longitudinal seats; electric heater as applied in connection with the Hale & Kilbourne Manufacturing Co.'s No. 80 two-quarter cross seat; 8-in. diameter brake cylinder with automatic slack adjuster attached; O V F operating or engineer's valve; O V T valve sectioned to show movement of parts of engineer's valve; O V G operating or engineer's valve; whistles used in electric railway service; hose couplings and fittings used with standard system of air brakes for electric railways; electric heater as applied to Heywood Bros. & Wakelind's cross seat No. 42; heater switch No. 10, used in connection with "Standard" Form D controllers to regulate the temperature in the car; heater switch No. 7, used in connection with the combined running and brake controllers; improved incostat, or diverter; demonstration of the path of the magnetic flux through the track magnet and the rail; designs of magnetic brake as applied to trucks; A C N duplex-gear axle-driven compressor; A C C duplex-gear axle-driven compressor; D R E regulator for compressors; preliminary and main reservoirs with duplex check valve interposed; C V F duplicate check valve, sectioned; D-1 motor-driven air compressor; D-2 motor-driven air compressor; D-3 motor-driven air compressor; E-1 motor-driven air compressor with two vertical cylinders; electric pump governor, Form C; electric pump governor, Form D; motorman's brake valve with slide-valve feed valve; No. 1 pressure reducing valve; reservoir with all welded joints.

The company's representatives at the convention were: J. R. Elliott, C. R. Elliott, New York; G. A. Hager, C. C. Farmer, Chicago; P. J. Myler, Hamilton, Ont.; A. D. Brown, Buffalo; S. D. Hutchins, Columbus, O.; W. Cummins, Cincinnati; I. B. Clarke, E. H. Dewson, F. C. Newell, Pittsburg; F. V. Green, A. J. Brislin, New York.



IRON FUSE BLOCKS FOR STREET CARS.

One of the minor exhibits of the Westinghouse Electric & Manufacturing Co. was an iron fuse block for cars, which is shown in the accompanying illustration. This fuse block is completely enclosed by an iron casing, except where the vent extends through the bottom. It is easily accessible for renewing the fuse and when open the contacts on which the fuse is sup-



ported are cut out of circuit, thus making it perfectly safe to renew the fuse while the line is alive. A straight piece of copper wire is used for a fuse, and it is secured in place and clamped in the contacts by the act of closing the block. Hence, in renewing, it is only necessary to open the block, drop a piece of straight copper wire in place, and again close the block; this is a very desirable feature in cold or stormy weather.



The Crocker-Wheeler Co. was represented at the convention by the following members of the company's selling force: Patnam A. Bates, assistant secretary, and Charles W. Staatsmaa, Ampere N. J., Francis B. De Gress, manager New York office; Julian Roe and Bert Forde, Chicago; William H. Wissing, St. Louis; W. F. Sullivan, Cleveland; W. J. Hartwig, Detroit agent.

NEW HAVEN CAR REGISTER CO.

The exhibit of the New Haven Car Register Co. was very complete and included some noticeable features. There was a new controller device calculated to keep the motorman from turning on current more than one notch at a time, although the device can be worked rapidly. A great many visitors, especially motormen, evinced much interest in this appliance, which is entirely new and simple. It has one endless flat spring inside, the lug of which works on the principle of a door latch.

The new Boston model register was also a feature. This machine works on similar lines to others, the difference lying in a device that makes it impossible, even if the glass is broken, to change the figures on the main train or totalizer. Attention was called to the fact that this is the only company that makes a triple register that records three styles of fares and is operated in the regular way.

Another specialty of the display was a new trolley wheel that requires no oil and has no bushing. The barrel is made by the same method as graphite lubricant. It is machine rifled and all made solid. The groove is wide, being easy on overhead construction. The company exhibited letters to show that the wheel gives eminent satisfaction. In addition to the articles enumerated the exhibit included the company's standard registers, cord fixtures, punchers, insulated tape and varnish and other products. A unique souvenir was distributed, consisting of pocket mirror and pin cushion. The looking glass is convex, so that the entire face is reflected. The representatives of the company present were: Willis Anthony, president; F. Coleman, vice-president and general manager; John S. Bradley, secretary and treasurer; J. M. Hayes, M. de F. Yates and Harry Beach.



THE ADAMS & WESTLAKE CO.

The principal features of the Adams & Westlake Co. exhibit were the Mosher arc headlight, the contra-twist door fixture and the Kling & Adlake brake handle. There were also samples of marker lamps, switch lamps and lanterns. An excellent feature of the Adams & Westlake lamps is that they are non-sweating, which in cold weather prevents the gathering of moisture and ice on the inside of the lenses, thus giving an efficient signal. Another point brought out by the company's representatives is that the A. & W. lights are standard on some of the largest street railway and railroad lines in the world. Mr. A. S. Anderson, of Chicago, and Mr. James Foster, of Philadelphia, presided over the Adams & Westlake booth, which was easily seen on account of the powerful rays of a Mosher arc headlight which was in operation constantly.



THE NEAL DUPLEX BRAKE.

The United States Steel Co. exhibited the well-known Neal duplex brake, large shipments of which have recently been ordered from Indianapolis, St. Louis and Jersey City. Successful trial equipments have been sent to Cleveland, O., also. The company sends the brakes subject to a satisfactory trial.



AN INTERESTING POLE EXHIBIT.

The Standard Pole & Tie Co.'s exhibit was one of the most interesting in the hall. It was in charge of Vice-President E. G. Chamberlin, aided by Secretary and Treasurer Fred L. Merritt. This company makes a specialty of octagonal and square poles and when its new plant at Brooksville, Fla., is completed it will make a specialty of cross arms. It has sold upwards of 10,000 southern white cedar poles in the middle west during the past 12 months. A large section of one of these poles was exhibited this week, as were several explanatory photographs of the company's pole yard at Wilmington, Ala. It was also explained that the Standard company furnished the corner posts, of Florida heart pine, in the car used in the Providence Car Pender Co.'s exhibit adjoining that of the pole company. Mr. Chamberlin goes from Detroit to superintend the completion of the Brooksville plant.

THE HART TIE PLATE

PATENTED

Made in three widths: 4 1/4, 5 and 6 inches.

SPENCER, OTIS & CO., Sales Agents,

903 Plymouth Building, CHICAGO. U. S. Nat. Bank Building, OMAHA

MANUFACTURE AND SALE CONTROLLED BY

GEORGE FULLER, 1300 OLD COLONY BUILDING, CHICAGO.

Republic Railway Appliance Co. Lincoln Trust Bldg., St. Louis, Mo.



OHIO BRASS CO.'S SPECIALTIES.

The Ohio Brass Co. had a large and tastefully arranged exhibit that was a mecca for inquirers throughout the convention. The display of all-wire rail bonds was exceedingly interesting. In this type of bond the terminal is made from the wire, forming a continuous conductor and eliminating contacts that usually prevail in cast terminal bonds. The sales of these bonds are reported to have been exceedingly large.

A very neat display was afforded by the railing made of 80-lb. rails, bonded with all-wire bonds and set upon various forms of the Ohio Brass Co.'s third rail insulators. A full line of overhead material was also attractively laid out.

The representatives of the company in attendance were the following: C. K. King, secretary; George A. Hanwood, general agent; H. C. Schwable, of the general office; N. M. Garland, New York; Hurl Gellatly, Pittsburg; Otto W. Uthoff, St. Louis; A. L. Wilkinson, Mansfield, O.; George A. Meade, chief engineer, and Porter & Berg, the Chicago agents. A cigar holder and ash receiver of nickelled brass was the 1902 souvenir.



H. W. JOHNS-MANVILLE CO.

The H. W. Johns-Manville Co. had a diversified display of electrical supplies, including the "Noark" fuses, "Johns" electric car heaters, Philadelphia break, metal crossings, giant strain insulator, toggle-clamp feed wire insulator, Philadelphia Insulated crossing, "H. W. J." arc lamp hangers, Vuleabeston insulating sheets, sleeves, hangers and other specialties. There were many inquiries at the Johns-Manville booth and many requests for catalogs and price lists.



The F. Bissell Co., agents for the Nernst lamps, presented callers a useful souvenir in the shape of a steel key ring with an ivory tag.



Merritt & Co., of Philadelphia, displayed a set of metal lockers in the annex. Expanded metal is the material used, cut into diamond shaped meshes. There are no joints or connections and the locker is very neat and attractive. The General Electric Co. has these lockers in its Schenectady plant. They insure ventilation and are fire proof.



The R. D. Nuttall Co. is giving to master mechanics, engineers, and other callers a useful little technical book on gearing. It is a very practical souvenir.



Westinghouse, Church, Kerr & Co. were represented at the convention by E. H. Smith and C. M. Vall of New York; H. H. Kerr Chicago; W. Franklin Detroit; S. A. Jenkins, Boston; H. J. Raynor Detroit.

MILLER'S SANDING MACHINE.

A new sanding machine, shown by D. N. Miller, of Detroit, is equipped with forced-feed handles, which permits using green sand without its having to be kiln dried. This sander is in use in Hamilton, Ont., and Mr. Miller stated that he would place it on any road in America for trial. He intends to put it on the market at a price that will ensure its general use.



Mr. B. B. Jenkins, of Toronto, Ont., was at the convention showing the "Jenkins improved car sander."



In the annex was shown the Norwood ball bearing base, both center and side bearings, controlled by the Ball Bearing Co., of Baltimore, Md.



The United States Steel Co. gave out two neat souvenirs, an aluminum covered memorandum book and an aluminum business card, upon the back of which is the yearly calendar.



The Standard Pole & Tie Co.'s souvenir was an octagonal pen holder shaped like one of the octagonal poles the company makes.



Mr. Herbert W. Smith, assistant manager of the railway department of the Stuart-Howland Co., Boston, was on hand at his company's space.



The Pittsburg transfer ticket machine, manufactured by the Pittsburg Blue Print Paper & Manufacturing Co., and which was illustrated and treated in yesterday's daily, was exhibited by S. B. Whitney, secretary and general manager, aided by Robert Gibson.



General Manager J. S. Speer of the Speer Carbon Co., states that the convention has certainly been good to him. The outlook for business, as a result of the convention, is enhanced and altogether he considers the convention a great success.



Mr. H. De Steese, representing Stuart-Howland Co., Boston, showed samples of railway and lighting supplies in room 320, Hotel Cadillac. Mr. Herbert W. Smith, assistant manager of the railway department of the same house, was also in attendance.



Mr. P. A. Poppenhusen, president of the Green Engineering Co., of Chicago, was on hand to tell about the economies effected by the use of Green traveling link gratings.



Of the Duff Manufacturing Co.'s officers, Treasurer T. A. McGinly and Superintendent George F. Freed were much in evidence during the convention.

THE NICHOLS-LINTERN COMPANY,

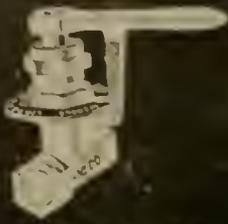
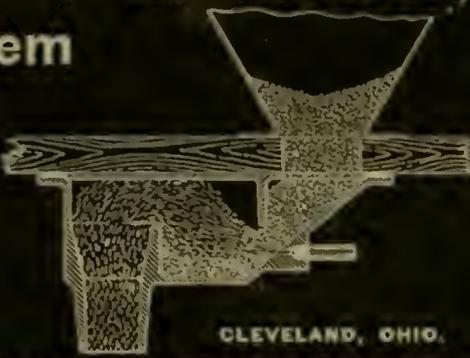
Track Sanding System

Saves

EQUIPMENT CURRENT

TIME AIR SAND

PREVENTS ACCIDENTS

ELECTRIC BLDG., CLEVELAND, OHIO.

LIVERPOOL'S NEW ELECTRIC CAR.

At the last meeting of the Tramways Committee of the Liverpool Corporation, the proceedings of the Finance and Sub-Committee, which included a report by the city tramways general manager (Mr. C. R. Bellamy) as to a new covered car which he had designed, were adopted.

The report stated that the experience of the committee, after trying the American and German types of cars, was that outside seats were very popular. But it was recognized that outside passengers had certain grievances arising from discomfort in bad weather, wet seats and exposure. There were other people, more especially ladies, who were more or less nervous in regard to the trolley standard. A further question which the committee had constantly before them was the overcrowding, both inside and outside. All these things had occupied the closest attention of the general manager, and, with the assistance of his staff, Mr. Bellamy had now produced a car with the upper deck cleverly covered in. The roof of this cover was 6 feet 2 inches from the deck, and was constructed of a light frame of steel, with movable sides and tops of waterproof canvas. The contrivance was in sections, which could be moved at will in the space of a few minutes. The covering was set back fore and aft sufficiently to avoid the current of air which came up from the staircase, and an additional advantage was that the trolley standard was removed. On the new car seating accommodation was provided for 42 persons outside and 31 inside. Therefore, by limiting the overcrowding inside to its present extent of nine passengers, they would be enabled to carry 73 passengers on a car. This meant that overcrowding would be very greatly restricted, and that in time they would abolish completely anything approaching overcrowding. It was proposed to apply this covering to 30 cars now coming from the makers, and to twelve which were being built in their own works. The upper deck would be thoroughly well lighted by three lights in addition to the end ones.



NEW YORK OFFICE OF CHRISTENSEN ENGINEERING CO.

By reason of the increasing demands of its business the eastern offices of the Christensen Engineering Co., at 135 Broadway, have been enlarged by the acquiring of several additional adjoining rooms which will be used for general office and exhibition purposes. The new suite has been elegantly furnished and the company's many friends are cordially invited to visit the company in its enlarged quarters. Out-of-town visitors to New York are particularly invited to partake of the comforts furnished and to make the place their headquarters while in town.



Mr. F. N. Root, manager of the Root Track Scraper Co., of Kalamazoo, Mich., emphasizes the fact that the Root scraper is the only one that fastens to the truck on a double truck car, making the liability of the scraper leaving the track on curves out of the question.

ONE MORE OF THE SAME KIND.

The following is still another sample of the kind of clippings the Consolidated Car Fender Co., of New York City, receives every day from some one of the 200 cities in which the Providence fender is used exclusively:

"Yetta Levine, 3 years old, of 54 Montgomery street, was crossing the street in front of her home Saturday afternoon when she was run down by Court House car No. 259. The motorman could not stop the car, but the child was not hurt. She fell in the fender. Her father took her home."—From Jersey City (N. J.) Journal, June 16, 1902



THE HART TIE PLATE.

Spencer, Otis & Co., of Chicago, sales agents for the Hart tie plate described in Thursday's "Daily Review," report a great deal of interest manifested in the device by street railway men, particularly track engineers. The manufacture and sale of this plate are controlled by George Fuller, Old Colony building, Chicago. The Republic Railway Appliance Co. is St. Louis agent.



Mr. H. K. Doolittle, of Watertown, N. Y., was kept busy explaining a model of his new window, so constructed that either sash can be removed without disturbing a stop or a screw. Mr. Doolittle is an expert mechanic, and his towns-people endorse him very highly.



Mr. Henry A. Dorner, of Logansport, Ind., was on hand to explain the merits of the Dorner truck that stood on Larned street, near the entrance to the hall.



President E. Lockwood, of the Michigan Electric Co., dropped into the convention frequently. He said it struck him that it could hardly be improved upon.



The General Electric Company's representatives were, among others, J. R. Lovejoy, J. J. Mahoney, C. C. Pierce, J. B. Pevear, B. E. Surroy, G. D. Rosenthal, J. H. Livsey, J. C. Callsch, T. P. Bailey, F. H. Gale, R. H. Beach and E. H. Mullin.



The Northern Electrical Manufacturing Co. interests in the convention were represented by Manager L. M. Harvey, of Chicago, who also looked after the Stanley Electric Co. exhibit.



President W. R. Garton, of the W. R. Garton Co., electrical supplies, of Chicago, was here there and everywhere during the convention making his presence known and keeping his eye open for business.



The Wheeler Walkover car seat exhibited by the Heywood Bros. & Wakefield Co. is standard on the Pennsylvania railroad. Orders have been received from that road for nearly 6,000 seats so far this year. Visitors to the exhibit evidenced much interest in this seat.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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This year for the fourth time the "Street Railway Review" published a "Daily Edition" on the occasion of the annual meetings of the American Street Railway Association and the Street Railway Accountants' Association, the "Daily" being published in Detroit and appearing on the mornings of Oct. 8, 9, 10 and 11, 1902. These four numbers of the "Daily Street Railway Review" aggregated 132 reading pages and included full accounts of the proceedings of the two associations with the exception of two committee reports, one of which is given in this issue; publication of the other report, that of the Committee on Standards, will have to be further delayed by reason of the drawings to accompany it not being ready.

The "Daily Review" is a separate publication, but is in its nature supplementary to the monthly "Street Railway Review," and for convenient reference should be bound with the latter, and for this reason the folio numbers of the "Daily" were made consecutive with those of the regular "Review." All four copies of the "Daily" should be filed with the monthly in order to have the 1902 "Reviews" complete.

It is extremely gratifying to us to know that our enterprise in publishing the first complete convention reports and placing them in the hands of our readers promptly, is more highly appreciated each succeeding year. This undertaking has grown rapidly and we trust that some statistics for the "Daily" will not be found uninteresting:

Year.	City.	Issues.	Pages	
			Reading Matter.	Total.
1899	Chicago	5	102	212
1900	Kansas City	4	88	188
1901	New York	4	125	252
1902	Detroit	4	132	300

It will be noted that the four Detroit "Dailies" contained practically twice the number of pages of reading matter that are to be found in two of the monthly issues of the "Review."

We congratulate both the A. S. R. A. and the Accountants on re-electing their secretaries for the ensuing year. The success of an association of the character of these is to a very great extent de-

pendent upon its active executive officer, who is of course the secretary, and no policy is more certain to bring good results than that of continuing an efficient secretary in office.

In his presidential address at the opening session of the Detroit convention Mr. Vreeland laid stress on the opportunities of the A. S. R. A. to enlarge its scope, and one of the points to which he directed attention was that discussed editorially in the "Review" for Sept. 20, 1902. He pointed out the rapid increase both in number and in magnitude of the electric railways which are not organized as "street railways" and do not have their tracks laid in streets, and are, perhaps, not eligible to membership in the association under a strict construction of Article III of the Constitution, but which look to the American Street Railway Association as the exponent of their interests, and expressed the belief that even were a change of the name of this association considered inadvisable it was desirable to welcome the participation of all companies engaged in electric railway transportation. Attention was also directed to the fact that the present development of interurban railways had brought with it certain questions that affect street railways proper, for instance, the interchange of freight, the handling of express and parcels by city lines, and the joint use of urban tracks for terminal purposes.

An important event at the Detroit convention was the meeting of master mechanics and chief engineers, at which steps were taken to organize a new association of electric railway men—one that shall comprise the heads of departments in charge of the motive power and rolling stock. One of the effects of consolidations of railway companies has been to impress on the managers of the merged companies the disadvantages of having to operate and repair diversified equipments, which included "one of every kind," and it is doubtless due to this fact that for the last two years committees of the A. S. R. A. have been appointed to report on standards for rolling stock. Neither of the reports on this subject recently submitted (1901 and 1902) were discussed before the convention, which must be taken as indicating that the A. S. R. A. had not the time to properly consider them. The adoption of rolling stock standards can only result after a full consideration of a multitude of details with which the master mechanic is entirely familiar, and therefore is a matter peculiarly the province of such an association as the new one is designed to be. Similarly the question of reciprocating engines versus turbines, which is undoubtedly a live one now, is not one that many railway managers would care to decide until after thoroughly canvassing it with the head of their motive power departments.

The A. S. R. A. has always been a progressive body and its position today is due to the liberal spirit in which it has met the changes resulting from the rapid development of the field it now covers. We may therefore expect the association, both as a body and through the managers of its member companies, to give cordial support to the new association.

"The Mechanical and Electrical Association of Electric Railways" will meet at Cleveland Jan. 12, 1903, for the purpose of effecting a permanent organization. We predict success for it and assure the committee that it shall always have the heartiest cooperation of the "Review."

The Detroit convention of the American Street Railway Association was in many respects the most successful one that has ever been held, particularly in the character of the papers presented, in the increased attendance at the business meetings, and in the large number both of delegates and manufacturers at the convention. At Detroit many of the almost innumerable expressions of satisfaction that were heard concluded with, "It is the largest convention the association ever held, excepting last year at New York." In view of the fact that this opinion is doubtless the one generally held, a comparison of the registrations for the New York and Detroit conventions will be interesting and perhaps surprising.

* * *

At New York in 1901 the total number of persons registering was 1,414; of these 478 were delegates of members, 39 were registered as accountants, 86 were ladies and 755 were classed as miscellaneous, including in this term the representatives of non-member street railway companies, of manufacturers and of the press. At Detroit, in 1902, the total registration was 1,779, or some 360 more

tion in New York, of those 193 were delegates, 48 were accountants, 325 were books, and 1013 were classified as miscellaneous, excluding books the only variation at Detroit was, in round numbers, 1,450 as against 1,250 for the year before.

As regards the exhibit at the official list for the New York convention shows that 132 companies and firms were assigned space in Madison Square Garden while at Detroit the total number was 166. Every thing in connection with the exhibits was this year handled in most excellent shape and the display itself was certainly one of the most elaborate ever given under the auspices of the Association, and despite the limited space available, which prevented many of the firms making more extended exhibits, we are inclined to think that this feature of the convention was second to none. For the admirable manner in which the details were handled the thanks of all concerned are due to the chairman of the exhibit committee, Mr. Fry, and those who were his principal assistants, Messrs. Burdick, Kerwin, Fastman, Parker, Russel and Lynch.

* * *

The only cloud over the convention was the illness of President Hutchings, of the Detroit United Railway, which prevented him from taking an active part in the meetings; with characteristic fortitude, however, Mr. Hutchings made a point of being present at the business sessions for at least a short time each day, and on Friday night was able to be at the banquet and deliver an address on the occasion of his installation as president of the association.

The incoming executive committee of the A. S. R. A. is charged with more important duties than have fallen to many of its predecessors. Two points of policy that must receive consideration relate to the future scope of the organization, and to the future meeting places for conventions. It was realized at Detroit, as never before, that the association makes extraordinary demands on the convention city for exhibit space and hotel accommodations, and the fact that the committee on nominations was unable to decide upon a meeting place for 1903 indicates that the entertainment of the association imposes burdens that the street railway companies of few cities care to assume. A change that has been suggested is to hold the annual convention always in the same place, or perhaps alternate between such large cities as New York, Chicago, St. Louis and Philadelphia, where exhibit halls of the requisite size are to be found, together with sufficient hotel accommodations. Such an arrangement would probably result in greatly changing the present plan for entertaining delegates, and might seriously affect the interest which delegates now take in the annual meetings because of the opportunity afforded to investigate an important railway system.

Some prominent members of the retiring executive committee are in favor of entirely changing the scope of the A. S. R. A., and making it an association for operating railway men; on the other hand it is urged that the time has not yet come for such a complete differentiation. The tendency, however, we believe to be in the direction of relinquishing portions of the older association's field to a number of other bodies which will be able to specialize to an extent now impracticable with the A. S. R. A. How well this plan has worked with regard to accounting we all know. Accounting was not entirely overlooked by the A. S. R. A., and in 1884 and in 1894 the question of a standard system of street railway accounting was reported upon, yet it is very probable that the A. S. R. A. would never have developed the "standards" that have been so well worked out by the Accountants' Association. The latter body has devoted the same amount of time to the comparatively limited subject of accounting that the parent association gave to the entire field of electric railways, and naturally the accountants covered the ground more thoroughly. If the American Street Railway Association keeps abreast of the industry it represents it will have to decide between assigning the subjects involving consideration of details and extended debate to special committees to which is delegated power to act, or to allied associations with comparatively restricted fields. The new association of shop and motive power men will give another opportunity to test the results of the latter policy.

It appears certain that in the near future the alternating current will play an important part in long distance and heavy railroading and our readers will be interested in the paper of Mr. Lamme, read before the last meeting of the American Institute of Electrical Engineers and printed in this issue, in which he describes a new

efficiency which is to be made to adapt single phase alternating current to this class of work. We are glad to welcome an advance in this important field of electric railroad work and there can be but little doubt as to its successful outcome in view of the competent hands in which the project rests, but we regret that Mr. Lamme's paper is incomplete in that it avoids all allusions to the details of the proposed equipment. It may be said that the general arrangement of the apparatus to be used is by no means new, as several attempts along the same lines have been made in years past.

The motor which Mr. Lamme proposes to use is simply a direct-current series motor adapted to alternating current by laminating the fields. This plan has been repeatedly tried as far back as ten years ago and the objection to such a motor, which has been found almost insuperable, is the vicious inductive sparking at the brushes, and this has heretofore proved such a difficulty as to entirely prohibit its use. As no special means were described for eliminating this sparking it may be assumed that this has been accomplished by the improvement in the design of the motor, and if such is the case it certainly reflects credit upon the designer. The paper, in fact, gives no indication that any new features are to be introduced. The method of control is by means of the so-called induction regulator, by which the pressure is varied according to the load and this method, as claimed by the author, avoids the troubles inherent to the direct-current controller. While this is true from a mechanical standpoint, it is hardly to be expected that this method of control will equal in efficiency the series-parallel method employed in direct-current railway equipments, especially in starting a car, when the work done is small. The series-parallel method of control and the very high initial torque of the direct-current series motor are its most important features and are the ones which have placed it in its pre-eminent position in the railway field today; the new system, however, being designed especially for long distance, high speed and heavy work, where stops are infrequent, can afford to sacrifice efficiency at starting in view of the great advantage it possesses in being able to utilize very high voltage distribution. The latter qualification being essential to long distance railroad work, any minor deficiencies will be readily condoned in a practical alternating-current system of an efficiency approximating the system in general use.

The development of alternating-current railway systems is now apparently at hand, as within the last two years the problem has been attacked both here and abroad by engineers of the highest standing. The Valtellina polyphase alternating-current railway in Italy has recently been opened to the public; the single-phase system invented by Mr. B. J. Arnold and described by him at the Great Barrington meeting of the A. I. E. E. in June last, is being installed on the Lansing, St. John & St. Louis Ry. in Michigan, which is nearly completed, and the system of Mr. H. Ward Leonard is being exploited by the Derlikon works.

Doubtless the great majority of street railway men do not fully realize what has been accomplished by the Street Railway Accountants' Association during the 5½ years since it was organized. One of the first committees appointed was on a "Standard System of Street Railway Accounting" covering the classification of construction, equipment and operating expense accounts and the forms of monthly and annual reports. The "Standard Classification" formulated by this committee has stood the test of actual practice for several years without the need of substantial amendment. Moreover, this has received the approval of the National Convention of Railroad Commissioners, and the form has been adopted by the railroad commissioners of New York and Connecticut.

In 1899 the subject of a standard unit for comparison was discussed and from this resulted, after a practical trial, the adoption of the "motor car-hour," a unit which has proved to be most convenient and useful.

For several years the association has had a standing committee on "Standard Classification of Construction and Operating Expenses," in 1899 a committee on "Standard Unit of Comparison" was added, and in 1900 a third committee on "Standard Blanks and Accounting for Materials and Supplies;" last year a committee charged with the important task of formulating a "Report for Electric Railways" was appointed.

At the Detroit meeting the two committees last mentioned filed reports which included sample forms and blanks; in connection with the discussion of these two reports, both of which were adopted, the fact was brought out that there was close harmony between the

association and the United States Census Bureau in regard to the plan to be followed in tabulating the street railway statistics for the census. Mr. T. C. Martin, who is the government's expert statistician on electrical industries, stated that the Census Bureau had adopted the system of the Accountants' Association practically en bloc, which action he believed would materially strengthen the position of the association; and also increase the value of the statistics to an extent that would only be fully appreciated when the work was completed.

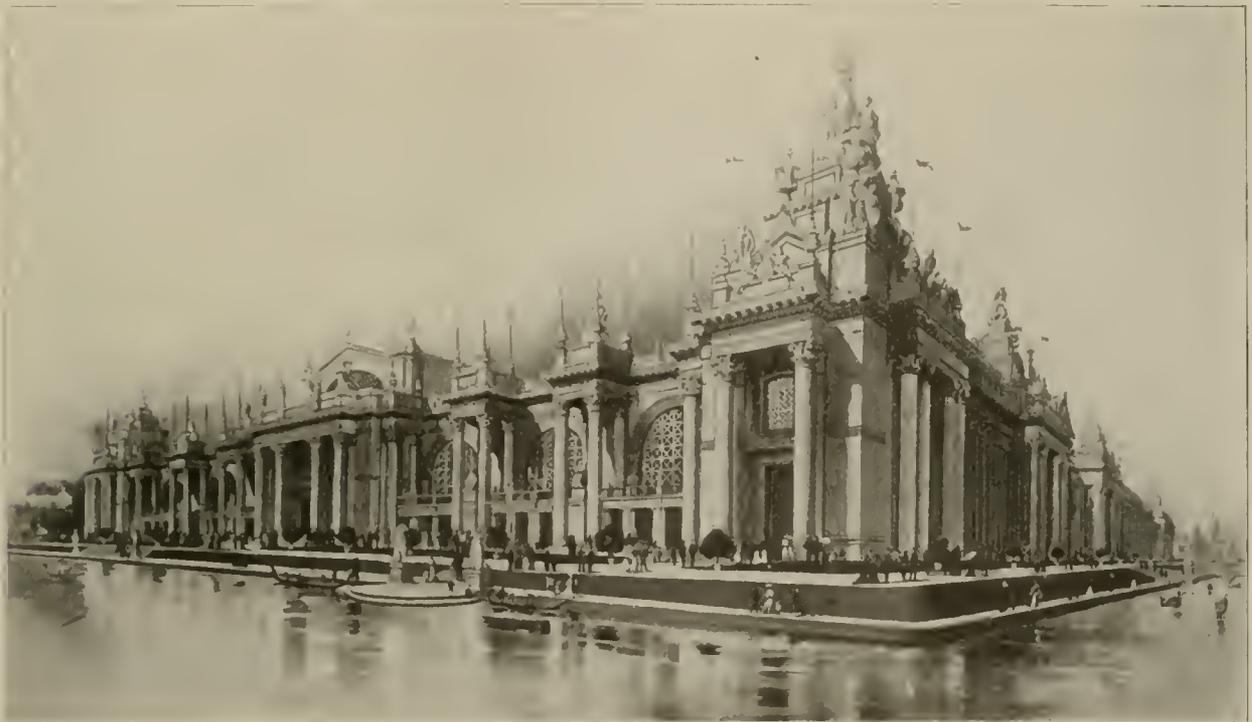
These several standard forms and reports which have been developed, the cordial relations with the association of Railroad Commissions which this association has been largely instrumental in establishing, the value of the "Department Blanks and Forms" to which Secretary Brockway has given much attention, and the opportunity which the association affords for discussion of mooted questions in accounting will all be more and more appreciated as time goes on. The Accountants' Association was organized just when the present era of electric railway consolidation was beginning and has been a large factor in developing accounting along the right channels, its future is at this time brighter than ever before.

ELECTRIC RAILWAYS AND THE ST. LOUIS EXPOSITION.

BY W. E. GOLDSBOROUGH.

The St. Louis Exposition of 1904 will afford an excellent example in detail of the operation of the business laws that illustrate the advantages which times of prosperity afford for the extension of business.

This seems a significant and extraordinary statement, and must imply an extensive general plan for the Exposition. All of this is true. A mistaken idea exists in the public mind of the scope and importance of the St. Louis Exposition. It does not seem to be understood that the Universal Exposition of St. Louis in 1904 is to be the most important and extensive universal and international exposition ever held. Too much attention can not, however, be directed to the words "international" and "universal", as they really describe the nature and scope of the St. Louis Exposition. It is not to be a local, or territorial, or even a national exposition. It is to be a World's Exposition in the fullest sense. It will almost double in



ELECTRICITY BUILDING FOR THE LOUISIANA PURCHASE EXPOSITION.

A CORRECTION.

Mr. W. Worth Bean, president of the Benton Harbor & St. Joseph Electric Railway & Light Co., of St. Joseph, Mich., has written us repudiating the profanity attributed to him in the course of the somewhat humorous discussion between himself and Colonel Heft on the subject of "Turbines," and reported in the "Daily Street Railway Review" for Oct. 11, 1902, at page 718.



Concerning the installation of electric power on the District Ry. in London, Mr. Charles T. Yerkes is quoted as stating that the work will be completed within 18 months, if the promoters are accorded the treatment which they consider just. Mr. Yerkes, in the interview, anticipated ruinous competition if the project of the Morgan interests for a practically parallel system shall be consummated.

It is stated that a bill is being prepared to be presented at the next session of the Pennsylvania Legislature, giving electric railways the right to carry freight and express matter and other privileges similar to those held by steam roads. The bill also provides for the granting of the right of eminent domain to street railways and, it is said, will contain a clause providing for the consolidation of all the electric railways in southeastern Pennsylvania.

size the Chicago Exposition; it is to cost nearly twice as much money; will be, in fact, approximately a \$50,000,000 exposition; will cover twice the amount of space and will offer almost twice the amount of exhibit area to exhibitors and the public. Its installation and entertainment places will be the most imposing ever raised. The architects of the exposition have the precedence of the experience and ideas of the past expositions, including the recent exposition at Paris, and the Chicago Exposition, with almost unlimited funds, and it will certainly be surprising if a result is not attained surpassing public expectation.

When, in connection with this great exposition, the problems connected in urban and inter-urban transportation are studied, some very interesting facts are brought out. Modern methods of transportation, which have revolutionized the entire world, had their inception after the event which is to be celebrated by the Louisiana Purchase Exposition. The vast territory purchased from France in 1803 is now the heart of the republic. That it has become so rich and powerful a seat of empire in one century is due to the railway and the steamship and their congeners. In 1803 the means of transportation in the Louisiana territory were of the crudest kind, principally the flat boat and the pack-horse, and today the same territory has 65,000 miles of railway, its rivers are traversed by great fleets, and the telegraph, telephone and trolley wires are weaving a close network over its entire surface. The unceasing purpose of

progress has had no better exemplification, and hardly a more fitting one can be imagined in the presentation of the vast progress that has been made within the past decade in the development of the electric railway than in the city of St. Louis, the gateway to the great West, which is destined to reap a rich harvest from the expensive and pain-taking care that the great East has bestowed upon the all important problem of urban and interurban electric transportation.

It has been truly and pertinently said by the president of our American Street Railway Association, that the membership of that association has in its keeping more of the happiness and comfort of the people of the United States than has any other set of vested interest. The electric railway responds to the needs of every element that goes to make up our population. The millionaire, the tourist, the business man, the philanthropist, the laborer and the

class railroad depot which prevails on the European continent. These two essential elements are apparent throughout the structure.

The Electricity Building of the St. Louis Exposition is the largest ever provided by an exposition, or otherwise, for electrical exhibits and displays. It covers virtually 300,000 sq. ft. of ground space as against 250,000 covered by the Electricity Building at the Columbian Exposition at Chicago in 1893 and 75,000 by the Electricity Building at the Pan American in 1901. It is of most graceful design and proportions, forming an elaborate polygon, each of its five sides presenting a succession of splendid columns after the richest Corinthian order, and four sides being surrounded by a balcony of rare grace and beauty. It encloses an open, central court bounded by rich colonnades, which will be banked with masses of flowers, and make a pleasing retreat for visitors to the building. Its location within the exposition grounds is most favorable. It rises right

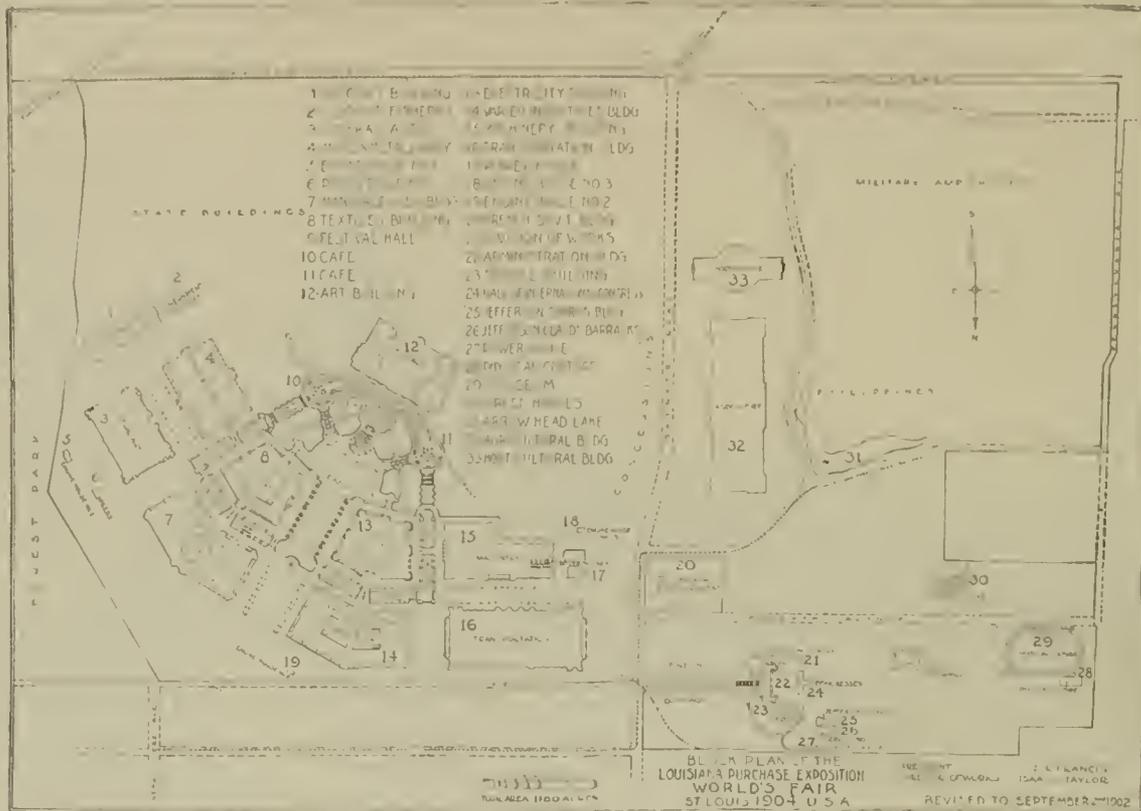


DIAGRAM OF LOUISIANA PURCHASE EXPOSITION GROUNDS.

The buildings under construction are the Textiles Building, the Electricity Building, and the varied Industries Building. The building for which contracts have been let are the Fine Arts Building, Mines and Metallurgy Building, Government Building, Government Fisheries Building, Liberal Arts Building, Manufacturers' Building, Transportation Building, Horticultural Building and Agricultural Building.

very poor meet on a common level when they come within the influence of the union between transportation and electricity.

The Transportation and Electrical Buildings.

At the Louisiana Purchase Exposition the electric transportation problem is given a most prominent place. It will have a broad presentation in two of the finest and most centrally located buildings of the exposition grounds. The Electricity Building has a place right in the heart of the main exposition picture. It is a structure, the architecture of which bears a significant relation to the uses for which the building is intended. It presents many pleasing and salient features, suggests a free use of imagination by the architect, and is adapted to a most brilliant and effective illumination. It possesses just the characteristics that "electricity" presents to the mind; the old, in fact, the very old, wrought into a new, a very new and pleasing picture.

The architecture of the Transportation Building is none the less well adapted to represent, with true feeling, the stability, safety and certainty that abide with the great transportation institutions of America. The building has gained strength at the hands of the architect by the dependence that has been placed on mass effects and the grouping of masses. The best elements of architecture have been used to produce an imposing result. The building combines that feeling of the magnificent exposition building and of the high-

at the foot of the grand terrace and cascades, and thus constitutes a prominent feature of the arrangement of the rich section which is called the main picture of the exposition. This broad thoroughfare leads up from the main entrance to the grand basin and cascades, and is penetrated by the central lagoon. The southern exposure, facing the grand basin and the cascades, is in direct view of the electric fountains, the peristyle of the Festival Hall and the Fine Arts Palace. On the west and north, the building is bordered by principal avenues of the exposition, and additional extended arms of the lagoon. It is, therefore, completely surrounded by water. It is led up to by splendid art bridges, which will discharge the crowds into the broad avenues directly surrounding the building. Four main entrances are provided; one imposing portal at the meeting of the two north facades, one at the center of each of the other sides. Graceful and ample entrances are also provided at the corners of the building. The doors are of gigantic dimensions, 11 x 18 ft. The north facades of the building measure 600 ft., which makes its greater dimensions 525 x 600 ft. One hundred and seventy-six trusses and 185 tons of steel have been used in its construction. Each of the 300,000 ft. of floor space is directly available. It is all advantageously situated, being compact, symmetrical, well lighted, well distributed with regard to aisles and entrances and well provided with all conveniences. Most of all, it is all ground floor

space, there being not a foot of gallery space in the building, a feature that will be welcome and appreciated by exhibitors and the public alike.

At the present time, the construction of this building is well under way. The installation of the big roof trusses has been begun and other work carried to a considerable stage of completion. The staff work of the Court of Electricity Building is practically completed, and has become one of the show places of the exposition.

The Transportation Building is placed on the extreme northwest corner of the main picture of the fair. It is the most expensive structure yet designed for the Louisiana Purchase Exposition. When all the exposition buildings are up, it will be exceeded in size only by the palatial Agricultural Building. The Transportation Building covers an area of 525 x 1,300 ft. (over fifteen acres). The facades show a most pleasing adaptation of the French renaissance. On the east and west fronts are three magnificent arches, which embrace more than one-half of the entire facade. Each of these arch openings will be 64 ft. wide and 52 ft. high. Through these archways fourteen parallel railroad tracks will be laid from one end of the building to the other. At the sides of these three openings the projecting angles are accentuated by pylon effects, which reach to a height of 150 ft. to the base of the crowning statue.

has made very elaborate plans for the exploitation of all the mechanical details of the electric railway problem on very broad lines. In his spacious building all matters pertaining to maintenance of way, grading, ballast, bridges, etc., switches and crossings, transfer tables, turn tables, signal systems and apparatus for securing the safety of traffic, track cleaning, protection against snow, general track repairs, etc., rolling stock, trucks, car bodies, passenger coaches, express cars, freight cars, snow plows, dynamometers, etc., traffic maintenance, time tables, distribution of rolling stock, cleaning and disinfection, passenger department matters, freight department matters and tariffs, methods and equipments for checking fares, and methods and equipment for handling baggage and freight, etc., will find place and be adequately presented. No small section of the Transportation Building will be given over to the exploitation of all the various mechanical details which characterize the operation of urban and interurban electric railways.

The other side of the electric street railway picture will be shown in the Electricity Building. All matters relating to the generation and distribution of electricity and to the control of cars and trains by electrical methods, come in the electrical department. Accordingly, dynamos producing direct, simple, alternating and multiphase currents; transformers, motor generators, boosters, rotaries, storage batteries, conduits, cables, wires, switches, switch-



TRANSPORTATION BUILDING FOR LOUISIANA PURCHASE EXPOSITION.

These pylons are not so much accentuated as to be obtrusive or out of harmony with the structure. On the north and south fronts the architect has deemed it well to repeat the three massive archways, which form the center feature of the smaller fronts. This treatment pleasantly breaks the unwieldy facade of 1,300 ft. On the north and south fronts, the pylon feature is omitted, but massive piers are repeated at intervals and lend dignity to the design. Flanking these opening on the long fronts are great rows of magnificent windows as wide as the archways. Not only will visitors be admitted through the twelve huge portals described above, but subsidiary entrances are supplied at frequent intervals in the remaining stretch of walls. The roof treatment of the building is peculiarly happy. Over each of the big archways is a lofty curve which supplies a background for the architectural features.

The Transportation Building will contain about four miles of standard gage railroad track. Even with this immense trackage, two entire bents of the building are left free of rails and afford an exhibit space of 270,000 sq. ft.

The Electric Railway Exhibits.

When we come to the point of taking up the detailed consideration of the allotment to be made, we find that the official classification of the exposition provides for a division along mechanical and electrical lines that makes it possible for both the Transportation and Electricity Department to build up large, dignified and interesting displays, and at the same time present in each of these exhibit divisions, thoroughly complete, logical and systematic arrangement.

Mr Willard Smith, chief of transportation of the Louisiana Purchase Exposition, and who brought the transportation exhibits of the Columbian Exposition to such a high degree of perfection,

boards, lightning arresters, circuit breakers, overhead and underground trolley equipments and appliances, electric line construction material, various forms of series, parallel and multiple controlling devices, electric railway motors and complete electric locomotives, electric train signaling apparatus, the electric signaling of trainmen and various electric systems for assuring the safety of traffic, will be brought together in one building, so that every detail which has to do with the electrical side of the installation, maintenance and operation of an electric railway system can be studied together as inseparable elements of one problem.

Therefore, managers, superintendents and engineers of electric railway enterprises desiring to study those things which pertain to the building of tracks, ballasting, the construction of lines, of car bodies, of mechanical or pneumatic signaling devices, and other matters that pertain directly to the mechanical side of this great problem, will go to the Transportation Building; whereas, when they desire to study the same problem from the generation of electricity through the transmission system, the transforming devices, the substations and the storage battery out over the line through the motors and the car axles, they will go to the Electricity Building, and there find, it is hoped and expected, enough material possessing new and interesting features to hold their attention for a considerable length of time.

It will be a source of gratification to railway men in general to learn that the great car shops and factories of the country supplying the electric railway interests, have taken up the matter of exhibiting at the St. Louis fair with enthusiasm. It is, therefore, not too much to say that a great deal will be forthcoming which will be in the nature of a surprise, and point to the fact that the intent and purpose of the directorate of the exposition has been brought to a successful conclusion. In making these exhibits carry with

them the force and interest which every one connected with the street railway industry desire, they should have more is needed than a mere co-operative interest on the part of those who will be part and parcel with the undertaking. The intention to make a good exhibit will not suffice, the intention to build up exhibits along the line that have been common to previous expositions will fall short of the realization of what must be accomplished to secure for the street railway exhibits that national and international renown which will make them rightly valuable in exploiting this phase of transportation, and in stimulating still greater and more rapid development in this department of our electrical activity. It should be the aim of all street railway men to give a real support to these departments of the exposition, to help, in what measure it may be possible for them to help, in the building up of the historical exhibits; to put thought and effort into the scheming and devising of features for exhibits which will represent the present state of the art, which will make these exhibits no mere wax pictures of what we are doing and what is being done, but pictures full of life and suggestion. To go beyond the measure of success that has attended previous expositions, we must introduce life into as many elements of the work as possible. The still exhibit is, in a large measure, a matter of the past; the present day demands more in view of the liberal education the general public has had in matters relating to expositions. It is for this reason that the exposition places at the hands of exhibitors every facility for carrying out the ideas outlined above. Space in the exhibit buildings is to be free and power will be free in such measure as is necessary to introduce the life element into the exhibits. What has been said must be taken, not as a suggestion, not as an idea thrown out to attract attention, but as a serious matter, and one which will be carried into effect.

That it is the purpose of the exposition to do these things and to have those exhibits which are treated in this article developed in a way to demand attention, is evidenced by the fact that the Louisiana Purchase Exposition has gone many steps further than has any other international exposition in affording opportunities for the proper and adequate exploitation of the street railway traction equipments. The chief of transportation and myself have, for some months, given much thought and attention to the matter of providing a tract on which to make experimental demonstrations of the relative merits of various traction devices. It is my pleasure at this time to be able to announce, and I am certain the announcement will give the exposition an added interest to all railway men, that a tract 1,300 ft. in length and 25 ft. in width has been set apart for the uses of the Transportation and Electricity Departments. This tract is situated just north of the Transportation Building, and on it double tracks can be laid for an outdoor exhibit of electrical and mechanical transportation appliances. Upon this right of way it is hoped a great deal of work will be done during the period of the exposition that will have more than a momentary value. Whether the traction equipments presented for experimental exploitation be driven pneumatically, or by steam, gas or electric power, they will all be fully exploited. It is the intention to organize these tests on very broad lines. When looked at from the electrical standpoint I think you will all agree with me that by the time the fair opens, there will be developed a large number of systems using alternating currents as the propelling power as well as the systems we now have using direct currents, and I cannot imagine a picture which will present greater interest to electrical railway men than that of seeing these various systems all exploited on the same ground and at the same time by the engineers of the various companies exhibiting there. It would not be fair for the electric street railway interests to feel that the Louisiana Purchase Exposition has not in mind to use every effort to give them every opportunity to do justice to this department of our national development, on which the eyes of the world are bent.

Observation cars are now operated over the lines of the Seattle Electric Co. for the accommodation of tourists and sight-seers. The service is well patronized and is resulting satisfactorily.

The Brooklyn Rapid Transit Co. is considering purchasing Christ Church in Bay Ridge, in order that the obstacle to the inauguration of a through service between Bay Ridge and Fort Hamilton may be removed.

STRIKE CONTINUES ON HUDSON VALLEY LINES.

The strike which was inaugurated over the entire system of the Hudson Valley Railway Co., extending to Warrenburg, Saratoga, Ballston, Troy and Schuylerville, N. Y., August 30th, is as yet unsettled. As was stated in the "Review" for September, the company had partially resumed operations on the Glens Falls division September 18th, the cars being protected by a military guard, which, however, did not prevent the strikers from stoning cars and otherwise jeopardizing the service. Riotous demonstrations have since been frequent along the lines through Saratoga, Washington and Warren Counties, and squads of soldiers, on September 26th, were stationed to guard the lines in Saratoga, and those running between Stillwater and Waterford. A mass-meeting of the strikers was called at Glens Falls on October 4th, and a mob numbering 3,000 collected in the streets, taking possession of the business district of the town. An attack was made on passing electric cars, and four of these were captured, the motormen and conductors being dragged from the cars and severely beaten. Soon after Company K of the National Guard arrived on the scene and cleared the company's right of way. Under a heavy guard the stalled cars were run to the power house, the crowd following and pelting the cars and the soldiers with stones. Near the power house hostilities were again renewed by the mob, and the soldiers responded with a volley of bullets fired into the air. The Second Regiment, Col. Lloyd commanding, was installed at Glens Falls on the night of October 7th, and the town was practically placed under martial law. With this protection cars were operated without further disturbance.

Though Glens Falls has been made the scene of the greatest activities on the part of the strikers, the other divisions of the system have experienced riots of a similar character. At Waterford, on September 21st, a serious outbreak was quelled by the local militia, bayonets being used to disperse the mob. In one hand-to-hand encounter a captain of one company of the National Guard cut a deep gash in the forehead of one of the strikers with his sword. Riots have been of frequent occurrence at Ballston and a large number of arrests have been made. Recent reports from Troy state that the Hudson Valley company contemplates operating its cars in that city over the lines of the United Traction Co., if arrangements can be effected for the lease of such privileges. In that event members of Company D, Second Regiment, will be detailed to guard the cars in Troy.

A number of serious riots are reported from Geneva, Switzerland, in consequence of the strike on all the tramway lines in the city. On October 4th 28 cars were wrecked, and the police had much difficulty in restoring and preserving order.

NEW COMPANY AT JACKSONVILLE, FLA.

The North Jacksonville Street Railway, Town & Improvement Co., of Jacksonville, Fla., secured a charter in March, 1902, and has just perfected its organization for the purpose of constructing an eight-mile suburban electric line. The company controls 320 acres of land at the terminus of the proposed street railway, and projects erecting several buildings and improving the location as a popular resort. The company has sold stock to the amount of \$20,000, and intends to place \$250,000 more stock and \$75,000 6 per cent bonds. The officers are: R. R. Robinson, president; George E. Ross, secretary, and H. Mason, treasurer.

The Philadelphia Rapid Transit Co. has closed a contract for 40,000 tons of washery coal for steam purposes and with the supply on hand will be prepared to maintain its service under any conditions that may arise in the coal market.

The Boston Elevated Railway Co. has completed the work of equipping 20 of its cars with vestibules in addition to the cars on the Neponset lines which were fitted with vestibules last winter. One hundred more will be equipped with vestibules so soon as the necessary brass fittings can be secured. A smaller percentage of accidents occurred on the Neponset lines last winter than on the lines where cars were operated without vestibules, and the experiment is, therefore, pronounced in every way satisfactory. A tie up on the Boston elevated lines from Malden to Everett occurred October 2d, owing to the snapping of a cable in the draw of the new Malsin bridge, and nearly 100 cars were delayed for an hour.

From the Lake Region to the Atlantic Sea Board by Trolley.*

R. H. DERRAIL, BOSTON, MASS.

The writer has been deeply interested in the development of suburban and interurban electric lines in New England since they first began to extend from the city proper to some suburban towns with large populations; this work of extension continued until at present you cannot find a town in Massachusetts with a population of more than 1,500 but has a street railway in actual operation or projected. So rapid has been the growth of the trolley throughout the New England and Middle states that within five years' time one will be able to travel from Augusta, Me., to Chicago, Ill., and even much farther west, as well as through the heart of Michigan, thus connecting the great lake region with the Atlantic coast by a



R. H. DERRAIL.

grand electric trunk line, which, with its tributaries, running in all directions, will form a network of some 7,000 miles. The connecting of the suburban towns with large centers throughout historic eastern New England has been the means of creating a large volume of pleasure travel, and it is increasing as years roll on. The mere bringing before the public the fact that with the exception of a few missing links it was possible to go from 75 miles east and south of Boston to New York city on the electric car has made the trunk line between the two large commercial centers very popular as it offers a diversity of scenery

class of travel, I decided to make a trip over the route to be later traversed by the "Broomstick Train" from west to east, together with its important feeders.

Before starting I had the impression that New England had the most complete system of electric lines, with the most modern and up-to-date equipment, the operation of which could not be improved upon. While I do not want to throw cold water on our great eastern system, I must admit that I was greatly surprised with the progressiveness of the western street railway companies, for while they have not the network like New England, their cars are more modernly fitted up with everything for the comfort and convenience of the traveling public. In most cities the interurban roads depend, the same as the eastern ones, on the revenue received from pleasure travel, which many of them will admit exceeds 50 per cent of the gross receipts, but their method of increasing this class of business is entirely different from the eastern roads.

In 1899 I had the pleasure of addressing the Massachusetts Street Railway Association, using as my subject, "Is Advertising as Profitable to Street Railways as to Steam Railroads." Among my remarks were the following: "There is no street railway man in Massachusetts qualified to give the public the information it desires in reference to the network of electric lines, and it, therefore, seems to me that one of the best paying investments for the street railways is to have them all combine and pay their proportionate share towards maintaining an office in Boston for giving the public this information. I am sure that if a sufficient amount of money were appropriated to publish in the different papers the fact that an office of this kind had been established for the benefit of the general public, it would be a popular office and a great benefit to the mass of people asking for such information. If such an office



VIEW ALONG THE LINE FROM LITTLE FALLS TO SYRACUSE, N. Y.

which appeal to the average tourist. [See Mr. Derrail's article in the "Street Railway Review," June 15, 1899, page 377.—Ed.]

Having made a special study of the trolley excursion business of the eastern states, and being satisfied from personal investigation that the grand trunk line would be completed in a very few years, and with a desire to learn something of what the western interurban lines offered as an inducement to pleasure travel and what the different companies were doing toward catering to that

was opened with photographs of historical places, seashore resorts, inland scenery, etc., it would add greatly to pleasure riding."

It certainly is a pleasure to me to see that the system I had suggested for Boston three years ago is now being operated in all the principal cities and towns through which I have traveled.

Many of the western roads run through a rural country which is sparsely settled, but their passenger revenue is large. There are several reasons for this: Substantial roadbeds built mostly upon private property are thus free from dust, the running of what might be called through palace cars, having smoking compartments, toilet, ice water, etc., the selling of through tickets to any point desired, and the maintenance of information bureaus and ticket offices.

*Technical description of the roads mentioned in Mr. Derrail's article will be found in the "Review" as follows: Detroit System, Sept. 29, 1902, p. 507; Toledo & Monroe Ry., July 1, 1901, p. 403; Toledo, Fremont & Norwalk Electric Railway Co., Oct. 1, 1901, p. 509; Cleveland & Eastern Railroad Co., March 1, 1901, p. 142; Albany & Hudson Railway & Power Co., Jan. 17, 1901, p. 26; Hudson Valley Railway Co., Apr. 15, 1902, p. 193.

Now let me confine myself to the trip which will take me eastward some 1,500 miles, and the branch lines with their several hundreds of miles, for when this system is connected the steam railroads will not only feel the loss to their passenger and freight business, but the trolley roads will then be in a position to compete with them in inducing pleasure travel, for one can see more of the country, with its historic places, picturesque scenery and points of varied interest by trolley than by steam.

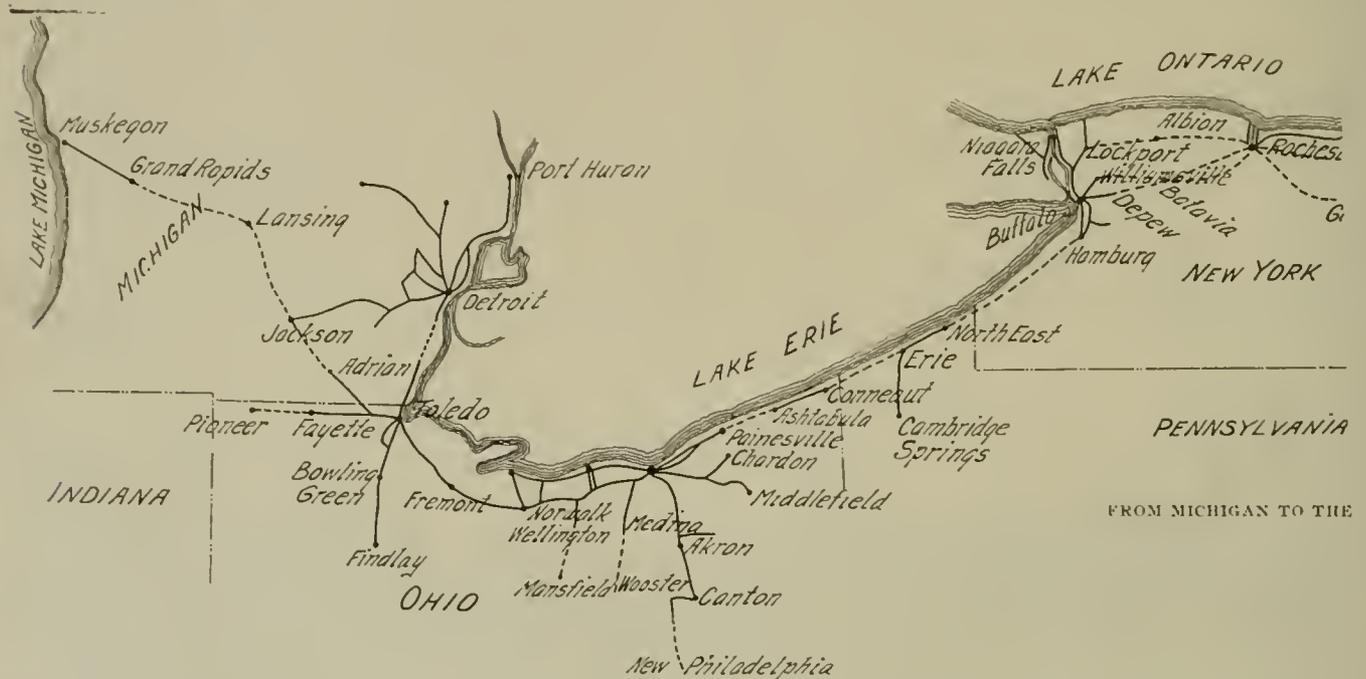
To begin my journey I started at Port Huron, located 73 miles north of the city of Detroit on the St. Clair River. I set out with a determination not to miss anything of interest, therefore a trip around the world was in order. Taking an electric car marked "tunnel" I was soon transferred to a car of the Grand Trunk railroad and in a few minutes disappeared in a great hole in the ground, the largest submarine tunnel in the world, under the St. Clair River; after a distance of some 3 miles I was landed in Sarnia, on the Canadian side of the river. A short ride in a horse car to the ferry and then back to Port Huron by boat, and I had visited two countries, been under the water, over the water, employing electric, railway locomotive, horse and marine engine power, all for the sum of 25 cents.

Port Huron is a beautiful city and noted for its deep spring baths. Here I boarded one of the handsome palace cars of the Detroit Rapid Railway system for a ride along a high elevation affording a grand view of the river and its pleasure boats and steamers which ply on the delightful St. Clair. Still following the river you are taken through the charming little summer resorts of Marysville, St. Clair, Marine City and Algonac, with their camps

with their loads of iron, copper or grain, which is in itself a sight well worth going miles to see.

In order to see Detroit, and see it properly, one should not miss a trip in the handsome excursion car "Yolande," which makes regular trips through the principal business and residential sections of the city accompanied by a competent guide; another year a similar car will be placed in service on the Cleveland lines. The cost of this trip is 25 cents and the time consumed is two hours.

As the object of my trip was not to study up the street railway lines operated in the congested sections of a city, I made good connections on my return from "seeing Detroit" with a car for Jackson, located due west from Detroit just 73 miles. The ride is through a beautiful inland country with many small, thriving towns, villages and hamlets, which served as the trading centers for the farmers before the trolley afforded them an opportunity to market their products in the large city. Although many of the towns were isolated their beautiful streets, fine, comfortable homes with spacious lawns shaded by the foliage of massive trees show clearly to the tourist that the people are contented and happy. Leaving Wayne and the large brick buildings of Wayne County Home, the car enters Ypsilanti, an attractive inland town located on the picturesque Huron River. Passing through the fine shaded street of the town, with its lawns and flower gardens, the high-speed car soon reaches Ann Arbor, the seat of the University of Michigan, located on a high elevation and affording a fine view of the surrounding country. From Ann Arbor the pretty little farming villages of Lima, Chelsea and Francisco are passed before coming to



and summer resorts. The people all along the line seemed to be enjoying themselves, for the car is continually passing croquet grounds, tennis courts, and golf links. Fishing and boating provide ample outdoor amusement for the many summer tourists visiting these resorts each year. At Algonac one has a fine view of Anchor Bay and its many islands locally called the "Flats," the "Venice of America." Turning to the right, the car follows the bay, passing through the villages of Fairhaven, Anchorville and New Baltimore, all summer resorts. From this point one leaves the cool, refreshing breeze from Lake Erie to enter the inland country where the famous "Bath City," Mt. Clements, is located on the banks of the Chauton River. It is indeed a beautiful city, with modern up-to-date hotels at every turn. From this point one has a choice of two routes to Detroit, one through a beautiful country of bewitching scenery, fertile fields, laden orchards, berry and vegetable gardens on all sides, while the other line affords an opportunity to follow the shore of Lake Erie practically the entire distance and view the sails of the fisherman and pleasure crafts as they skim from shore to shore, steam yachts, huge vessels of commerce

Grass Lake, a favorite summer resort located on a small lake after which the town is named.

Eleven miles farther is the terminus of the line, Jackson, the abiding place of some 300 commercial travelers. It is a hustling city and credits itself with a large number of extensive manufactories. A line is now projected from here through Lansing to Grand Rapids, where it will connect with the existing one running to Muskegon. When this missing link is completed it is the intention of the promoters to run through cars from Detroit to the latter city, a distance of some 200 miles. These will have a dining room; sleepers will also be run.

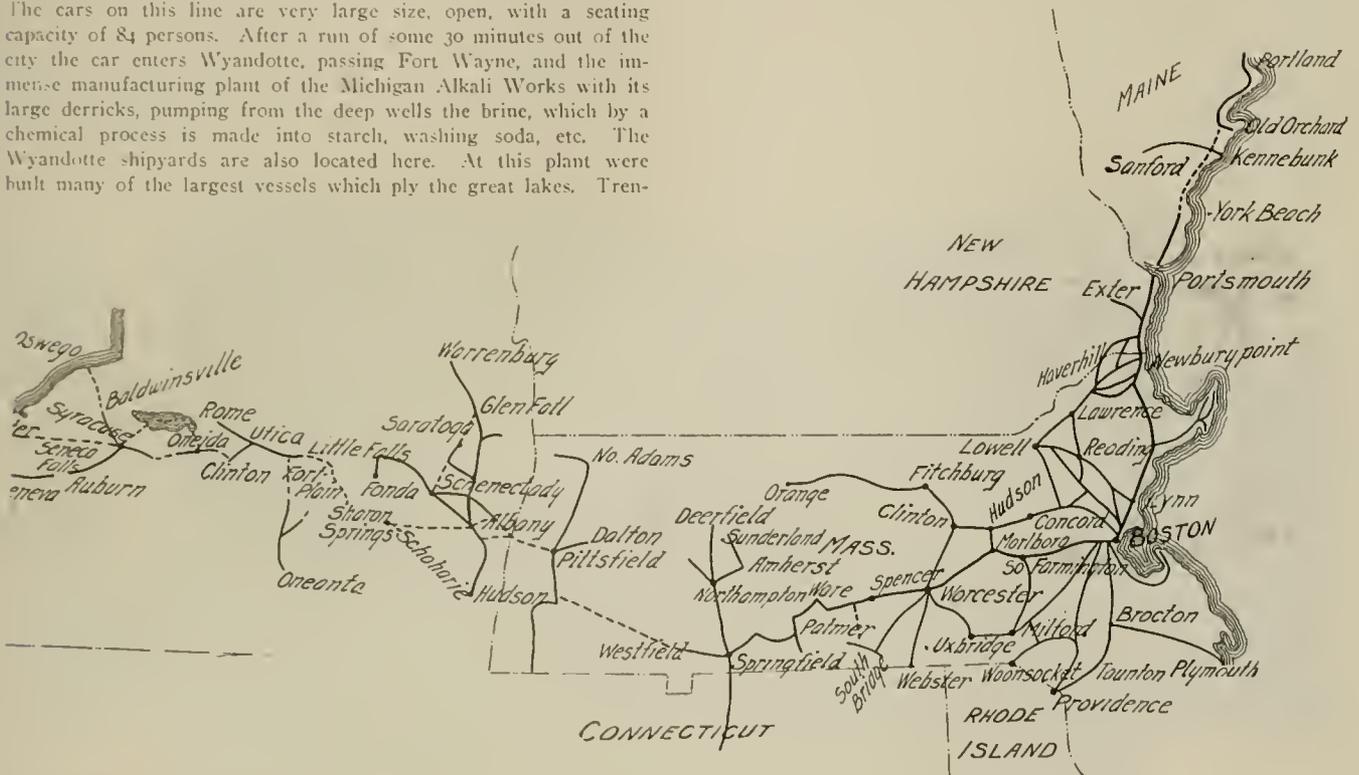
The line running to Flint is the longest line out from Detroit, the distance being 76 miles. The line, running practically due northwest from Detroit, is through a rural farming country similar to that along the Jackson road except each has its own individual features and advantages to offer the tourist. A short run out of the business section brings the car to Royal Oak, where a line diverges to the left, affording one an opportunity of returning to the city via Pontiac, Farmington or Wayne. This is a beautiful

trip through the great chain of lakes for which Oakland county is noted, having some 400 in all, beautifully shaded by fine groves, fertile fields and garden plots, with summer cottages and picnic grounds. Continuing on the Flint line a fine level country is traversed, large sugar beet plantations are seen on every hand, while the oat and wheat industry is not forgotten. At Rochester a branch line to the right leads to Romeo, a suburban town composed chiefly of retired farmers. As the car approaches Rochester it attains a very high elevation, the scene from which is a beautiful one. Down in the valley below lies Rochester nestled among the foliage. From Rochester one enters a rolling country under high cultivation. Flint is noted for its carriage industry. The principal street of the city is lighted by permanent arches extending from one trolley pole to another, attached to which are hundreds of incandescent lights, giving one a splendid impression of the city.

Leaving Detroit on my eastward trip, I boarded a car for Trenton, which followed the banks of the river for most of the way. The cars on this line are very large size, open, with a seating capacity of 84 persons. After a run of some 30 minutes out of the city the car enters Wyandotte, passing Fort Wayne, and the immense manufacturing plant of the Michigan Alkali Works with its large derricks, pumping from the deep wells the brine, which by a chemical process is made into starch, washing soda, etc. The Wyandotte shipyards are also located here. At this plant were built many of the largest vessels which ply the great lakes. Tren-

lasted with broken limestone. The cars are of the usual type used on most of the roads, seating 68 persons, with smoking compartments, toilet, etc. The line follows closely the old Toledo and Detroit turnpike and the route is through a picturesque country with fertile farms. Although this road parallels the tracks of the Michigan Central and the Lake Shore, its speed of 30 miles an hour and sometimes 55 miles, with hourly service, has created a large through passenger service.

Reaching Toledo, I found many interurban lines radiating in all directions, each of which runs through a section of country having its own individual bits of picturesque scenery and points of interest to offer the pleasure seeker. The lines of the Toledo, Bowling Green & Southern Traction Co. follow along the historic Maumee Valley and through the oil region of Bowling Green to Findlay. This line will be continued southward to Cincinnati within a short time, the only missing links to be connected are between Findlay



ATLANTIC COAST BY TROLLEY.

ton, the present terminus of the line, is a pretty little village located on the river bank. It is the summer home of many Detroit citizens.

Here I was obliged to take the train to Monroe, a distance of 18 miles, the fare being 38 cents. There are only five trains daily, three on the Michigan Central and two on the Lake Shore. Less than a year ago the prospects were good for the operation of a trolley line connecting these two places; the track and overhead construction were in readiness for the power and rolling stock when trouble overtook the Everett-Moore syndicate. It is now the general impression along the line and with street railway men in general that the line will be turned into a steam railroad. This state of affairs will not, however, prevent the connecting of Detroit with the trolley network of Ohio, for the Toledo & Monroe company expects to have the missing link completed and in operation by another summer. It will be an extension of the line from Monroe through Flat Rock and will connect with the tracks of the Detroit United at Wyandotte, a distance of some 42 miles. When this is completed the company expects to make the run from Toledo to Detroit a distance of 63 miles, in one hour and forty five minutes, and the fare will be 60 cents. The right of way for the entire extension has already been obtained.

The system of the Toledo & Monroe now in operation, a distance of 21 miles, is considered one of the best in the country, both as to roadbed and equipment. Nearly the entire distance is over private right of way, and 70-lb. T rail are used, heavily bal-

and Lima, projected, and the other is under construction from Wapakoneta to Piqua.

The Toledo & Western traverses a rural farming country that has heretofore been neglected by the steam railroads. The main line runs to Morenci, on the Ohio-Michigan state line, and will be extended in the near future as far west as Pioneer.

A branch line extends from Sylvania, Ohio, to Adrian, Mich., and will eventually be extended to Jackson, there connecting with the line from Detroit. The latter branch is in direct competition with the Lake Shore R. R. Ninety-five per cent of the entire distance is over private right of way. The road is designed and equipped with a view to handling a large amount of freight and express matter as well as passengers, and when everything is in full operation the rate of speed will be materially increased. The company is equipping its entire system with telegraph service instead of the telephone used on most of the other roads. At 11 places along the line substantial faced brick dispatching stations are being constructed, where competent telegraph operators will be stationed, to govern the movement of the cars through the chief dispatcher's office at Sylvania, where the main power station, car houses and offices of the company are located.

The entire route is through a prosperous open farming country, corn, wheat and oats being the principal products while dairy and garden products for a large portion of the company's freight. Mr. C. F. Franklin, general manager of the company, is an old steam railroad man, having been for many years connected with the Long

Island R. R. He anticipates a very large freight and passenger business when the entire system is in operation under the improved methods which are to be employed, and with this in view he has added several large flat and box cars to the present equipment, and is constructing an electric locomotive capable of hauling 12 to 14 loaded cars. The passenger cars are of the most modern type.

I have so far given a brief description of three lines extending from the city of Toledo into the suburban country, where one can study farm life in its many phases, but nothing out of the city can compare with the ride on the "Maumee Belt Line" of two hours along the historic and picturesque Maumee Valley. The trip can be made for 20 cents. The car passes the water works, Walbridge Park, the Country Club, and Orchard Grove, all situated on the banks of the river overlooking the valley below, Ft. Miami, established 1780, Ft. Meigs, Turkey Foot Rock, and many other places remembered as the spots where many bloody battles have been fought.

Toledo is not behind any of the other western cities in the way of providing proper accommodations for the comfort and convenience of its patrons. It has a union waiting room and ticket office, a thing no other street railway company has.

The line of the Lake Shore operating between Toledo and Cleveland is the longest through trolley line without change in the eastern and middle states the distance being 118 miles. The line as far east as Lorain, while the rails and rolling stock are of the best,

on the Lake Shore and passing through a rural section of the country and the village of Berlin Heights to Ceylon, Lake Erie comes in full view. From here the line follows the shore of the lake passing many pretty picnic groves, to Lorain where two lines run to Elyria and out to Sandusky. The line to Cleveland crosses the Black River from which a fine view is had of the immense plant of the Lorain Steel Co.

Following the lake and passing the power station and car house located at Beach Park, the car traverses a great vineyard extending from the lake inland as far as the eye can see. From the elevation which the car reaches a grand view is had of the lake. Scattered along the shore are pretty little groves in which may be seen on any pleasant summer day family picnic parties enjoying an outing. This together with the corn, wheat and oat fields gives the route a most picturesque appearance. Crossing the Rocky River on a high trestle there is seen in the valley below the buildings of a pleasure park maintained by the street railway company, closed in by high stone walls on either side. The car now reaches the outskirts of Cleveland and soon passes over one of its many viaducts. The Public Square, Cleveland, is the terminus of this as well as all the Cleveland suburban lines. For tickets, booklets and general information on the street railway companies the tourist is referred to the general ticket office, located at No. 10 Public Square.

Cleveland is a beautiful city and has one of the finest street



TYPICAL SCENE ON THE BEACHES SERVED BY THE RAPID RAILWAY, DETROIT.

was not in the best condition when the Everett-Moore syndicate which controlled the line, became involved in its trouble, but great improvements are being made. The track is being ballasted in the very best manner, and by another season the entire system will be in first-class shape, and the cars which are now obliged to run at a moderate rate will be operated on a schedule of at least 30 miles an hour, including stops. From Lorain to Cleveland the roadbed and equipment are in first-class condition. The run from Cleveland to Toledo is made in six hours and the fare is \$1.80.

Leaving Toledo the line follows the route of the Western Reserve & Maumee Turnpike, which is the oldest turnpike in Northern Ohio, having been ceded by the Indians over 150 years ago. Many thousand emigrants made their way over this road on their westward journey. The route, mostly over private property, is through a populous oil district with many shafts scattered here and there over the level country. Leaving the oil region the route is through a fertile farming country producing quantities of agricultural supplies and many sugar beet plantations are seen along the route. Fremont, located on the Sandusky River, is about half way between Toledo and Norwalk. Here is located Fort Stephenson which marks the spot where the British and Indians were defeated in 1812. Still following the turnpike through many pretty little villages and farming country the car reaches Norwalk just 57 miles from Toledo. From here a line runs to Sandusky. There will shortly be two trunk lines from Norwalk to Cleveland, the Lake Shore Electric, and the Cleveland, Elyria & Wellington, the latter being referred to in the lines out of Cleveland. Continuing

railway systems in the country. One interested in street railway transportation can enjoy himself for many hours sitting in the spacious square watching the loading and unloading of passengers from the large, commodious cars which run for miles into the country east, west and south. The local railway company has planned many nickel-trolley trips, and is giving considerable attention to the development of pleasure-excursion business, by issuing attractive leaflets and booklets describing and illustrating the points of interest along its lines. A novel feature was employed by the company the Sunday I was there. By arrangement with the various newspapers, each one printed a coupon or ticket good for a return trip from Garfield Park that day. Mr. J. W. Butler, manager of the Outing Department, and to whom a large proportion of credit is due for the increase of pleasure travel, informed me that the results from this experiment far exceeded the expectations of the management. The company has a very handsome parlor car and will by another season put into operation an observation car similar to that now in use on the Detroit-United lines. The company operates a funeral car, which seems to fill a long-felt want, is 28 feet long, painted in ebony black, with gold trimmings. The draperies are of green tapestry and yellow silk. The interior is divided into two compartments. The front receives the casket, while the rear has a seating capacity for 28 persons.

The interurban lines out of Cleveland are so rapidly forming into trunk lines with many important branches that it will only be a matter of two or three years at the latest when the whole state will be gridironed by trolley the same as is the eastern section

of New England. The Cleveland, Elyria & Wellington now operates a line through Oberlin to Wellington, and the line from Oberlin to Norwalk will be in operation as soon as the bridge over the Vermillion River is completed, thus giving two trunk lines between Cleveland and Norwalk. The line from the city runs through several small country towns without any steam railway facilities except between Elyria and Oberlin, where it parallels the Lake Shore. The extension of the line from Wellington southward to Mansfield will also be through a section devoid of steam railroad service. The route is through a farming country with many small villages, whose fine squares, business blocks and shaded streets gives every indication of prosperity.

While the country is not under as high cultivation as some parts of Michigan, the route is none the less attractive, for here and there many picturesque spots reveal themselves to the traveler as the road passes through cornfields and orchards, over its own private roadway, which is constructed in the best possible manner. As a through line from Cleveland to Wellington the electric cars compete with the "Big Four" and it is the only instance I have noticed where the trolley car charges more than the steam road. Round trip ticket by steam cost \$1.20 and by electric cars \$1.30. While the electric cars charge more they carry practically all the through passengers, giving an hourly service from 5:30 a.

informed that the Board of Health prohibits the use of drinking water tanks. Other points of particular interest which draw much patronage for this road are Bedford Glens, a beautiful spot noted for its natural, wild picturesque scenery; the Boston Ledges, Silver Lake Park, Randolph Park and Brady's Lake, all popular summer resorts, being provided with dancing pavilions, boating and other accommodations usually maintained by street railway pleasure resorts.

For a distance of seven miles south of Northfield the valley of the river is walled in on the west by a range of high hills of a gradual slope whose sides are covered with terraced farms and tiny groves which give an almost foreign aspect to the landscape. The company operates two branch lines, one running from the main line to the thriving town of Kent, while the other extends from Akron to Barberton.

At Akron a change is made to the cars of the Canton-Akron line which has been in operation but a short time. The road runs through a beautiful farming country, past Springfield Lake, a summer resort recently leased by the company, with fine natural surroundings. Here the company has erected a pavilion, where dancing and band concerts are provided during the summer months. The grounds offer fine facilities for camping parties. The company was hampered by lack of power, but I was informed



A STREET IN THE WHITE CITY, WINDSOR BEACH, ROCHESTER.

at 8:30 p. m. while the steam railroad makes only a few trips per day.

Another line of the company extends south from Cleveland to Medina, passing Puritas Springs, a popular summer resort owned by the company. The granite quarries located at Berea, the valleys, streams and woodlands give much diversity to the landscape and indeed make it a popular tourist line. Extension of the line is now under construction from Medina through to Crete and will eventually be built to Wooster, thus adding some forty miles to the already large system.

The next in order was a sixty mile trip to Canton via Akron, over the line of the Northern Ohio Traction and the Canton-Akron companies. The latter road was constructed by Tucker, Aronson & Co. of Boston, who are large investors in several other roads in the southern part of the state. The line from Cleveland follows the valley of the Cuyahoga River to Akron, following much of the wild scenic landscape for which this region is noted. The Newburgh Steel Co. now part of the United States Steel Corporation is located on this line, near the city limit. Garfield Park and a Cleveland pleasure resort and the Inman Ashburton with its massive buildings hidden by large shade trees which cover the park are noted with much interest by the passengers. While the cars of the company are of the usual standard type, used by the equipment of other companies, I am

by Mr. George W. Rounds, general manager of the company, who, by the way, is an Eastern man having been connected with the West Roxbury & Roslindale Street Ry. (now part of the Old Colony), that the new power house which is nearly completed at Canton will obviate all difficulty. The company will operate its line from this station using 13,000-volt, three-phase current and the necessary rotary converters and transformers. The capacity of the station will be 2,600 h. p. The company proposes to extend its lines from Navarre to New Philadelphia, which when completed will make a total length of 60 miles. Over this main line from the latter point to Akron the company will operate 60-ft. cars equipped with four 300 h. p. motors each. As a large part of this system is over private right of way built with 70 lb. T rails, and well ballasted, the speed at times will be as high as 45 miles an hour. The company's franchise gives it the right to carry baggage and freight and as the road runs through a thriving farming district the company anticipates a large business in handling farm products, and it has easy access to the Pennsylvania and other railroads at Canton, Massillon and other central points.

In addition to the park located at Springfield Lake, there is another one about a mile and a half west of Canton called Myer's Lake, where one of the finest ball grounds in the country is located. This lake contains about 90 acres of water and is surrounded by 200 acres of woodland and groves. Here may be

found the usual attractions which are so common at the resorts maintained by the street railways of eastern New England. It might be well to say here that very few companies maintain such pleasure resorts through Michigan and Ohio.

From Cleveland a line owned by the Cleveland & Eastern runs to Chardon and Middlefield, which is popularly termed the "Maple Route." This line is similar to that of the Toledo & Western for it is through a country heretofore lacking railway facilities and has from the beginning worked up a general freight and express business until today it transports more freight than any of the other street railways running out of Cleveland. This, and its other line out of the city running through Chagrin Falls and Hiram to Garrettsburg, are two of the most popular tourist lines out of any city in the country and were fully described in the "Review" for March, 1901.

A new company, called the Burton, Jefferson & Andover Electric Railroad Co. has been incorporated with Dr. E. Rowdon, of Windsor, Ohio, at the head to build some 100 miles from the terminus of the Cleveland & Eastern lines at Middlefield through Windsor to Colebrook, where it will run south to Howland and north to the line of the Pennsylvania & Ohio Traction Co. at Jefferson; the entire right of way has, I am informed, been obtained. The line to Garrettsville runs through a well-tilled farming country. Dairy products and garden vegetables are the principal products. It is one of the most fascinating trips I have yet taken; stretches of fertile farm lands are immediately followed by perfect wilderness, affording grand opportunities for hunting, while along the banks of the Chagrin River, over which the car passes, may be seen the angler eagerly waiting his prey. A short distance from Chagrin Falls one is carried through a deep ravine forming a perfect horseshoe after which the glen is properly named. Hiram is a pretty little village, best known as the place where ex-President Garfield taught school.

From Cleveland eastward the Cleveland, Painesville & Eastern operates two divisions as far as Willoughby, the "Main" and the "Shore;" the latter line follows the shore of Lake Erie for many miles passing numerous beautiful private and semi-public resorts. The countless little creeks which find their way at frequent intervals into the lake and the wood ravines make this route a picturesque one and it is much patronized by pleasure parties. Near the end of this line is located Willough Beach Park, an ideal resort. It is beautifully situated on the lake with a fine sandy beach, and it consists of twenty-five acres of land. Its natural beauty is enhanced by the erection of rustic bridges and arbors. Tables, seats and swings are scattered about through the well-shaded portions of the park.

The main line follows Euclid Ave., Cleveland, for several miles, along which many millionaires have palatial residences, passing Wade Park, the buildings of the Western Reserve University, the Garfield Memorial and the summer residence of John D. Rockefeller. Along the entire route are many fine highly tilled farms and pretty country towns whose streets are shaded by giant elms forming a perfect archway through which the car passes.

East of Willoughby the car passes through a section which had at one time the greatest vineyards in the state and there still remain many large fields. The company has put into service some limited cars for the benefit of the business men of Cleveland who live in the suburban districts. This service reminds an eastern man very much of the special trains which run out of Boston during the summer months called the "Dude's Train."

At Painesville, the terminus of the line, I was obliged to take the train for Ashtabula, a distance of 26 miles, fare 75 cents. The Cleveland, Painesville & Ashtabula Railroad Co., has been incorporated to build this missing link and Mr. Luther Allen, president of the Toledo & Western, is president of this company. In conversation with his son, E. Brigham Allen, secretary of the company, he informed me that considerable grading had been done and that the company expected to have the line opened by another year. This system will not only fill up one of the gaps of the trunk line but will connect at either end with good paying roads. The entire route, with the exception of through the few small country towns, will be over private property. The company has already made traffic arrangements with the C. P. & E. which will enable it when the line is completed to run through cars from Ashtabula to Cleveland, a distance of some 58 miles. Although the company will have to compete with the Nickle Plate and the

Lake Shore, the frequent service, the high rate of speed at which it is intended to run, the fine equipment and fares cut practically in two, will, it is believed, be sufficient inducement to not only encourage travel, but take away a large portion of the regular patronage which the steam roads now have.

At Ashtabula I found two lines in operation, a local one running from the village to the shore and the other, the Pennsylvania & Ohio Traction Co., east to Conneaut a distance of 15 miles. Both Ashtabula and Conneaut are noted far and wide as the greatest iron ore ports in the world. The company operates a



INTERIOR VIEW OF PARLOR CAR.

branch line from Ashtabula to Jefferson, the county seat, a distance of 10 miles. The line east runs through a very fertile agricultural country and the travel is mostly through, the fare being 25 cents, while on the steam road it is 40 cents. Every other car is a combination baggage and passenger car.

At Conneaut another missing link of 26 miles is promised to be filled up in the near future by the Conneaut & Erie Traction Co., if what Mr. George J. Chapman, a director of the company predicts comes true. The line will run through a very hilly country with many deep valleys and will be a costly one to construct. There is no question but that it will be built, although many others projected, will be realized before this connection is made.

There are three lines operating from the city of Erie, Pa. The Erie Electric Motor Co. has a local one running four miles west to Waldameer Park, a beautiful pleasure resort for the citizens of Erie and surrounding towns. Another line runs from Erie to Cambridge Springs.

Eastward the Erie Rapid Transit Co. operates a line along the Buffalo turnpike a distance of 15 miles to North East and it is extending to Westfield, N. Y. Sixty and 70-lb. rails are used. Its line runs through the great grape belt of northern Pennsylvania and on each side are large vineyards and small fruit farms the entire distance. The cars are of a fine type being 45 ft. in length, vestibuled and having twin Pullman windows gives them a very attractive appearance. They have the usual smoking compartments so popular on all the suburban lines.

I have now reached the state of New York where the connecting of the established lines which go to form the trunk line depends largely upon the promoters throughout the central and western portion of the state. So numerous are the breaks along this section that it was out of the question to study what the various lines would offer a trolley tourist when completed. I did however ride over all the existing lines of consequence, and talked with officials of the companies which intend to build the projected ones, so I feel that I am as able to give as correct an account of the situation as anyone.

At Westfield a company has been incorporated called the Lake Shore Traction Co., to build a line from this point to a place

called Silver Creek there connecting with a line which the Hamburg Street Railway Co. intends to build. Surveys for these two routes have been made. A trip on the Niagara Falls and the Oleott Beach lines of the International Railway is well-known to all street railway officials. These two lines are purely pleasure lines and they are becoming more popular every day through the up-to-date methods of advertising of the passenger department. The line from Tonawanda to Lockport was the first steam railroad to abandon the use of locomotives and adopt electricity. The speed on this line is sometimes as high as 60 miles an hour.

If all the plans formulated for a trolley connection between Buffalo and Rochester, are realized, no less than four will be catering for passenger and express service between these two large commercial centers. The Buffalo, Rochester & Niagara Falls Street Railway Co. was incorporated some time ago to build a line along the old historic Ridge road and several reports have been published purporting to come from officials of the company to the effect that construction would be started at once, but up to the present time it has not received the necessary certificate from the Board of Railroad Commissioners. There is a proposed line along the route of the Erie Canal which seems to be a much more feasible one from a passenger standpoint and much favored by the farmers along the line. Nothing has been made public regarding this route and it is rather hard to obtain information. I had an interview with Mr. Tomlinson, chief engineer, and Mr. Charles B. Hill, secretary and treasurer of the Albion Street Ry., a new company. From this interview although neither one committed himself, I am satisfied that what I predict will come true and within a short time.

The Albion Street Railway Co. was incorporated to build a line in the town of Albion which is about midway between Lockport and Rochester on the canal. The company has received a franchise from the town to build three miles of track extending from the cemetery east of the town to the Fair Grounds on the west side. J. G. White & Co. of New York, who made the survey and have the contract for building the line, also made the survey extending east along the canal to Rochester and west to Lockport.

The Buffalo & Williamsville and the Buffalo & Depew companies have both signified their intention of extending their lines through to Rochester. They will follow the same general direction as far as Batavia, from which point the former will take a more direct cross-country route to Rochester, while the latter making a detour will pass through several small intermediate towns. The former plans to operate as a high speed road and



NEAR CHAGRIN FALLS, OHIO. LINE OF EASTERN OHIO TRACTION CO.

later to through travel, while the latter expects to obtain a greater portion of its revenue from local travel.

Rochester offers many pleasant trips in and about the city. The Seneca and Genesee Valley Parks are both beautiful places through which the Genesee River flows. The upper and lower falls of the river are best seen from the bridge which spans the banks some 200 ft. above the deep gorge. The bridge over the Lower Falls is the third longest single span bridge in the world, being 990 ft. in length. There are many other places of interest too numerous to mention.

Few cities have as many beautiful pleasure resorts within easy reach by the trolley as Rochester. Ontario and Windsor beaches located on the banks of Lake Ontario at the mouth of the Genesee River, $7\frac{1}{2}$ miles from the city are popular summer resorts and camping grounds. The ride to these places takes one through the business and residential portions of the city, and a delightful and picturesque country with many handsome summer residences. Many enjoyable trips can be made by a combination of boat and trolley. One of these is by trolley to Glen Haven, a beautiful summer resort with many attractions, located in a charming glen at the head of Irondequoit Bay. From here one may take a boat to Sea Breeze on the Lake and there transfer to another boat for Windsor Beach and thence by trolley to the city. The round trip costs 50 cents. Another trip is by trolley to Windsor Beach, across the river by boat and back to the city by car may be made for 30 cents.

With the exception of the Hudson Valley with its 105 miles of road the Rochester & Sodus Bay line is the longest in New York state, being 40 miles. The line is a direct competitor of the Rome, Watertown & Ogdensburg Railroad which until this trolley line was operated two years ago charged \$2. for a round trip to Sodus Bay. Today it sells round trip excursion tickets for 50 cents. The fare on the electric cars is 75 cents. Large 45-ft. vestibuled cars are used on this line as well as on the beach lines. The company has several combination cars which make two round trips per day for freight service. Although this line is a long one and the rate of speed not so high as on some other roads of similar length, its through travel is heavy. It also gives much better service to the intermediate towns en route than the steam road inasmuch as it enters their main streets while the steam road is some distance from the centers.

One may take the trolley from Rochester to Charlotte, the boat to Sodus Bay and the trolley back to Rochester, affording a splendid day's outing, for \$1.00.

At the terminus of the Rochester line at Ontario Beach, a line runs along the shore of the lake crossing many inlets and small bays, by trestles to Manitou Beach, a distance of eight miles. This also is a charming trip.

The line to Sea Breeze was originally the Rochester & Lake Ontario Railroad until three years ago when it was converted into an electric line by the Rochester & Suburban.

In two year's time the line, and in fact two lines between Rochester and Syracuse, will be operating, one following closely the historic Erie canal and paralleling the tracks of the New York Central, while the other will run through Canandaigua, Geneva, Seneca Falls and Auburn. Along this line I find that the Rochester & Eastern Rapid Railway has done considerable grading and expects to have the line to Canandaigua completed by spring and the rest of the line to Geneva by another year. The entire length of this line from Rochester to Geneva will be 41 miles and the fare 60 cents. The company will locate its power station at Canandaigua, using 10,500-volt three-phase current. The sub-stations will be located at Pittsfield, Victor and Seneca Castle. The rate of speed will be 25 miles an hour including stops. It has purchased a large tract of land on Canandaigua Lake which it will convert into a pleasure resort.

At Geneva it will connect with a line now in operation through Waterloo to Seneca Falls. To connect the Falls with Auburn it will be necessary to build a bridge over the Cayuga river which it is estimated will cost \$200,000. At Auburn an interurban road is now in operation 16 miles east to Skaneateles and the company is constructing the rest of the line to sales to Syracuse which it expects to have in operation by the first of the year.

Returning to Rochester, the Rochester, Syracuse & Eastern Railway Co. has received the necessary certificate from the Board of Railroad Commissioners to build between the two cities. Mr. C. D. Beebe, general manager of the company, informed me that the line will be opened for travel in two years time. It will be mostly upon private right of way and double track with rolling stock of the very best. It is expected to make the run in four hours.

Syracuse is not what might be called an interurban railway center. With the exception of the line to Baldwinsville (to be extended to Oswego) which has some pretty parks along its route and the line of the Syracuse & Suburban to Manlius running over a high elevation affording many beautiful views, the trolley

lines have no charms for the pleasure seeker. Syracuse and Utica must be connected say the enterprising street railway man, and by a double track with heavy rails, private right of way and the best equipment obtainable for through travel. This is being realized.

A year ago we knew the Oneida Railway Co. only as a horse railway running some three miles between the stations of the New York Central and the West Shore railroads. Times have changed for neither the old rails, cars or horses are seen on the street. Some enterprising western business men have not only replaced the old rail by an extra heavy girder, but are building westward as far as Canastota and eastward to Oneida Castle. This system will be in operation before the snow flies. The company is also acquiring the right of way from the latter place to New Hartford, there connecting with the Utica & Mohawk Valley Ry. which was controlled and is operated by the same parties.

The Oneida company will also build a branch to Syvian Beach, a very popular summer resort.

Rome, N. Y., is a good example of a city which on account of its size cannot maintain a profitable street railway. No road operated only within the limits of a city of this size can pay, and this road could only be made valuable through consolidation with an interurban company. The cars operated are of the compressed air type and three cars make the schedule trips. For some reason the city will not allow them to operate over a bridge.

From Rome through Utica to Little Falls will by another summer be one of the best interurban lines in this section of the country, the entire distance being double tracked with 70-lb. rail and over a private right of way. For a scenic route it cannot be excelled, and many historic spots lie along the banks of the Mohawk.

From Rome to Utica the route is through a fertile farming country and the large open cars seating 84 people give the traveler an opportunity to see the mountains and fields decked in their autumn foliage. From Utica to Herkimer the line follows the south side of the Mohawk river, along a high elevation from which a fine view is had of the valley below. From Herkimer the road will, when completed, cross over the valley to the north side by a trestle, now under construction, which will span the West Canada Creek and the tracks of the New York Central. There are 12 spans of concrete with a total length of 820 ft., the tracks of the New York Central are crossed by a steel span 225 ft. in length and 22 ft. high in the clear. The bridge will cost \$140,000. Upon reaching the high banks on the north side of the valley a magnificent view is presented. Down in the broad valley to the right peacefully flow the waters of the Mohawk and West Canada Creek; the shores are dotted here and there with comfortable farm houses and traversed by the numerous trains which run east and west over the tracks of the New York Central and the West Shore. There may also be seen any day canal boats loaded with lumber and drawn by three horses or mules. Few would realize that two of these boats contain something like from 280,000 to 290,000 feet of lumber. The scene as the car reaches Little Falls changes and the valley becomes narrower, and the waters flow over the frequent falls. This bustling little city is nestled in between great mountains of boulders giving it a very rugged background.

A company has been incorporated, called the Mohawk River Interurban, to connect Little Falls and Fort Plain by a trolley line. Nothing has as yet been done towards the construction of the road except making the preliminary survey.

Fort Plain, Cananoharie and Sharon Springs will eventually be connected, the Mohawk Valley Traction Co. having been incorporated for that purpose. Sharon Springs is a very popular summer resort and is today accessible only by the Delaware & Hudson Railroad in an indirect way from Albany. By the building of this electric line the Springs will be connected with the through system of the New York Central and there is no doubt but that it would be a very popular and profitable line. The New York Central people are very much interested in the building of this road as it would divert a large amount of travel from the Delaware & Hudson to its lines. I had a talk with Mr. Wm. Roser, secretary of the company, and he informed me that he has been trying for some time to obtain the necessary franchises along the line but has met with considerable opposition from the farmers en route and the citizens of the Springs who would, without doubt

receive the greatest benefit if the road were built. As the matter now stands nothing will be done until late this fall or next spring. Mr. John W. Boyle, of Utica, who is a large investor in the Utica & Mohawk Valley road is the prime mover in this project.

From Cananoharie to Fonda is the only place between Michigan and Maine that no attempt has been made to build in connection with the trunk line. From Fonda a line runs north through Johnstown to Gloversville, a distance of 10 miles. At Johnstown a line is now under construction and will be in operation within a very short time through Amsterdam to Schenectady following for a greater portion of the way the valley of the Mohawk. At Schenectady this line will connect with the system that now operates up and down the Hudson River for many miles. It is at this point also that one can ride over, as far as Albany, a distance of 17 miles, one of the best paying roads in the country, and I think the only interurban road whose revenue is obtained chiefly from business travel. The large number of people employed by the General Electric Co. and the Schenectady Locomotive Works, some 14,000 in all, has increased the rent of houses to such a price that many families have gone to live in Albany and ride back and forth each day to their work. The line between these two cities is double track and the cars, which are large and commodious, make the trip in forty-five minutes, al-



BENTLEYVILLE BRIDGE. EASTERN OHIO TRACTION CO.

though the time could easily be reduced to thirty minutes. The road follows the old turnpike which is as straight as an arrow. The company is building many extensions; one is just completed to the aqueduct; it is about completing the one to Saratoga, there connecting with the system of the Hudson Valley Ry. Another line will shortly be in operation from Schenectady to Troy. There was a hard fought fight between the Hudson Valley and the Schenectady road for the right to build the line connecting the latter city with Saratoga but the courts decided in favor of the Schenectady Ry.

At Albany I found a very convenient waiting room and ticket office for the benefit of the patrons of the companies that make this city their terminus. The lines of the Hudson Valley Railway and the Albany & Hudson Railway & Power companies have been described in detail in the "Review." The Hudson Valley has a trackage right over the tracks of the United Traction Co. (of Albany) as far as Waterford, and from here the line runs through the picturesque and historic valley of the Hudson passing the battle grounds of Saratoga and Lake George. It is a direct competitor of the Delaware & Hudson Railroad with which it has had many a legal fight before the Board of Railroad Commissioners and in the courts. This is a thoroughly modern up-to-date road in every respect, its roadbed and luxurious upholstered parlor and observation cars are the finest in the country. The route along the main line through Glens Falls to the foot of Lake George, acknowledged to be the finest sheet of fresh water in the state if not in the country, has many attractions for the lover of natural wild scenery, all picturesque in the extreme, for it is a continual change; one moment you are following the deep

shores of the Hudson with many large water falls from which power is obtained to run the large manufacturing plants located along this section, while the next moment you are either looking out upon an open country with the waters of the river flowing calmly through the valley, or along one of the war trails with its many old taverns still standing. In addition to the numerous attractions which the natural scenery and the noted resorts of Lake George and Saratoga offer to pleasure travel, this enterprising company maintains three pleasure resorts each of which is equal to any resort maintained by a street railway in this section of the country.

Fort William Henry Park is located at the southern end of Lake George on which it borders. In this park stands the Fort William Henry Hotel, from which a fine view is had of the lake and the wild scenery of the Adirondaek mountains. The trip on the incline railway to the summit of Prospect Mountain is a big attraction in itself, and the view from the top overlooking the lake and mountains is one of the finest.

Ondawa Park, on the Greenwich line, and Kaydeross Park, located on the shore of Saratoga Lake, are both ideal summer resorts furnishing band concerts, vaudeville and comic operas, etc., for the entertainment of the road's patrons. The company does considerable freight business, and it also sells tickets to any point on its system.

Returning to Albany I took a trip over the great third rail system of the Empire State—the Albany & Hudson. After crossing the river from Albany into Rensselaer the tracks of the Boston & Albany and the New York Central are crossed by a steel viaduct 2,100 feet long which cost the road \$125,000. From here I was taken through a most beautiful and prosperous inland farming country. Cornfields, apple and peach orchards as well as large vineyards are passed in rapid succession. From the car is a fine view of the Catskill mountains on the right, while on the left may be seen in the distance the rolling hills of the Berkshires. It is the intention of the company to extend its line in the near future to the Massachusetts state line at Lebanon, there to connect with the proposed extension of the Berkshire Street Railway Co.

At Kinderhook Lake the company maintains a very popular summer resort. The line is 30 miles in length all of which is over private property. The cars are 53 ft. over all and are, I am told, heavier than the standard passenger coaches on the Boston & Albany road. Tickets are sold on this line for the convenience of the passengers. The line is a direct competitor of the New York Central as far as Hudson, the fare, 50 cents, being the same on both lines.

The Troy, Rensselaer & Pittsfield Street Railway Co. has been incorporated to build a line from the terminus of the Troy & New England Railroad at Averill Park to the Massachusetts state line, there to connect with the proposed extension of the Pittsfield company. I am informed by Mr. George E. Murray that the line will be completed and in operation next year.

To be continued.

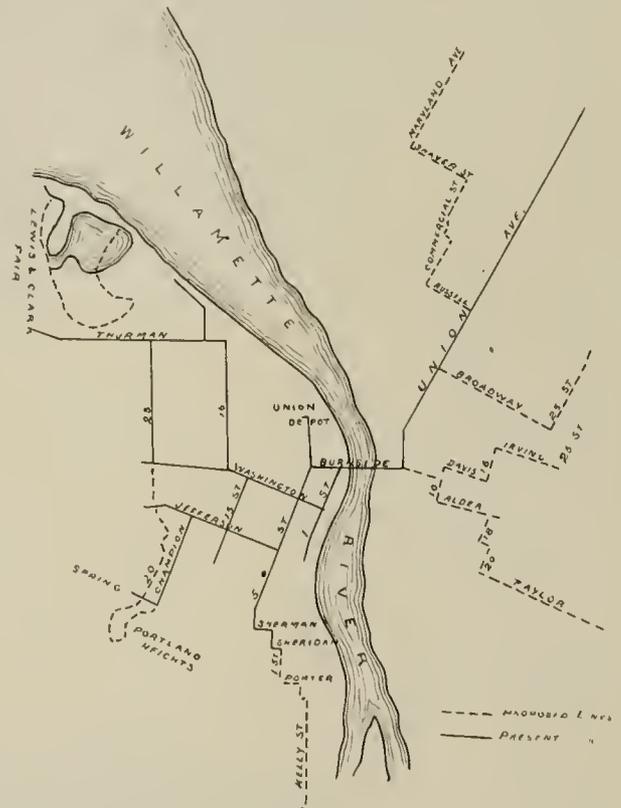
MUNICIPAL ELECTRICIANS CONVENE AT RICHMOND.

The International Association of Municipal Electricians held its seventh annual convention at Richmond, Va., October 7th, 8th and 9th, with a large and representative attendance. The delegates were welcomed at the first session by Governor A. J. Montague, of Virginia, and Major R. M. Taylor, of Richmond, who extended hospitality in the name of the city and state. Papers were read of the following subjects: "Municipal Inspection and Control of Electrical Matters," by Mr. Walter M. Petty, of Rutherford, N. J.; "Electrical Government," by Mr. Anton S. Hatch, of Detroit; "Relation of Electrical Interests to Other Branches of the Municipality," by Captain William Brophy, of Boston; "The Joint Use of Conduits," by Mr. Charles L. Hopewell, of Cambridge, Mass.; and "The Telephone Service in Connection with Fire and Police Signal Systems," by Mr. Jerry Murphy, of Cleveland. The privileges of the telephone, telegraph and street railway service were extended to the members by the courtesy of the American Bell Telephone Co., the Western Union and Postal Telegraph Co., and the Richmond Passenger & Power Co.

PORTLAND (ORE.) RAILWAY COMPANY'S EXTENSIONS.

The new franchise applied for by the Portland (Ore.) Railway Co., will, if granted, give that company rights on about 10½ miles of street not now occupied by its lines; it now holds franchises on about 17 miles of street. If the ordinance granting these franchises go through the council without delay, it will probably take two seasons to complete the extensions. The expenses of building the tracks and providing the additional rolling stock necessary to operate all the lines would require a new investment of about \$40,000. Other extensions are in view.

The most important change contemplated is the abandonment of the cable trestle to Portland Heights. The proposed extension out 20th St. to the heights will be just two blocks west of the present



SYSTEM OF THE PORTLAND RAILWAY CO.

line. It will also go about half a mile farther than the present line, reaching the very top of the hill.

The proposal for a South Portland extension is merely a renewal of the application that was presented two years ago for advancement of the line passing out Fifth St. In North Portland a franchise is sought for four blocks on Thurman St., in order to connect the present lines of the company and facilitate their operation. These two and the Portland Heights franchise are the only ones applied for on the West Side.

On the East Side a franchise is sought for a street railway from a junction with the Vancouver line, at Russell St., thence west and north a street distance of about 2½ miles. Another branch is projected from the junction of Broadway with the Vancouver line, east to 22d and north to Stanton, a distance of about 1½ miles. From the corner of Buraside St. and Union Ave., where the Vancouver line turns, an extension is projected six blocks east to Tenth St., from which point there are two branches; there will be about 3½ miles in these lines.

The Pittsburg Railway Co. for the past six weeks has employed 500 men and 50 teams in excavating for the foundations for its proposed new power house on Brimot's Island, which will be 100 x 500 ft. in dimensions and is to be in operation within two years. Specifications are being completed for the superstructure and machinery, and it is announced that 24 boilers and 6 engines will be included in the installation.



Laura May



Wm. H. Taylor

EDWARD F. C. YOUNG.

It has been said of Mr. E. F. C. Young that his career has been one typically American—energetic, arduous and successful. Born of humble Scotch-English parentage in Morris County, New Jersey in 1835, his life work has been largely confined within the borders of his native state, but to this concentration of his energies New Jersey may justly attribute the successful development of more than a score of her largest financial, commercial and public utility enterprises.

With a public school education as a foundation Mr. Young began his business life as junior clerk in the Hudson County Bank of Jersey City. Through the exhibition of executive abilities in many respects exceptional, he rapidly advanced from positions under the direction of others to offices where he himself became the one to direct and manage.

Through successive consolidations of banking interests in the eastern part of the state he assumed greater and greater responsibilities until in 1874 he was appointed cashier and in 1879 was made president of the First National Bank, the largest banking institution in the state of New Jersey. He still holds the office and may be found every business day in the week at his office in the bank in Jersey City, directing the policies and affairs of the institution.

Although Mr. Young is essentially a banker, this is but one phase of his activities. As exhibiting the wide range of his ability his management of the affairs of the Joseph Dixon Crucible Co., of Jersey City, may be cited. In 1881 this company, whose lead and graphite products are known throughout the civilized world, became involved in financial difficulties and Mr. Young was appointed receiver. With wonderful skill and sagacity he reorganized every detail of the business, paid off all obligations of the company and in 1891 turned the plant over to the owners as one of the foremost manufacturing industries in the world. Mr. Young was elected president of the reorganized Joseph Dixon Crucible Co.

Closely identified as he was with the business life of the community, Mr. Young early saw the possibilities that were to be opened up by the application of electric traction to the street railways of the state. He found time to devote to a study of street railway conditions and was interested in forming a number of the first companies operating in and around Jersey City and Newark, all of which were eventually merged into the Consolidated Traction Co., and finally into the North Jersey Street Railway Co., controlling 250 miles of electric railway in the territory named. Mr. Young is president of this company.

In his last annual report to the stockholders of the North Jersey Street Railway Co., Mr. Young was able to report gross earnings of the property for the year ending Dec. 31, 1901, as \$4,172,646, and a surplus after paying all expenses and fixed charges of \$133,769. The company has planned to spend \$1,000,000 in improvements during the current year, a portion of which will be expended in building a 17-mile belt line between the Pennsylvania R. R. station in Jersey City and Bergen Point. As announced in previous issues of the "Review" plans are also well under way whereby the lines of this company will make connection with the surface and elevated lines on Manhattan Island by means of a tunnel under the North River.

Mr. Young has held places in the directorate of nearly forty important companies including the United Electric Co., of New Jersey, the Butler Hard Rubber Co., several trust companies, the Jersey City Coal Co., the Standard Distilling & Distributing Co., and others.

He is a member of over a dozen social and political clubs and an officer of several. He was a presidential elector in 1880 and is actively interested in the affairs of the Democratic party in city and state.

The Valdosta (Ga.) Street Railway Co. has acquired the property of the Valdosta Poultry Co., amounting to about \$7,000, and comprising houses, pens, brooders, etc., and a stock of 1,000 fine chickens. According to reports the company will take the stock in the road for the property of the poultry company. In connection with the Valdosta railway, Pine Park zoo is to be enlarged, and special attention will be given to the breeding of wild animals. It is proposed to make Pine Park one of the most attractive resorts in the South.

DAVID YOUNG.

Mr. David Young, who is one of the successful street railway managers of the country, was born in Scotland, May 1849, but at an early age was brought to Newark, N. J., where he received a high school education and first began to gratify his ambition to become a civil engineer. During several years he was connected with various partnerships until 1893 when he entered the firm of Young & Borrie. Shortly afterward he became interested in street railway matters in his part of the state and was made general manager of the Consolidated Traction Co., of Jersey City. He is now vice-president and general manager of the North Jersey Street Railway Co., and president and general manager of the Jersey City, Hoboken & Paterson Street Railway Co.

The life of a street railway manager is never one conducive to the taking of one's ease, but in the management of these two important properties Mr. Young finds the fullest scope for the seemingly tireless energy which is characteristic of the man. His day's work frequently calls for his presence at his Newark office at 7:30 in the morning; at his Elizabeth office at 8:30; at his Jersey City office at 9:45, and at his Hoboken office at 1:30 in the afternoon. Although controlled by a community of interests the two properties are run entirely independent of each other. At his Jersey City office, Mr. Young is vice-president and general manager of the North Jersey Street Ry. At his Hoboken office he is president and general manager of the Jersey City, Hoboken & Paterson Street Ry. And his title of general manager is well given for he is manager not only when broad policies of action are to be settled but, as well, when the minutest detail of operation is in question.

Next to his capacity to do work Mr. Young's most striking quality is his genial good nature. It has been said of him that his is the heartiest laugh in New Jersey—a laugh that has nothing of hidden motive in it, but is the ringing expression of a man who loves his work, with malice toward none, and good will toward all. To the casual visitor, the supplyman, the political visitor, the person with a complaint, the man out of a job, and to all subordinates, he is always the same, easily approachable, genial in greeting, a sympathetic listener, and judge, whose decision is kindly and just but final.

Mr. Young is a believer in the future of the street railway industry and thinks the electric road is the most powerful advance agent of prosperity in this country. In his own words "the electric car is the chariot of the people and the pioneer of progress. Wherever it goes it carries growth and development. The electric car is revolutionizing social conditions." He also points out that the combinations of managements of electric roads that have been going on so rapidly during the decade have resulted in good everywhere, not only in securing faster development and better systems, but also in increasing the number of positions open to intelligent men and in giving greater opportunities for advancement.

Mr. Young was a member of the Newark city council from 1876 to 1882; president of the council for four years; and was elected a member of the New Jersey Legislature in 1882. For 25 years he was town surveyor for Harrison and Kearney, N. J. He is a staunch Republican.

Mr. David Young has been associated for many years in street railway matters with Mr. E. F. C. Young, but the two men, though of the same name, are not kinsmen.

INCREASED POWER FACILITIES AT CHATTANOOGA.

An agreement has been effected between the Chattanooga (Tenn.) Electric Railway Co. and the Chattanooga Light & Power Co., whereby the latter will furnish power for the operation of the street railway system for the next seven years. In order to fulfill its contract the Chattanooga Light & Power Co. will double the capacity of its plant, installing a 300-kw. and two 700-kw. generators, which have been ordered and will soon be delivered. The present plant of the street railway company will be used as an auxiliary station, and combined, the two will furnish sufficient power for the operation of existing lines and the numerous extensions which the Chattanooga Electric Railway Co. contemplates making in the near future.

POWER HOUSE AND THIRD RAIL SYSTEM OF THE BERLIN ELEVATED AND UNDERGROUND RAILWAY.

In addition to the description of the structure of the Berlin Elevated and Underground Ry. given in the "Review" for April, 1902, the following details in regard to the power house and third

and the other for closets, wash rooms and dressing rooms for the operating staff, these rooms being near the repair shop of the engine room.

The boiler equipment occupies a much larger space than the engine plant, therefore the whole of the first floor was not required for the engines even after allowing for future extensions. The engine floor is divided by a row of columns on one side of which is an intermediate floor used for a repair shop and the portion



BOILER ROOM—BERLIN ELEVATED AND UNDERGROUND RAILWAY.

rail system will be found of interest as this plant represents the most advanced electric railway practice in Germany. The power house is located near the center of the city at which place the greatest consumption of energy occurs. A continuous current of 750 volts is generated at this station and is conducted directly to the special contact rails and feeders along the tracks of the elevated and underground structures. The return circuit is through the track rails. On account of the cost of land in this locality the power station is built several stories high. The boiler equipment, which is located near the top of the building comprises six Gehrle boilers which operate at a pressure of 135 lb. Immediately above the boiler room is a system of Hunt conveyors for handling the coal.

The engines are located on the floor directly below the boilers, and the feed water is either pumped from the Landwehr Canal or from a tank into which the air pump discharges. The exhaust from the pumps is led into this tank and also the condensation water from the steam pipes. The feed pipes and steam pipes for these pumps are in duplicate to provide against any accident which might occur. The boiler room piping consists of a main ring pipe over the double series of boilers from which branches are carried between the boilers down to the engines. Cast iron bends are employed, the flanges being rolled on. The flanges are protected by removable caps and the whole system of piping is thoroughly insulated. The boilers are provided with superheaters which make it possible to raise the temperature of the steam to 440 deg. F. These superheaters are arranged so that the tubes are very near the fire and by operating a set of valves and filling the heaters with water they may be used to generate steam. The condensers, as well as the air and feed pumps are placed in the basement in an open space around the engine foundation. The air pump is operated by a small crank on the extended engine shaft and there are two tanks in the basement of the station connected with the canal in which the water stands on the canal level and which are connected by a pipe to the condensers. Each condenser has separate injector pipes taking water from the tanks, and the waste water is carried through pipes running back to the canal after first passing through a filtering well. The lower part of the chimney which cannot be used for draft on account of the location of the boilers, is divided into two floors, one of which is used as a store room

underneath this is used for the switchboards and electrical apparatus. The main portion of the engine room is again subdivided into two parts by a row of columns over one portion of which is a 15-ton crane and over the other side is a 20-ton traveling crane. These are operated by direct current motors.

The engine equipment consists of three direct connected units of a normal capacity of 900 h. p. and a maximum capacity of 1,200



VIEW OF COAL CONVEYOR.

h. p. each. These are of the vertical compound type and each is directly coupled to a Siemens & Halske shunt-wound dynamo. The engines run at a speed of 115 r. p. m. and were constructed by Borsig. The high pressure cylinder dimensions are 31½ and 50 in. by 29½ in. stroke. On the high pressure cylinders the valve gear is of the Collman type while on the low pressure cylinders ordinary piston slide valves are employed. There are two platforms

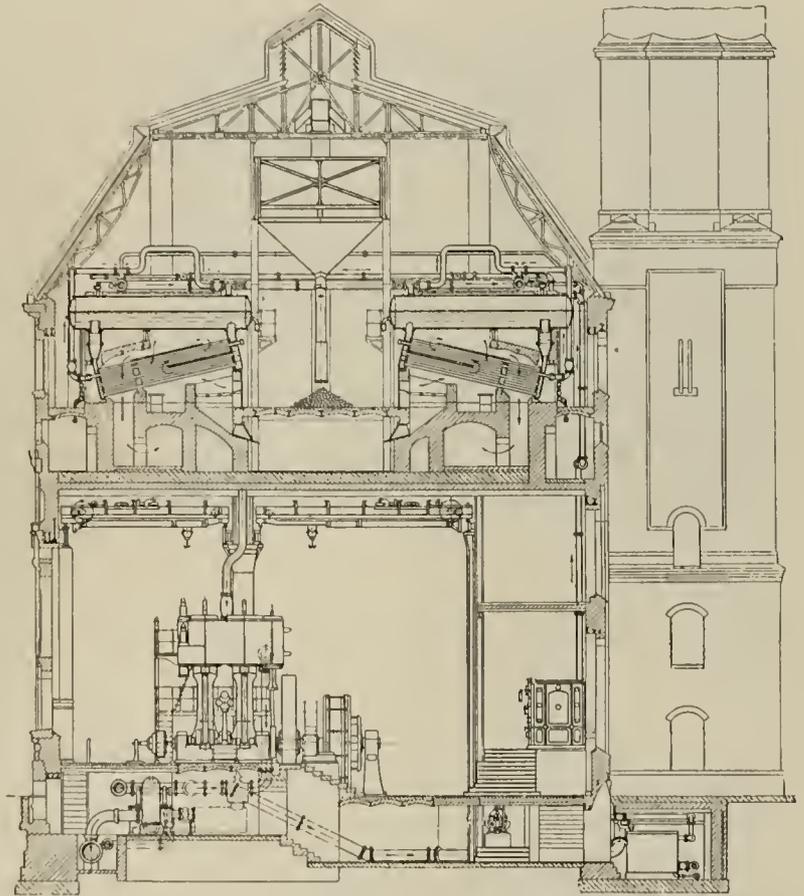
provided on each of the engines for use in adjusting and lubricating the various parts and these platforms are all connected together by iron bridges so that the attendants may pass from one engine to the other without descending to the floor. An extension of the engine crank shaft is provided for operating the governor. The fly wheels are started by a 20-h. p. motor-driven mechanism which is automatically cut out when the engine has attained sufficient speed. The fly wheels are enclosed in sheet metal which prevents the throwing of oil as well as the creation of draughts about the machinery. The generators are of the shunt wound, inner pole type with ring armatures and were specially designed by the Siemens & Halske Co. for this plant. Each of the dynamos has a capacity of 800 kw. and supplies continuous current at 750 volts.

The floor of the dynamo room, as will be seen from the cross section view of the plant, is somewhat higher than that in the engine room proper and all of the parts of the generators which require attention are within easy reach. The two floor levels are connected by stairways.

The main switchboard is mounted on a platform slightly elevated from the floor and is connected to the generators by heavy iron armored and lead covered cables. The switchboard contains the usual switches, circuit breakers, ammeters and volt meters. A small auxiliary switchboard is provided for connecting the main switchboard to the booster and storage batteries used for regulation and lighting. The storage battery has a capacity of 1,200 ampere hours and a small auxiliary motor generator is provided for raising the current to the potential necessary for charging. The storage battery used for regulation, as well as the lighting battery are placed in adjoining rooms in the arches of the overhead railway viaduct. The booster and battery are also used for driving the auxiliary electric motors used in the plant.

The third rails of this system are placed on the right hand side of the tracks in the tunnels and on the left hand side on the elevated structure. These conductor rails are raised about 6 in. above the tracks on the elevated portion and somewhat higher within the tunnel, and by this disposition of the third rail the automatic lighting of the cars in the tunnel is secured. The conductor rails are laid in 40 ft. lengths and have a cross section of $5\frac{1}{2}$ sq. in. They are iron rails of the ordinary pattern connected by copper bonds

are lighted by incandescent lamps, three lamps of 220 volts being used in series. Where arc lights are used, 12 arc lamps having a difference of potential of 55 volts are connected in series and a compensating device is in use for taking care of the fluctuations.



SECTION OF POWER HOUSE.

The trains consist of three cars, the two end cars each being equipped with four motors, one on each axle. These trains will seat about 125 people and have standing room for about 50 more.



CROSSING OF CANAL, STREET AND STEAM RAILROAD.

at the joints and insulated by vulcanized rubber supports which are bolted to the superstructure. The main feeders are made of copper strip placed on edge and they have a cross section of from $1\frac{1}{2}$ to $2\frac{1}{2}$ sq. in. The overhead and underground stations

In addition to the air and hand brakes it is possible to short circuit the motors through resistances for obtaining an electric braking effect in case of an emergency. The motor cars are provided with signal lamps which are lighted automatically in the

day time when the car enters the tunnel. Electric heaters are used which are placed under the seats of the cars and the lighting is effected by two circuits each of 6 incandescant lamps. The motors have a capacity of 70 h. p. each and are operated by series parallel



SHOWING CONSTRUCTION IN TUNNEL.

controllers. The elevated structure is double track throughout, the rails being laid to standard gage of 1,435 meters and the two tracks being 3 meters apart. The sharpest curve has a radius of about 250 ft. and the heaviest grade is about 3 per cent.

PRODUCTION OF COPPER

The production of copper in 1901 is reported by Mr. Charles Kirchoff in Mineral Resources of the United States, 1901, now in press, United States Geological Survey.

The conditions surrounding the copper-mining industry during the year 1901 were in many respects extraordinary. Production was only slightly less than it had been in 1899 and in 1900, and consumption in this country was undoubtedly considerably greater. But a determined effort was made during the greater part of the year to maintain values in the face of adverse conditions in the countries which are the principal customers for our large surplus. Prices were kept above the parity of Europe, so that large importations were added to the supply. The result was an extraordinary accumulation of the red metal in the hands of leading interests. For a while co-operation between the principal producers was tried, and, when this failed, coercion was attempted by the breaking of the market toward the close of the year. This was preceded by a very serious decline in the shares of copper companies on both sides of the Atlantic.

The total production of domestic copper in the United States in 1901 was 268,782 long tons, as against 270,588 long tons in 1900. The amounts produced and the relative percentages of the total production of Lake Superior, Montana and Arizona were as follows:

Lake Superior, 69,772 long tons, percentage of total production, 25.9; Montana, 102,621 long tons, percentage, 38.2; Arizona, 58,383 long tons, percentage 21.7. Mr. Kirchoff discusses at some length the conditions and production of the mines in the Lake Superior district, in Montana, in Arizona, in Utah, and in Tennessee.

The total imports of copper in the United States in 1901, from all sources and in all forms, amounted to 124,938,323 pounds, as compared with 103,895,026 pounds in 1900, with 93,172,191 pounds in 1899, and with 50,268,499 pounds in 1898.

The total value of the exports of copper from the United States in 1901 was \$36,071,448, as compared with \$58,875,439 in 1900, with \$43,485,654 in 1899, and with \$35,545,251 in 1898. Germany is by far our largest customer for copper, since the greater part of the metal shipped to the Netherlands is in transit for that country; on the other hand, some of the copper which goes to the United Kingdom is shipped from there to other countries. The details of these movements cannot well be followed.

The estimated consumption of copper in the United States in 1901 was 382,761,014 pounds, as against 356,891,121 pounds in 1900.

The stock of copper on hand in the United States on January 1, 1902, is estimated as being at least 300,000,000 pounds, equivalent to six months' production. In the absence of figures which might be said to represent normal years, it is impossible to do more than make a guess at what might be considered the excess over a reasonable stock. It is probably fair to assume that, even at the beginning of the year 1901, the stocks of copper in this country were beyond the working limit.

The copper market opened in 1901 rather dull at the official prices of 17 cents for Lake and 16½ cents for electrolytic, but actual sales were made at 16⅞ cents for Lake, and at 16¼ cents for electrolytic. By the 13th of January, 1902, the official prices had fallen to 11¼ cents for Lake copper.

The world's production of copper in 1901 was 511,803 long tons, as against 487,206 tons in 1900, 463,693 tons in 1899, and 429,379 tons in 1898.

By far the most important of the new mines which have entered the world's market in recent years is that of the Greene Consolidated Copper Co., whose properties are located at Cananea, Sonora, Mexico. There is every reason to believe that, before the close of the current year, the production of this company will reach 4,500,000 to 5,000,000 pounds of fine copper per month. Such a rapid development has never before been witnessed in the copper-mining industry.

KANSAS CITY NOTES.

The site of the new power house of the Metropolitan Street Railway Co. occupies the space of nearly three city blocks. It is a clay bank about 100 ft. high and before the work on the power house can be begun this hill of clay must be removed. The work was let to a local contractor, who attempted to remove it by means of running water. He ran a pipe connected to the city water works along the top of the hill and allowed the water to run down over the side of the hill. Laborers stirred up the water and mud, which ultimately ran to a pump, where it was discharged into the river. This plan did not prove effective and the contractor, becoming discouraged, abandoned the job. The company then took up the work and under the direction of its chief engineer, Mr. Bacon, the pipe along the top of the hill was connected with a 4-in. hose which led down the bank, and was discharged through nozzles which threw it with great force against the side of the hill. This proved a more practicable plan and was so successful that the size of the upper pipe was increased to 12 in. and six 4-in. hose pipes are now employed in tearing away the bank for 24 hours a day. All the available teams in the city have been employed to assist in reducing the hill.

Several more or less serious accidents have occurred on the Ninth St. incline this year, and in order to reduce the possibility of such accidents in the future the company now runs two grip cars on each train running on the incline. The main line cars have been diverted to another route so that less than one-third the usual number of cars are now operating on the incline.

The city council recently passed an ordinance requiring cars to stop on the near side of street crossings. The public and the press, however, criticised the ordinance so severely that the same council was obliged to pass a new ordinance changing back to the farther corner method. It inserted a clause, however, that cars will be stopped on the near side only at points where railway lines intersect.

Labor and teams are reaping a harvest in Kansas City this season, the prevailing price being \$1.75 and \$2.00 per day for labor and \$3.50 to \$4.00 per day for teams. On city work these prices are paid for an eight-hour day.

The South Jersey Gas, Electric & Traction Co., of Camden, N. J., has awarded the contract for the erection of a group of new buildings, which will comprise a three-story warehouse, 59 x 66 ft.; a two-story stable, 102 x 34 ft., and a blacksmith shop, 45 x 34 ft.

An unusual accident is reported from Ithaca, N. Y. A fare register, weighing 20 lb., fell from its position at the top of a car as the latter was rounding an abrupt curve, and struck a woman passenger on the head, stunning her, but fortunately, not causing a serious injury.

FRANCHISE OF THE INDIANAPOLIS TRACTION & TERMINAL CO.

The organization of the Indianapolis Traction & Terminal Co. for the purpose of building a system of tracks and passenger and freight terminals for the several interurban lines entering Indianapolis, was described in the issue of the "Review" for August, page 496. This terminal system is to be used by the Union Traction Co. of Indiana, the Indianapolis Northern Traction Co., the Indianapolis, Lebanon & Frankfort Railway Co., the Indianapolis & Martinsville Rapid Transit Co., the Indianapolis & Plainfield Railway Co., the Indianapolis & Eastern Railway Co., the Indianapolis, Greenwood & Franklin Railroad Co., and the Indianapolis, Shelbyville & South-eastern Traction Co.

The franchise, which was granted on August 4th, authorizes the company to construct, own and maintain a single or double-track surface street passenger railway system, to be operated by electricity or other improved power to be approved by the Board of Public Works, on thirty streets and avenues named in the city, and the company as part of the consideration for the grant, expressly disclaims any right to use any street or avenue except such as is named in the franchise. The company shall not have the right to build or operate any line of street railway except such as is specifically named. The operation of any line which may hereafter be built may be discontinued only with the consent and authority of the Board of Public Works, and in case of such discontinuation, the company shall restore the street vacated to a good condition. The tracks shall be laid so that the center line in case of a single track, or the center line of the space between the tracks in case of a double track, shall be the center line of the street. The tracks shall be of the same gage as the tracks of the Indianapolis Street Railway Co. and shall be so constructed that they may be physically connected with the tracks of the latter company at intersecting points.

The franchise gives the new company authority to sell, lease, or otherwise dispose of the system of street railways which it may construct, to the Indianapolis Street Railway Co., and authority is also given the new company to purchase, lease or otherwise acquire from the Indianapolis Street Railway Co., any part of its system of street railways, power houses, car barns and other property.

Under the terms of the franchise, the new company agrees to construct and equip a large portion of its road so as to be ready for operation within 12 months. Other portions of the road are specified to be ready for operation within three years and five years respectively. A five-cent fare and universal transfers are also prescribed. The new company agrees to construct within 18 months from the date of the franchise, a suitable and commodious passenger terminal to be located within a certain prescribed section of the city, which shall be accessible to any suburban or interurban railway company, either directly or by means of lines to be constructed. This terminal is to be used by all of the suburban and interurban railway companies for the purpose of passenger traffic, without discrimination in favor of or against any of these companies, and for such compensation as shall be agreed upon for the use of the tracks of the new company.

The right to the use of the terminal station shall be upon condition that the compensation for such use shall be paid when it becomes due and that reasonable rules and regulations shall be conformed to, and that for failure to pay or to conform to such rules, the suburban or interurban company so failing, shall be excluded from the use of the station.

An emergency repair fund is to be kept on deposit in the city treasury, to be drawn upon by the Board of Public Works when an emergency arises calling for immediate repairs of any dangerous defect in any street or avenue required by the franchise to be kept in repair by the new company.

In case of any improvements in the pavements of streets or avenues occupied by the company's tracks, the company agrees to pave that part of the street bounded by its outside tracks, in the same manner and with the same material as is used on the other part of the street, and that such improvement by the company shall be completed at the same time that the improvement by the city shall be finished.

The franchise requires the new company to make reasonable extensions of its several lines when required for the convenience of the public and authorized by the Board of Public Works. When the board shall have ordered such an extension or new construc-

tion, fixing the time of its completion, the company must forfeit to the city the sum of \$50 for each day that the completion of the new work is delayed beyond the date ordered.

The company is authorized to carry baggage, freight, express and mail in separate compartments of the passenger cars or in freight cars. No live animals except hunting dogs may be carried in any of the cars, and all baggage, express matter, parcels and articles of merchandise must be delivered at the terminal station for distribution. No express or baggage shall be loaded or unloaded upon any of the streets or avenues of the city except at the station or terminals. Fowls properly secured in boxes may be carried in the cars between the hours of 12:30 and 4:30 a. m.

Until the station for the receipt and delivery of freight shall have been provided the company may use the dead track of the Indianapolis Street Railway Co. for loading and unloading freight, provided the selection of the dead track shall be approved by the Board of Public Works, and that the cars shall not be allowed to stand more than 15 minutes at any one time in loading or unloading. The city reserves the right to regulate or change the route of cars operating through the city, used exclusively for carrying mail, express or freight, but only in such a way that such route will connect with the other part of the line on which the company enters the city, and at the same time connect with the terminal station. The rates charged for either freight or express shall not exceed those charged by any other common carrier for similar matter. The companies shall not, however, be required to charge less than 80 per cent of the published rates now charged by other common carriers.

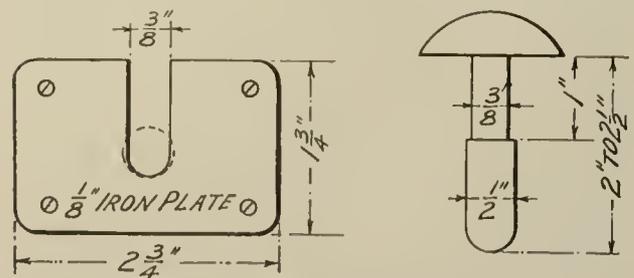
Each of the suburban or interurban companies, with the exception of the Union Traction Co. of Indiana, binds itself to pay one cent for each round trip made by any of its cars during the life of the franchise, and the city cannot charge more. The franchise terminates April 7, 1933.

The Indianapolis Street Railway Co. and the Indianapolis Terminal & Traction Co. have the right to exclude interurbans from their tracks if the latter do not pay the rates agreed upon for the use of the tracks of the two local companies.

ONE OF THE LITTLE THINGS.

The foot plunger for ringing the platform gong of a car is a small detail, but it very frequently becomes annoyingly conspicuous by its absence. The plunger hole in the platform sometimes wears away sufficiently to let the plunger drop through; or the men in cleaning the car may knock the plunger out and it becomes lost.

This petty annoyance can be avoided by placing over the hole a small iron plate having a narrow opening through which the plunger



FOOT PLUNGER FOR RINGING GONG.

works. For the suggestion and the sketch we are indebted to Mr. J. C. Sherrill, barn electrician for the Charleston (S. C.) Consolidated Railway Gas & Electric Co. The iron plate is about 2 3/4 in. long, by 1 3/4 in. wide, and is 1/4 in. thick. The slot or opening in the plate is 3/8 in. wide by about 1 in. long. To prevent it from working out of the opening the plunger is cut down to a diameter of 3/8 in. for a distance of 1 in. below the head. It is then placed in the slot and the plate is screwed down over the hole in the platform. The plunger is free to move up and down within the limits of an inch, but it cannot be removed from the hole without unscrewing the plate.

The Chicago Union Traction Co., on October 1st, put a new rule into effect, granting half fares over its lines on the West and North-west side to children between the ages of 7 and 11 years. Children less than 7 years of age will be carried free.

STREET RAILWAY CONSTRUCTION.

An interesting series of papers were recently read before the Boston Society of Civil Engineers which have been published by the Journal of the Association of Engineering Societies. The papers were as follows:

"The Street Railway System of Providence, R. I., and Vicinity," by George B. Francis; "Street Railway Track Construction in City Streets," by Arthur L. Plimpton; "The Relation of Street Railway Tracks to the Paving of City Streets," by Henry Manley; "Track and Overhead System for an Interurban Electric Railway," by Gilbert Hodges; "Street Railways and State Highways," by Harold Parker.

In the paper on the street railway system of Providence the author stated that the system was first put in operation in 1805 and now consists of 270 miles of track, 743 cars and 2,100 employes. This system includes the lines of the Union Railroad Co., the Pawtucket Street Railway Co., the Rhode Island & Suburban Railway Co., and the Interstate Consolidated Street Railway Co. These four operating companies are all controlled by the United Traction & Electric Co., of New Jersey, and are under the management of the same officers.

There are no less than 27 kinds of rails in the main tracks, not counting the variety of guard rails, etc., in the special work, and a number of improvements in the track work are contemplated and under way. These consist of the placing of concrete beams under the rail and avoiding ties altogether in some instances; the placing of at least 1 ft. of gravel ballast under the ties in all track instead of using whatever material happens to be convenient; the decrease in the spacing of ties to about 22 in. between centers; the increase in width and length of ties to not less than 7-in. widths and 8-ft. lengths; the placing of guard rails on all curves of less than 600-ft. radius; the placing of the switch tongue on the opposite side from usual practice in many cases so that the main track will be free from the tongue; the adoption of a lock for switch points as soon as a suitable method can be found for the various conditions; to locate interurban lines, as far as possible, on private right of way so that control may be had over grades, alignments and drainage as well as speed of the cars; to avoid sharp curves and reverses in curvature as far as possible; to improve the usual country bridges so there shall be no question as to the sufficiency of their strength; to improve private bridge floors up to the standard reached by steam roads; to eliminate the mate, so called, wherever possible and to use double-point switches connected together, thrown by a stand and capable of being locked.

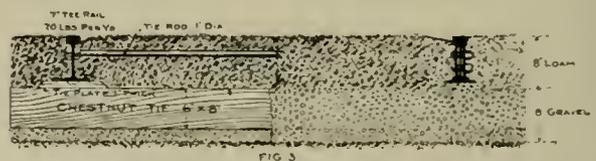
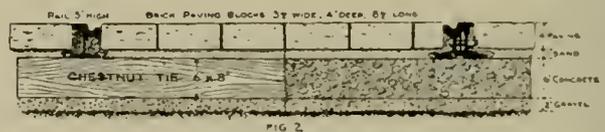
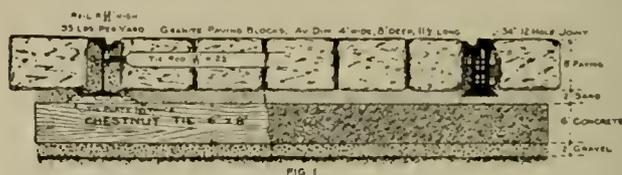
Much trouble has been experienced with chipped flanges, due to running over special work, as it has become the custom in street railway construction to build special work in such a way that when the wheels pass over the mates and frogs they bear on the flanges, thus avoiding the pounding over the break in the rail. While with light horse cars this may have been defensible, with heavy cars which must go through the city streets at moderate speeds and run upon the suburban and interurban tracks at high speed it seems wholly indefensible. At present the chipping of the flanges is a very serious matter and the only reason for building special work in the manner mentioned has been to prolong the life of the track. This is now being done at the expense of the life of the wheels. The only way which comes to mind of avoiding this trouble is the widening of the treads of the wheels from the present widths of 2¼ in. or 2½ in. to 3 in. or more so that by reason of the additional width the wheel may still bear on one portion of the frogs or mates until it laps over the space and begins to bear on the other portion. This is the reason why steam railroad wheels do not drop into the frog openings, and it can be applied to street railroads. This remedy involves care in paving outside of the rails so that the wheel will not have to run upon paving obstructions.

The author then touched upon the car houses and repair shops of the system, which were fully described and illustrated in the "Review" for May, 1902, page 255, and the freight and express service described in the "Review" for June, 1902, page 341.

STREET RAILWAY TRACK CONSTRUCTION IN CITY STREETS.

The author did not attempt to discuss street railway track construction in general, but confined himself to the track construction of the Boston Elevated Railway Co.'s system. After describing the

well-known early forms of rails used in horse car service the author led up to the deep girder rail, which was designed to allow paving with granite blocks. The accompanying illustration shows the standard track construction which has existed since the 9-in. rail was introduced. On top of the tie there is a plate of cast iron about 1½ in. in thickness, so that with the rail, which is a little less than 9 in., we have a height of 10 in. The plate has the added advantage of backing up the spikes and holding them against the base of the rail. When the city first began to put in concrete foundation and apply it to the streets where tracks existed it was found that this form of track construction was admirably adapted to the new conditions as the depth to the bottom of the tie, about 16 in., agreed exactly with the depth to the bottom of the grade, and no change in the track construction was necessary. Experience here has proved that there is absolutely no advantage in concreting under the tie. The track construction is bonded to the rest of the street by the tie being bedded in the concrete and if there is any settlement of the street below all will go together, and this would occur even if there was a bed of concrete under the tie. The tie rod, which is one of the most important parts of the track and which is required in order to hold it absolutely to gage has been largely increased in size since the days of horse cars and is now made 1 in. in diameter at the threaded ends. This not only is sufficient to stand the



strain, but allows something for rusting so that the rods remain effective and last as long as the rest of the track.

The joints in this rail are fish-plate joints, using 12 bolts. The center of the fish plate is made to bear against the rail; and if that point should meet the web of the rail before the plates come to the proper bearing at the head and base of the rail, the strain of the bolts would bring it to a bearing by bending the plate. It is designed to just touch there when the plates are in their final position.

The form of construction already described which lent itself so admirably to the granite pavement is of much greater depth than is required for the asphalt pavement. There are 3 or 3½ in. of asphalt and then 6 in. of concrete, so that when certain streets were first laid in asphalt it made all the concrete come above the tie so that it was in no way bonded to the track construction. In order to secure permanent track the railroad company decided to carry the concrete to a greater depth in the track than in the rest of the street so that it would be flush with the bottom of the tie. This method has been followed during the last three years, but is, of course, a very expensive construction. It gives a depth of solid concrete between the ties and adds about \$1,100 or \$1,200 per mile to the cost. It is obvious that if a number of miles of track were to be laid a rail not over 5 in. in height which would bring the top of the tie up nearer to the top of the concrete, would give a much more economical construction. The depth of 9 in. for the rail was made necessary only by the depth of the granite block pavement. This 10-in. construction, as it is called, laid with granite blocks on gravel base, costs at present prices about \$18,500 per mile of track in a paved street, where the city paves the roadway and the center between the tracks and the company paves the part

that comes in each track. Similar pavement, laid with pitch and pebble joints on concrete foundations, costs about \$23,400 per mile. The asphalt track is the most expensive, costing about \$26,600. The brick costs less than granite blocks, about \$22,500.

In the outlying tracks of the system where a reservation has been constructed in the roadway, another form of track construction has gradually been introduced which permits all pavement to be dispensed with. It is considered desirable to make these reservations grass areas and thus reduce the dust-bearing area of the street. At first it was thought that here was an opportunity to take up regular steam railroad construction and a T rail was laid in a number of cases in the earlier reservations, but this did not give a sufficient depth over the ties for the raising of grass. The 7-in. section of T rail has been finally adopted, laid on a 1-in. cast iron plate, giving a depth of 8 in. of loam over the ties. This gives a very elastic track and the difference can be noted at once in passing from a solid-paved track to a reservation track.

The author spoke of the welding of joints and said that while at first the process did not prove entirely satisfactory it had been of late years perfected to such an extent that it gave excellent results. The necessary plant, however, for carrying on this process is very expensive and a railroad can scarcely afford to own one for its own use. Furthermore, the track foreman should have it in his power to renew a worn or defective rail and put in a standard joint which would be out of the question with any form of welding, so the joint question appears to be still an open one. The joints used in the Boston subway seem to be nearly fulfilling all requirements. It is a fish plate carried around under the rails so as to provide a base support.

The first improvement in special work was to make it after the general idea of steam railroad work, that is of rails of the desired length and angles bolted together. This improvement was, therefore, a substitution of rolled steel in place of cast iron. The trouble with this class of work was that before it wore out the action of the cars would loosen the fastenings, and as in paved streets the fastenings are difficult to get at, the special work was often broken before it could be fastened, and was then beyond repair. The next step in the line of improvement was producing a solid frog, which was done in two ways. One, by making the center of the frog a steel casting and then welding on the arms, while another consisted of rails cast together by a mass of cast iron so as to give treads of rolled steel all through the frog. The defect which first appeared in this type of special work was actual wearing out of the frog centers, after which a new form of frog called the hardened center frog was offered. This form had a plate of Harveyized steel set into the center of the frog at the point of greatest wear, and these centers proved to be even better than rolled steel. After using the Harveyized steel centers for a year or two a form of construction appeared in which frog centers and parts of switches subjected to the greatest wear were made of manganese steel. The latter is still in use and has been brought to a condition that is difficult to improve upon.

THE RELATION OF STREET RAILWAY TRACKS TO THE PAVING OF CITY STREETS.

In the eye of those having the care of city streets, the rails of the street railway tracks are a nuisance; but, as they are permitted by the state, which is the owner of all streets when there is anything to give away, it becomes the duty of the officers of the city, with such co-operation of the railway companies as they may secure, to reduce and abate in part the nuisance which they cannot absolutely control.

The direct connection of the engineering department of the city of Boston with the street railway tracks began in 1891, at which time the street department called upon the engineers for assistance, and since that time substantially all new track work and renewals have been laid to grades furnished by the city. Previous to that time the railway engineers graded their own tracks and endeavored to fit the surface of the street as they best could, while maintaining a practicable grade upon which cars could be run.

There was a general lack of co-operation between the city and the railway; and when one corporation desired to reconstruct a street surface, the other was seldom ready, and the result was that the rails were fitted to the street, and later the street fitted to the rails, and as each work settled more or less, after the round had been repeated times enough, the tracks in the middle of the street were frequently found to be lower than the gutters. Latterly, the city

and the railroad have worked more in harmony, but in rearranging the surface of the streets it has not infrequently been necessary to raise the tracks a foot or fifteen inches.

The form of the head of the rail used is a very important matter to the street surface. The desirable features are: As narrow a head is feasible, with the necessary groove or slot for the flange of the wheel made as narrow as may be, so as to keep wide tires out of it altogether, and of such shape as to enable a narrow-tired wheel to turn out of it easily without a wrench. The sides of the rail on each side of the groove should be of equal height, so that the pavement may be smooth.

The standard rail used in Boston does not absolutely conform to this specification, but is a compromise between the tram rail (which has no groove at all and has a difference in height of about an inch and a quarter between the two levels) and the full-grooved rail with sides of equal height. The difference in height of the two sides of the Boston standard rail is about $\frac{1}{2}$ in. The full-grooved rail is very extensively used, however, both in this country and in Europe.

The next point in which the tracks affect the maintenance of the street surface is the stability of the track structure. In this matter it has been necessary for the street railway engineer to make a radical departure from the practice of the steam railway engineer. Instead of purposely building an elastic track, the street railway engineer reverts to the primitive idea in tracks and builds a solid and immovable structure. In a well-built track the rail is so deep and the ties so near together that there is no perceptible spring to the rail, and the more solidly and firmly the ties are imbedded in concrete, instead of the loose ballast of the steam track, the longer and better do the rails and ties wear. It is left to the springs of the cars to furnish the desired elasticity. It is apparent that a street in which this kind of track has been built can be surfaced with almost any paving material without much fear of a dissolution of continuity between the track and the rest of the street; but no form of pavement will stand up in contact with an elastic track, and the attempt to find a pavement that will do so, or to persuade different kinds of pavement to do so, has caused endless trouble.

It is the general practice to lay a narrow brow of stone blocks outside the rails in all asphalt pavement, and either to do the same on each side of the rail or to pave all the space from out to out of rails with granite blocks or bricks. It must be remembered that the asphalt part of an asphalt pavement is only a carpet, and is very friable. It is very likely to fray out next the rail, even when the tracks are solidly built. It does just the same when laid against the stone block brow, perhaps not quite so quickly or generally; but by so doing the weak spot has been removed from the area of pavement for which the railroad corporation can be held responsible.

The street railway tracks interfere with the surface drainage of streets built on side hills or on irregular ground, for the reason that nothing short of a flood will cross the track. In a few places drain inlets have been placed between the rails and in a few other places the rails have been furnished with openings at the bottom of the groove, thus providing outlets to be connected with drains.

Substantially all the railway tracks in Boston are paved. In macadam streets, where the ties are not imbedded in concrete, it is necessary to lay a strip of pavement, usually stone blocks, outside each track, wide enough to cover the ends of the ties and to form a bridge or connecting link between the tracks and the macadam. A double track, with its paved strip or brow, occupies about 18 ft. in width. The minimum width of a paved gutter is about 3 ft. or 6 ft. for both gutters, making 24 ft. in all. A street 60 ft. wide has a roadway, between curbs, of 40 ft. If a double railway track runs through it, there will be left two strips of macadam, each 8 ft. wide. Even this is too narrow a strip to maintain at average expense, and any street less than 60 ft. wide must be paved with something beside macadam from curb to curb; not because it is desired, but because of the street railway.

The cost of repairs of any street of moderate width carrying railway tracks is increased, first, by the concentration of the traffic, as teams avoid the tracks; and still more markedly by the formation of ruts and grooves caused by teams moving in parallel lines and all in one direction on each narrow strip of pavement. The extra cost of these repairs is somewhat a matter of conjecture, but it is probably that the cost of maintenance in macadam streets is at least doubled by the presence of the tracks.

TRACK AND OVERHEAD SYSTEM FOR AN INTERURBAN ELECTRIC RAILWAY.

Roadbed and Track.

A modern first class and fully up-to-date interurban electric railway should have a location that will admit of the most direct route with as few curves as possible, and so laid out as to grades as to have them as easy as possible. In arriving at this condition, it has been found not only desirable, but most economical to purchase private rights of way, make heavy cuts and embankments and build costly bridges and culverts. The cross-section of the roadbed at subgrade should give a full and sufficient shoulder, beyond the ends of the ties, of not less than 4 ft. on each side. There should be provided suitable drainage or culverts under the track wherever water is liable to accumulate to prevent washouts.

All bridges should be well designed by a competent engineer, and made strong enough to carry a car weighing 40 tons on a 17-ft. wheel base, with a sufficient factor of safety to avoid material tax upon any portion of the structure. If the bridges are to be of wood, they should have short spans of from 12 to 16 ft., and where several spans are required they would naturally have either pile or timber trestle bents. All timber, entering into the framing of a bridge should be of long leaf southern pine of the best grade to be obtained in the market, well framed and thoroughly fastened in every way.

Where piles are used they should be of upland white oak, if possible to obtain it. Red oak, chestnut oak and chestnut do not make satisfactory or durable piles. No piles grown in swampy or low-lying soils should be allowed, as they will generally be found to have a coarse, spongy wood which is sensitive to moisture and liable to early decay. Great care must be used in the driving of piles, to see that they not only reach a firm foundation, but also that they are not split or broomed at the small end by injudicious hammering. This work should always be done under the inspection of a competent engineer. Where steel bridges are used, they should be either of eye beams, plate girders, riveted trusses or pin and link trusses. Eye beams of proper size and number may be used with safety and economy for spans as high as 30 ft., plate girders from 30 to 100 ft., and riveted trusses from 100 to 200 ft. For all spans over 200 ft. in length the best practice is to use the pin and link truss. All bridge floors should have ties not less than 10 ft. long and spaced not farther apart than 8 in. in the clear. On the outer ends of these ties there should be a guard stick, gained down between the ties and securely bolted to every third or fourth tie. The office of these guard sticks is not, as is generally supposed, to prevent a derailed car leaving the bridge, for the stick is generally so placed that, should the car go so far as to reach it, the tendency would be for the car to topple over the side, regardless of this slight obstruction. The guard stick is intended to serve as a spacer for the ties, and to keep them in place longitudinally, so that they shall not bunch up. Hence the importance of having the guard sticks gained down not less than an inch on the ties. For the purpose of keeping a derailed car from leaving the bridge, a heavy rail should be placed inside each track rail spaced about 8 in. away from it, and securely spiked and fastened to the ties. These rails, if properly spaced, will permit of a car dropping between them and the track rail, and will generally keep the car in that position, thus carrying it along in the direction of the track and preventing its leaving the bridge or striking the trusses. Guard rails should extend for a distance of not less than 60 ft. from each end of the bridge, and then be brought to a point at the center of the track. No bridge, however small, should be without a protection of this kind. Assuming that the roadbed has been carefully graded and brought to subgrade, and the drains, culverts and bridges built, we then come to the work of track laying.

On the subgrade, as prepared, are laid the ties, which should be not less than 6 x 6 in. and 8 ft. long, of good sound chestnut, if possible to obtain. Ties should be hewn rather than sawn, and should be straight and lie level and true on their beds. They should be spaced not more than 2 ft. on centers. To these ties are spiked the rails, which should be of a good section of T rail, weighing not less than 60 lb. to the yard. Most interurban roads use 70 lb., and some use 75 and even 80 lb. These rails should be 30 ft. in length, and should have an improved joint, such as the "Continuous" or the Weber joint. Joints need not be over 24 in. long if of either of the two kinds mentioned. Too long a joint is as

detrimental to track as is too short a joint. These joints may be laid squarely across the track, or they may be staggered or broken, as desired.

The discussion on this question is still going on, and each side has many sponsors.

An allowance for contraction and expansion should be made at every joint, usually about $\frac{1}{8}$ in. for every 30-ft. rail laid at the average temperature. The spikes should be 5 $\frac{1}{2}$ x 9-16 in. and of the best quality of tough material. There should be four spikes to each tie; those on the inside so driven that they do not come directly opposite those on the outside of the rail. Very careful and thorough driving is quite essential. In placing the joint plates in position, care should be taken that they have a good bearing upon the rail, the nuts screwed up on the outside and the whole joint made rigid and firm. Care should be taken to have gage lines of the two rails coincide at all joints.

After the rails have been spiked to the ties to a true gage the ballast should be put in place. The ballast should consist of good, clean sharp gravel or of broken stone of a suitable size, and should have a depth of 2 ft. and extend for at least 2 ft. beyond the ends of the ties. In bringing the track to its proper surface and alignment shovel tamping may be allowed, but no shovel tamping should ever be allowed on finished work. After the track has been thoroughly tamped, the ballast should be rounded off on the sides, and the entire roadbed left in a neat and smooth condition.

When the track has been made secure in true line and surface, the electrical connections may be made. All holes for electrical connection should be carefully drilled, and they should be reamed out or otherwise made bright and clean throughout their perimeter, immediately before the bond is applied. There should be two rail bonds, of not less than 0000 capacity each, at every joint; and cross-bonds of the same capacity should be put in place, one in every 300 ft. These bonds should not be applied by hammer riveting, but should be put in place by pressure, either of screws or by hydraulic pressure, to insure their best possible contact. The track return, on electric railways, has so far not proved entirely satisfactory. Various attempts have been, and some are now being made, to discover a more practical and more reliable means of carrying the current by the joints, but so far it does not appear that any better means have been devised than that described herein; and therefore, with the knowledge that the best we have is not absolutely certain to keep up the voltage a long distance from the sources of power, it is evidently wise for us to use the best methods and best appliances that have so far been found.

All curves of 500 ft. radius or less should be well guarded, not with another rail or other makeshift, but either by a bolted-on Z guard or by a rolled guard rail. On curves of very short radius, both rails should be guarded, and wherever it is possible all curves should be well elevated, to insure the safe and comfortable passage of cars at high speed. Curves of sharp radius should be either compounded or laid with spiral or easement curves at their ends. The turnouts or side tracks for interurban roads should have split switches of the Lorenz or other similar pattern, with spring frogs, and their leads should not be less than 60 ft. Wherever the car houses are located, their switches, curves and connecting tracks should, if possible, lead out of a side track or turnout rather than out of the main line. Wherever cross-connections are used in double track lines, they should if possible be trailing cross-overs, so that cars running on their proper tracks would pass through the heel of the switch first.

The summing up of our remarks on track work will be, then: Prepare a good foundation; use large ties, close together; lay thereon good heavy rails; have plenty of good ballast, well put in place; make the best possible electrical connections and slight nothing; do not for one minute forget that good, substantial, well-laid track is a vital factor in the economical operation of a road and is a large factor in the earning capacity.

This is not imagination. The wisest railway operators are of this opinion, although a realization of its truth came very slowly, indeed, to some of them.

Overhead System.

Next to the track work, in the construction and equipping of an electric railway, comes the overhead system. In overhead construction the first item to be considered will naturally be that of poles. These should be of good, sound chestnut, if possible to obtain, and

unless otherwise restricted by local requirements. Hard pine poles are to be avoided wherever and whenever possible, as they are often very short lived and therefore very expensive to maintain, as well as being somewhat more costly at the outset. If square or hexagon poles are absolutely required, within the limits of cities or thickly settled villages, it will be found to be economical to obtain good-sized chestnut poles and have them sawed into shape, for they will have the longer life. We know of one urban road in this state, that now has large numbers of this kind of poles, and they have found them to be entirely satisfactory, so far as we have been informed. All chestnut or round poles designed for an interurban railway should not be less than 35 ft. in length. They should finish not less than 7 in. in diameter at the small end, and should be no less than 10 in. in diameter 7 ft. from the butt or large end, and they should be straight and sound. Hard pine poles, if used, should be of good, sound long leaf southern pine, 10 x 10 in. and 35 ft. long, with tops not less than 7 x 7 in. The poles should be fitted with two cross-arms, to provide properly for both direct and alternating current transmission wires as well as the necessary telephone and block signal circuits. These cross-arms should be of such sizes and so arranged as to meet the requirements, which would probably not be the same on any two roads. Generally it is thought well to have one two-pin arm above and one four-pin arm below. It is hardly necessary to say that cross-arms should be so placed as to come on opposite sides of adjacent poles, in order to form what is known as a storm line. Locust pins are used on straight lines, and iron pins or guard pins should be used on all curves or wherever any unusual strain is brought upon the pins. All poles should be well galled and roofed, and entirely stripped of bark before setting. They should be well set to a true line, and with sufficient rake to present a good appearance when the line work is finished. Poles should be 6 ft. in the ground on straight lines, and at least 7 ft. on curves. The earth or other filling should be well and thoroughly rammed around the pole, so that it will be firmly bedded and held solidly in place. No pole should be placed less than 5 ft. from the nearest rail and no two poles should be further apart than 100 ft. Some interurban roads have cross-suspension or span wire construction throughout, on account of the heavy trolley wires and the correspondingly heavy overhead material. Where brackets are used, the flexible or Craighead type has been found to be the best. They should have extra heavy brace rods, and be not less than 9 ft. long. They should be securely fastened to the poles at a uniform height from the rail. Spans should be made of seven-strand 5-16 in. wire, all guy wires of No. 4, and all anchor and pull-off wires of No. 6, best grade of galvanized wire, fastened to the poles by 5/8-in. eyebolts with 5-in. thread. It is considered good practice to have two trolley wires on long distance interurban roads. They are generally of large size, either 000 or 0000, and of a grooved pattern. The wire should be hard drawn and of not less than 95 per cent conductivity. They should be strung not less than 18 ft. above the rail, and may be placed higher. Grooved trolley wires are supported by mechanical clips of brass or composition, of a length sufficient to produce an even surface for the wires. First-class hard rubber or compressed mica, surrounding the metallic portion of the hanger, is considered the best insulation. The very best overhead material that is made is none too good, and quality and durability, rather than price, should govern in the selection of all overhead material.

The feeder and return wires may be of copper or aluminum. The latter is very much lighter than copper. It is generally used at about 61 per cent conductivity. At that value it weighs about half as much as copper of 95 per cent conductivity, and, at present prices of copper, is about the same cost for wire, while a saving will be made in freight, cost of handling and labor of erection. It is strong and durable when in the form of a stranded cable, and has been proved for efficiency and economy. Where high tension or alternating transmission wires are to be put in place, they should have special insulators tested for high voltage, of a good design and reliable manufacture. These high-tension wires may be of No. 2 or No. 4 B. & S. gage, and they are usually arranged for a three-phase system. This will, however, be governed by the types and the voltages of the instruments at the power station. All direct current feeders should be tapped to the trolley wire often enough to give good distribution to the current. This spacing of taps will be governed by the location of heavy grades and by the size and number of the trolley wires in use. The overhead system should be divided into sections convenient for the operation of the road, and,

so far as possible, to obviate the crippling of the service in case of breakdowns, storms or other emergencies on the line. It is not necessary to paint the poles, nor has any form of preservation so far been used that has proved to be of much value for prevention of decay at the ground line. Painted poles, however, present a better appearance, and in villages and thickly settled districts they will be found to be desirable.

Third Rail System.

The third rail system has for a number of years been in use, both in Europe and in this country, but until recently has not been used much for surface roads. In order to have this system of practical value, it should be applied to such roads only as are largely outside of the highways and where the highway travel will not reach it. In other words, a road using this system should be located almost entirely on a private right of way. Of course this would not prevent any such road from using the highways at termini, or at important points en route where the overhead system would be necessary. There must, however, be long stretches of road where the third rail can be safely used, before it can be economical to put it in use.

When they were first brought into use, a hooded or yoke rail was used, of a special pattern costly to roll. This rail was put in place in the center, between two track rails, but it has been superseded by a T rail on insulating blocks, placed either midway between the two track rails, or to one side of the track, according to the location of the contact brushes on the cars. The track construction, on a road of this type, should be about the same as, and ought to be fully up to the standard of, the road which we have just described. The overhead system will, of course, be done away with, and in its place a rail, having a low percentage of carbon, with the necessary joints, insulators, cables at crossings and other applications, must be put in place. When the third rail is located outside of the track rails, it has been placed about 26 in. away from the nearest rail, and it is elevated above the track rails in order to give good and sufficient insulation. For this purpose, extra long ties, about 9 ft. 3 in., are necessary, once in about every 10 ft. These ties should have sawn faces, and be of such wood as will hold bolts or lag screws. The insulators should, beside having the required insulating quality, also have strength to sustain the heavy third rail, which usually weighs about 80 lb. per yard. As already stated this rail should be of a stated mixture of metal, and have an exceedingly low percentage of carbon, manganese and phosphorous.

It is the custom to provide, in the third rail, sufficient capacity to carry the entire current between sub-stations without any added feeders, and on this account the bonds at the joints must be of a capacity to carry this current, probably upward of 400,000 c. m. in most cases. These bonds can be applied to the bottoms of the rails, where they are out of the way and where a very satisfactory attachment can be made. Underground cables are used at highways and farm crossings to complete the circuit, on account of the rail being broken at those places.

In addition to a very careful fencing of the right of way, it will be necessary to construct cattle guards at all points where crossings or openings into the highway occur. There are at present, in New England and vicinity, but two roads which use the third rail outside of the Boston Elevated, which, of course, is a purely city road and is not of the class now under consideration.

Cost.

The cost of the roadbed, track and overhead system for interurban roads will vary, of course, according to the type of construction adopted, the character of the country through which it is located and the relative location and number of its power stations. For an example I will quote a road that is now approaching completion, and which is a good sample of the road which I have described. The cost per mile, not including anything for equipment, power plant, buildings, etc., will be practically as follows:

COST OF ROADBED AND TRACK FOR ONE MILE.

14,300 cu. ft. of earthwork at 45 cents.....	\$6,435.00
325 cu. yd. rock work at \$1.75.....	568.75
Three acres of clearing and grubbing at \$75.....	225.00
3,000 cu. yd. of gravel ballast at 50 cents.....	1,500.00
640 rods wire fencing at \$1.....	640.00

Pipe culverts	50.00
Masonry for bridges and culverts.	1,000.00
Wooden and steel bridges.	1,300.00
Land for private right of way	1,000.00
Total roadbed	\$12,718.75

TRACK

110 tons 70-lb. T rails at \$31.50	\$3,465.00
360 "continuous" rail joints at \$1.54	554.40
2,640 6-in. x 6-in. x 8-ft. chestnut ties at 54 cents.	1,425.60
5,870 lb. spikes at 2 1/4 cents.	132.07
720 bonds in place at 61 1/2 cents.	442.80
17 cross bonds at 50 cents in place	8.50
Labor laying track	1,056.00
Teaming material	270.00
Total track	7,354.37
Superintendence and engineering.	500.00

Total roadbed and track. \$20,573.12

OVERHEAD SYSTEM FOR ONE MILE.

Poles, brackets, cross-arms, etc., in place.	\$650.00
Trolley wires and overhead material in place.	1,100.00
Direct and alternating current feeders in place.	1,750.00
Block signal and telephone systems.	2,000.00
Superintendence and engineering.	100.00
Total overhead system.	5,600.00
Total	\$26,173.12

The foregoing figures include nothing for interest during construction. The construction of the roadbed and track for the third rail system, as applied to an interurban railway, will be found very nearly, if not quite as high, as the cost of a railway using the overhead system and on the same locations, when the cost of all the necessary additional safeguards is taken into consideration.

With reference to the general subject of the need of the best, most substantial and most carefully planned roadbed, track and overhead system for interurban roads, we wish to reiterate what we have before said as to its importance, its ultimate economy and advisability from all practical points of view. When we consider that 40 miles per hour will be the possible speed of the cars upon a road now being built in Massachusetts, which is, we are informed, to adopt a schedule time of 20 miles per hour including all stops, and that we, ourselves, have ridden on a single track interurban road in Ohio at the rate of 60 miles per hour for 21 miles on a special trip, and that the schedule on that road calls for nearly 50 miles in places, it is evident that the money, carefully and judiciously spent to secure the very best construction in all parts of a property which goes to make up the way for the passage of the cars at these high rates of speed, is well spent, and that any scrimping or saving in this direction is not only poor economy, but is the most unwise policy that can be pursued. To those who have long advocated the building of roads in a substantial manner, who have on their part endeavored to see that roads under their supervision were so built, it is a source of satisfaction to see, at last, the owners and operators of railway properties fast coming into line and constructing their roads more and more in accordance with what is the best and most modern practice.

STREET RAILWAYS AND STATE HIGHWAYS.

The author of this paper stated that the Massachusetts Highway Commission was organized upon a plan laid before Governor Russell by a preliminary committee and after a year of hard work this committee framed a bill which became the foundation of the highway laws of Massachusetts. Slight modifications have been made from year to year, but the main law stands as at first drawn. The theory of the Massachusetts highway policy is to shape a network of excellent roads connecting each town with its market and ultimately creating continuous roads from city to city from end to end of the state and with adjoining states. The commission does not consider through roads leading directly from one large city to another as the

main object, but believes that these through roads will be the ultimate result of first uniting each town with its neighboring town.

The distinction drawn by the author between a state highway and a street railway, as far as the actual relation to the public is concerned, is that the latter is used for greater distances than the former. The average distance driven is not over 500 miles; for greater distances other means of conveyance than carriages will generally be employed. Both the highways and street railways follow the same general lines of travel and although one conveys passengers to a greater distance than the other, they both lead into the nearest important centers of population and must pass through as many towns on the way as possible. These two great foundations for travel have grown in importance side by side, and they must, of course, come into contact. The laws of the state give the state highway commission necessary authority to protect the public welfare except that they do not give it the right to act in a judicial capacity. It can fix the location and grade of any street railway that proposes to come within the side lines of a state highway, and it may apportion the cost of changing the grade or line. It may also upon the petition of the proper parties, establish lines of grade for the street railways on any road that it may decide shall, at some future time, become a state highway, and may apportion the expense between the highway commission and the street railway company. It may determine the size and shape of the rail, the kind of service, the place and method of crossing, and the extension of culverts and bridges. No contract may be let within the limits of a state highway without a special decree showing the exact location of track and profile with detailed specifications. The inner rail is never allowed to be nearer than 4 ft. from the edge of the macadam and a greater distance is preferred. The commission usually requires the street railway track to conform to the line of the cross-section, following the regular slope of 3/4 in. to 1 ft. In practice, however, it has been found that this outline of cross-section is not always the best, as water in passing off the road surface follows the rails and on grades often does much damage. It seems to the author that under ordinary conditions it is probably better to lay out a shallow depression or gutter between the shoulder of the highway and the end of the tie. It frequently happens that, for other reasons than these it is better to elevate the track above the road. Where it is necessary for a street railway to cross a highway the grade line is accurately determined so as to cause as little depression in the highway as possible. The weight and section of rail and kind of surface to be used are specified in the decree. The commission has usually found that a brick surface between the rails, and 18 in. or more outside are best. There are, of course, no end to the number of points of contact between street railway companies and the highway commission, but since the author has been a member of the commission he has seen hardly an instance in which the street railway officials have not readily accepted the conditions prescribed, even where they involved considerable additional expense.

PITTSBURG RAILWAYS TO ACCOMODATE ISLANDERS.

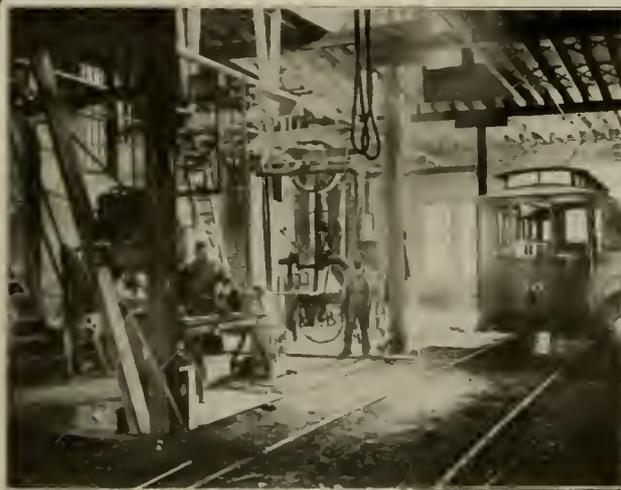
The Pittsburg Railway Co. has acquired the rights and franchises of the Pittsburg, Coraopolis & Monaca Street Ry. and will build a double track system across Neville Island to connect at Coraopolis with other lines, thus affording a through trip in one direction, 32 miles long. The object is to render Neville Island more easily accessible from Pittsburg and to accommodate the employes of the large manufactories which have secured sites for prospective plants on the island. The island has an area of 1,000 acres and was formerly occupied by farmers. Owing to the ingress of manufacturers, streets are being surveyed and other improvements effected which will render the island habitable. At present, connections with Pittsburg are made by a single electric line, running across the bridge into Fleming Park. The proposed double track system will be 14 miles in length and an agreement will be effected with the independent company which operates between Monaca and Beaver Falls, so that a through route to the latter city will be afforded, the route for a part of the distance practically paralleling the Pittsburg & Lake Erie R. R. The company will expend \$120,000 in making the improvements of the lines on the island. Cars of the large interurban type will be operated.

IMPROVEMENTS ON THE KANSAS CITY-LEAVENWORTH INTERURBAN.

BY N. B. PERRY.

Owing to the enlargement of Fort Leavenworth to a garrison of 3,000 troops, the Kansas City-Leavenworth electric lines have recently met with a heavy increase of traffic and it has been found necessary to considerably increase the capacity of the road. New tracks have been laid to reach the new Federal prison at the north-west limit of the city, and a new route, which does away with a large number of trestle bridges, has been built over the government reservation between the city and the fort. The headway of the cars has been considerably shortened and four new 51-ft. Kuhlman cars have been added to the service between Kansas City and the post.

A sub-station is located at Fifth and Spruce streets, in the heart of the city, and with other buildings of the company, occupies about a quarter of the block. A new three-story building to contain the general offices of the company is being located on this site, and a



A CORNER IN THE MACHINE SHOP.

car barn 65 x 170 ft., capable of accommodating 25 cars, has also been built.

Adjoining the sub-station is a machine shop 30 x 100 ft. in size, where repairs are made, and there is also a store room 15 x 30 ft., and an armature room 40 x 60 ft. on this site. In one end of the latter room freight is handled and the freight traffic has grown to be a considerable feature between Kansas City and Leavenworth. The buildings of this group which are now finished cover 180 x 285 ft. of ground.

The sub-station receives current from the Wolcott power house, 12 miles distant, and contains a three-phase rotary converter running at 500 r. p. m., transforming alternating current of 375 volts to direct current of 550 volts, and three step-down transformers of 12,500 volt primary and 375 volts secondary. The rotary converter is brought up to synchronizing speed by the direct current from Wolcott. The transformers are cooled by a fan giving an air pressure of 3/8 of an ounce. Power is generated at Wolcott at 13,000 volts and the current is stepped down and transformed at the Leavenworth sub-station to 550 volts, at which it is distributed to the lines.

Another sub-station is located at Chelsea Park, at the Kansas City end of the road, 12 miles from Wolcott, and contains a 250-kw. rotary and transformers, and at Wolcott there is a Stanley 400-kw. rotary and transformers.

A wealthy citizen of St. Louis, whose name is withheld from publication has contracted for the space in the local street cars which is usually reserved for advertising, and has caused to be placed therein scriptural quotations of an admonitory character for the edification of the traveling public. The contract provides for the display of such cards in 200 cars for a period of six months.

THE CROYDON (ENGLAND) TRAMWAY SYSTEM.

The tramways in Croydon cover a route of 10 1/2 miles of track and are being operated, during a limited period, by the British Electric Traction Co., Ltd., under contract with the municipality. The company pays the city 6 1/2 per cent of the investment and 4 cents per unit for the current consumed. The road consists of 5 miles of double track and 5 1/2 miles of single track, and the cars are of the double-deck type, seating 52 passengers. The company has 37 cars in service, with a number in reserve. These travel at speeds varying from 4 to 10 miles an hour according to whether the district is in the city, or suburban. The outside seats are of the reversible back type and the inside seats are of perforated bent wood. The staircase is of the reversible type which has been criticised as causing loss of time in reaching and leaving the outside seats as passengers cannot pass upon the stairs. The city has accepted bids for supplying 10 double-deck cars capable of seating 69 passengers.

The car shops are situated in Thornton Heath, are capable of accommodating 30 cars, and are built so as to be readily extended. In the new portion of the barn the tracks are carried on cast iron columns and are floored with loose planks to facilitate the machinery being easily removed into the pits when necessary. A room is being provided for the employes at these barns, which is to be comfortably furnished and supplied with papers, magazines, games, etc.

THE STUDENT OF MECHANICAL ARTS, AN APPRENTICE.

A paper on this subject was read by J. D. Hoffman, M. E., of Purdue University, at the 14th Annual Convention of the Association of American Agricultural Colleges and Experimental Stations. The author stated that many writers on the subject of technical education seemed to believe that the product of an educational institution is far inferior to that produced through the busy marts of trade. The central point of attack of these writers is the apparent inability of schools teaching mechanical arts to turn out machinists, pattern makers, foundrymen and other tradesmen who, at the time of completing their course, are skilled workmen. The author speaks of the technical school and of the shop both as training places where a young man may educate himself in the line of general mechanical work. These places, he believes, should not be considered antagonistic, but mutually helpful to each other, since both are endeavoring to turn out men of the highest possible shop value. The comparison of the student and apprentice is difficult to make on account of the training of each being along such dissimilar lines. The student that has experience in many lines should not be called upon to stand an examination in only one subject in competition with a man thoroughly experienced in that special feature, yet in many cases this is done and the student is told he is inferior to the shop-trained man. Examination as to his fitness as a shop hand should not be conducted along any one line, but along various lines, in which case he presents an entirely different appearance. The author claims that the student receives largely an equivalent practice in shop methods, but much more than that goes to make him a valuable member in any working force, and which cannot be obtained in the shop. No claim is made that the graduate can turn threads as fast as the man who has served his entire apprenticeship of three or four years as a lathe hand, or that he can chip and file a surface as quickly or as well as the vise hand of several years' experience, but rather that he will take a job from its inception and carry it through the various lathes, planers, grinders, shapers, drills, etc., to completion and will keep alongside, if not a step ahead of the man who has had the benefit of the training usually given to the apprentice. The demands for technical men at present prove that the student has so far been successful and the statement that the technical graduate is falling into disrepute is not well founded.

Detectives in the employ of the South Side Elevated Railroad Co., of Chicago, recently discovered that a systematic fraud was being practiced by the ticket sellers at two of the "Alley L" stations. The plan consisted in the selling of bogus tickets during rush hours, and in consequence of its being discovered two employes have been discharged.

IN THE POWER HOUSE

This department is devoted to the construction and operation of electric railway power houses. Correspondence from practical men is specially invited. Both the users and makers of power house appliances are expected to give their views and experiences on subjects within the range of the department.

FOR DETECTING GROUNDS AT THE POWER HOUSE.

A power house engineer soon learns that the different lines feeding from his station have individual temperaments, so to speak, almost as varied as human nature. On one feeder panel the circuit breaker may go out on the average half a dozen times a day owing to temporary combinations of conditions brought about by the number and size of cars on the line, the number and location of grades, poor handling of controllers, or one of a score of other causes. On the other hand the breaker at another panel may not blow once a week, but when it does go out the attendant usually is justified in assuming there is a serious ground somewhere.

For aiding the engineer in determining the degree of ground on any line and therefore to some extent the steps that should be taken to remedy the fault there is used at the several power houses of the United Railways & Electric Co., of Baltimore, a ground detector, the details of which were suggested by Mr. Carsoll Thomas, an electrical inspector for the company, Mr. Thomas furnishes us the following description of the instrument and the way it is made:

The accompanying sketch shows a ground detector used on the 500 volt circuit at the Pratt street power house of the United Railways & Electric Co., of Baltimore. To make this instrument, take a Weston illuminated dial ammeter of the type that measures the drop in potential through a resistance inserted in the circuit, or a voltmeter will do if only the armature coil is used and the resistance cut out. Take off the lamp receptacle from the center of the

of the dial. The object of the box is to exclude the daylight from back of the dial. The receptacles in the box should be placed in the locations shown.

Take 6 lamps wired in series, the lamps being of the same kind that are to be used in the instrument, also take the wire that is to be used as the resistance C, A, and B and make connections according to the sketch Fig. 2. Connect the negative side of the meter to the

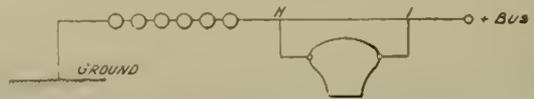


FIG. 2—METHOD OF CALIBRATION.

wire at II and move the positive side towards the positive bus until the needle gives a full deflection. This length of wire will be the length of A C in Fig. 1.

Let the wire of which A C forms a part extend in one unjointed piece from receptacle E to receptacle F, then tap the wire from the first four lamps in the center at A, and make A C and A B equal in length. The reason for using this number of lamps is as follows:

There are four lamps to start with and a resistance equal to one lamp in the series will allow them to come up to candle power. On the ground side there are two lamps, which is one more than necessary, but when the line wire is connected through the ground there are two lamps in parallel with the other two which halves the resistance, making a resistance equal to one lamp, which, added to the first four, brings them up to candle power.

Another object in using the two lamps in series on each side (ground and line) is to avoid burning them up by getting the line permanently connected to the full voltage, which should not happen, as the wire should always be removed before throwing in the switch. If it should be connected for only an instant the lamps will flare up, and if left on the only damage will be to burn up one or both of the ground lamps as there will be only four lights on this circuit and the ground lines will also get current from the lamps connected to the positive bus.

To calibrate the instrument make the wire to the ground and the wire for the line connections of equal resistance. The upper figures on the scale represent amperes that will flow the instant the switch is pulled. The bottom scale shows the resistance in ohms of the line and cars, or of the ground. Then take some value in amperes, say 300. If the station voltage is 500, insert 1.66 ohms between the end of the line connection and the ground. Continue this down to 1/2 amperes and 1,000 ohms, which would represent one car on the line with one lamp circuit burning. When the needle stands at the left hand end of the dial it shows there is no flow of current through it and the drop is the same from A to B as from A to C. When the needle stands at the right hand end of the dial it shows that the line is clear.

To test for grounds on the line, hook the line connection to the line wire, disconnect from the positive bus by leaving either the switch or circuit breaker open. If only the left hand lamps light up and the needle swings to the limit on the right hand side the line is clear. If both sides light with equal intensity and the needle stands at same position as when disconnected from the positive bus it shows there is a bad ground or an unmeasurably low resistance on the line. The readings are affected somewhat by the drop in the rail due to the flow of current from the other lines, but the operator soon becomes acquainted with the action of the instrument on the different lines and can judge by the character of the fluctuations what the nature of the trouble is.

A simpler method of testing grounds than that described is used

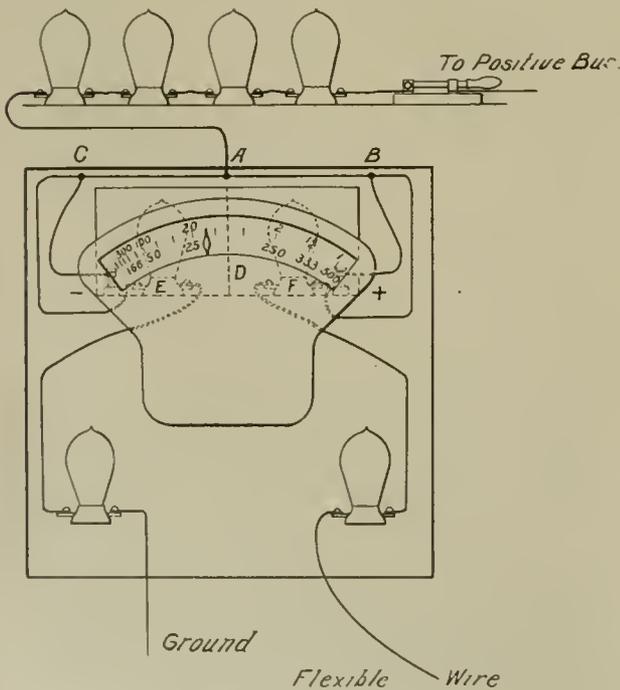


FIG. 1—GROUND DETECTOR.

meter and mount the instrument in a wooden box having its sides lined with tin. The function of the tin is to act as a reflector. This box should be large enough to hold the lamps and receptacles as shown in the sketch. Place a thin partition in the center of the box from the center of the dial to the back of the box. The object of this partition is to keep all the light from each lamp on its own side

by some of the other stations on this road, which consists in connecting the lamps in the same relation but omitting the instrument and depending for an indication only on the variation in the lighting of the lamps. The lamps connected thus will show a change varying with the line voltage, when a straight series of five lamps will not show a flicker. The lamps on the instrument may be tested by attaching the line connection to the ground connection and if the lights are not equal it shows that the lamps are not alike. The lamps should then be changed until the lights show all equal.

POWER HOUSE NOTES.

BY ARTHUR B. WEEKS.

An occurrence which once proved a great surprise at two power houses was due to a severe short circuit on a 10,000-volt transmission line. A fire, caused by defective lightning arresters, and lasting a couple of hours, was extinguished with water, after a hard fight. One part of the building, where the three-conductor cable entered the power house from another power house three miles distant, was comparatively remote from the scene of the fire, and was supposed to be unharmed. In closing the switches there, however, a sound was heard which nobody about a power house where high voltages are used could possibly mistake for anything but a short circuit. Large cables, 300,000 c. m., were burnt off back of the switchboard as though they had been chopped off with an ax. Although there was an automatic oil switch on the secondary, and circuit breakers on the primary, yet the circuit breaker did not open until much damage was done. The trouble was traced to water, which had found its way into the cable head, where the three conductors were separated from the cable, for the purpose of making connection to the switchboard.

On another occasion, a short circuit occurred on a 10,000-volt line, and the circuit breaker did not open, having stuck fast. The cause of this sticking was found to be due to the expansion of the large copper contacts of the breaker, from continued overload.

A peculiar freak on a 22,000-volt feeder at a series converter took place one night without a second's warning. It was accompanied by a most peculiar noise in the generators, a very loud rattling. The load was immediately thrown off, and investigation disclosed that one of the three wires of the circuit was burnt off at the series converter as clean as in the case first cited. There were five feeders in parallel, and it was necessary to start up with reduced load until the trouble was remedied, which was done by making a splice, leaving out the converter in absence of another.

Among the things about a power house which seems to concern no one after they have been installed, excepting to keep the oil replaced or the air in circulation, are the station transformers. The writer recalls a plant of large capacity in which this portion of its equipment had not been examined in five years, until the feeder wattmeters read rather suspiciously. The removal of the large top cover disclosed two cables loose in their terminals, and very highly discolored. Right here is a lesson on the proper method of securing such cables to their binding posts, and making them accessible.

The resoldering of the cables was a serious problem with the repair men, and there was a feeling that they might not remain tight, even when the resoldering was accomplished.

Another point of great value to the switchboard electrician in charge of the operation of such a plant, is to have the feeder indicating wattmeters or ammeters, as the case may be, located where he may know the condition of the load at all times. He cannot intelligently operate a system where such meters are in a remote building, or in a superintendent's office, or in a cellar. They should be either on his switchboard, or at least in the same room, where he can easily see them. One chief advantage is that when a short circuit occurs, where the plant is not equipped with the most modern devices, he can tell when the arc has let go, and can then safely open the feeder switch to save the rest of the load. To open the switch without this knowledge would not be advisable, as a destructive arc might follow on opening the switch, and cause a shut-down after all, doing much damage as well.

One of the errors in power house designing, is not allowing for enough space between the high potential panels and other nearby apparatus. The writer, for instance, remembers a case where there were selector single element knife-blade switches, double throw. The upper connection was for bus-bar No. 1, and below was bus-bar

No. 2, both at times having loads which were not in parallel. The switches were operated by a 3-ft. pole which engaged in eyes at the end of each switch blade. Less than 4 ft. from the switch panels were large transformers. The attendant ran the risk of pulling the switch too low or dropping it to the bus-bar below, which of course, being out of synchronism with the bus-bars above, would produce disastrous results. There was almost always a severe arc on opening any of these switches, and on one occasion the attendant barely escaped cremation from this cause.

To design a system of bus-bars for high tension feeders requires considerable experience to avoid trouble. But however well the bus-bars may be insulated, and however neatly constructed, the improper dividing of the outgoing lines may cause serious errors which are very expensive. For instance, there may be four three-phase lines tapped from the common bus-bar. The first two legs of No. 1 line are side by side, with a marble slab carrier between, then a space; then the third leg of No. 1 line, followed by three others of line No. 2. Another space, and four switches, etc. An attendant, when taking off lines and putting on others, especially under the excitement of short circuits, is very liable to open or close the wrong switches, adding to the excitement already at fever heat.

Coupled with improper designing of power house switchboards as cited, is that of switches and circuit breakers too small for the work they are designed to do. Switches should be given length enough to rupture the arc, if they must be depended upon to do so when opened. The writer recalls a case where it was necessary for an electrician to request one of the power house customers to open his feeder switches, which were quick break, because the switches at the power house would not rupture the arc.

There could hardly be a worse condition than the arcing across phases when a switch or a circuit breaker opens, because of the barriers not having been properly proportioned, or more load put on the line than the circuit breaker can safely carry. There are numerous cases of this character which would be very instructive if published. Some plants have been able to remedy the trouble in part, where the arcing was due to short circuits when the circuit breakers opened, by placing an oil switch in series with the circuit breaker. In some cases, larger barriers have been the remedy, but where the duty is very severe—that is, the lines at times greatly overloaded—or where the power house requests its tenant to open its breakers in time of emergency, the better plan is to have the switches in series.

Piecing out marble barriers which were not large enough for the purpose intended with wood, asbestos lined, may be satisfactory enough on low tension lines. It is absolutely useless, however, on those of high tension; for one who has seen the results of electric arcs on asbestos, even at 500 volts, would never dream of placing it at the mercy of a 10,000-volt line.

Another defect is failing to allow space between high tension switches and circuit breakers, so as to properly open the switches. Still another is obliging one to go through a long, narrow passage between switches and breakers, upstairs, to close the circuit breakers of one line, and to go downstairs again to close the switches on that line. One must go upstairs as many times as the breakers open, which at times is very frequently.

On one occasion a short circuit blew the fuses on a certain feeder, and one of the circuit breakers of a two-phase line opened; but, as the cables to the switches were not marked, it was not certain which of the switches belonged to that circuit. Current was on the other phase, so it was essential to know positively which was the proper switch to open. This was found only after tracing the cables. Proper marking of circuits, switches, and circuit breakers would be the remedy in a case like this.

An original method for starting a 350-h. p. synchronous motor recently came to the writer's notice. Owing to the disabled condition of the direct current apparatus at the power house, the electrician could not start the motor in the usual way. With the assistance of a couple of men to pull on the rope of a block and tackle, the rope, which had been passed several times around the pulley of the motor, gave the armature sufficient speed to enable the electrician to plug in the alternating current switches. The motor started all right.

In certain cases where a plant is overloaded and a large induction motor is to be started, since it draws so heavily on the system when starting, if it can be started in some manner similar to that above described, there will be no difficulty in carrying the extra load after

the motor is once set in motion and the switch closed. Otherwise it would be better not to attempt to start it at all.

A common source of annoyance is due to placing feeder circuit breakers too close on the switchboards. A circuit breaker frequently, if opened under a heavy overload, arcs to an adjoining breaker and causes great damage. An asbestos box, asbestos lined, would prevent further damage, but the arrangement is anything but good in design, and far from being artistic.

Important switches for various circuits that are apparently an afterthought, something overlooked in the original design, are often placed in inaccessible places, where one is helpless, should it be necessary to use them in times of emergency. This condition of things should be carefully guarded against.

SOME STATISTICS ON THE COST OF POWER.

Statistical data on the cost of power are always of interest because managers all wish to know what their brethren elsewhere are paying per kilowatt-hour, even if the figures are not directly comparable with those from their own stations by reason of differences in conditions.

The following statistics are furnished us by a prominent street railway auditor. We are not at liberty to state the names of the companies, but the figures are actual records taken from the companies' books.

Case I is a large city system operating about 175 miles of electric track and about 1,000 cars. Power is generated in two stations, three miles apart, containing belt driven apparatus that is more or less antiquated and the stations are being run at a great disadvantage.

Wages	18.93	41,857.18
Fuel	64.78	143,278.29
Water	3.84	8,541.76
Lubricants and waste	1.24	2,730.87
Miscellaneous	3.10	6,849.22
	100.00	\$221,193.31

Total cost of power:

Total for year	\$221,193.31
Per day	606.01
Per day per car	1.29
Per car-mile	.0141
Per car-hour	.11
Per passenger (fare and transfer passengers)	.0023
Per kilowatt-hour	.0105
Average daily consumption of coal, tons	254
Average daily consumption of water, gal.	295,788
Average daily consumption of water, lb.	2,464,900
Water evaporated per pound of coal, lb.	4.9
Average daily kilowatt-hours	57,483
Average daily watts per motor car	128,885
Coal per car-mile, lb.	11.8
Coal per car-hour, lb.	94
Water evaporated per car-mile, lb.	57.8
Water evaporated per car-hour, lb.	461
Coal per kilowatt-hour, lb.	8.8
Water evaporated per kilowatt-hour, lb.	43.1
Total kilowatt hours for the year	20,981,295
Total car-hours for the year	1,966,430
Total car-miles for the year	15,702,380

COST OF POWER PER KILOWATT-HOUR AND OTHER DATA

ITEMS.	CASE I. *	CASE II. **	CASE III. **	CASE IV. **		CASE V.
				July	Nov.	
Fuel	.680	.803	.509	.958	.870	1.004
Wages	.199	.133	.115	.287	.276	.217
Oil and Waste	.013	.018	.012	.048	.025	.023
Water	.040	.	.077	.	.	.022
Maintenance, Buildings	.005	.	.	.	.	.015
" Steam Apparatus	.072	.029	.011	.	.	.035
" Electrical Apparatus	.008	.019	.001	.004	.	.010
Miscellaneous	.033	.023	.012	.	.	.
Total Cost, Cents	1.050	1.030	.669	1.299	1.188	1.326
Price of Fuel per ton	\$ 1.55	\$ 2.66	\$ 3.07	\$ 2.98	\$ 2.98	\$ 3.62
" Water per 1000 Gallons	.079	.	.	.	.	.
Output of Station, kw. h.	20,981,295	2,140,641	641,650	119,304	114,384	2,104,337
Car-miles run	15,702,380	739,958	.	113,429	109,770	619,466
Car-hours run	1,966,430	89,690	.	17,143	16,590	82,039
Kw. h. City Railway Use	.	.	.	.	.	979,243
" Booster Use	.	.	.	.	.	179,343
" Light and Power	.	.	.	.	.	945,711
Coal, per kw. h., lb.	.	6.04	.	6.40	5.55	5.55

* For one year. ** For one month.

As an aid in examining the figures the following explanations are given: (a) Fuel for power: Indiana bituminous screenings are used; at one of the plants the coal is delivered on track, at the other by wagons; the average cost per ton in the year reported was \$1.55. (b) Miscellaneous supplies and expenses of power plant: Some of the largest items in this account are the cost of boiler compound, rendered necessary by the quality of feed water used, and the cost of removing cinders and ashes, which has to be done in cars and wagons. (c) Pounds of water evaporated per pound of coal, per car-mile, per car-hour, and per kilowatt-hour: The figures on water evaporation represent only the water registered by water meters, and do not include all of the water consumed, for the reason that a part of the time at one of the power plants water was used from a reservoir into which flowed the drainage from rainfalls and the water used for washing out the boilers. A fairly conservative estimate of the amount of water used, in addition to the amount registered by the water meters, would be about one third more. This would make the water evaporated per lb. of coal 6.5 lb.; water evaporated per car-mile run 77.1 lb.; water evaporated per car-hour 615 lb.; water evaporated per kw. h. 57.5 lb.

The following additional data are furnished for Case I:

	Per cent of total.	Total.
Maintenance of buildings	.46	\$ 1,004.14
Maintenance of steam plant	6.85	15,157.32
Maintenance of electric plant	.80	1,765.53

COAL CONSUMED FOR "FUEL FOR POWER."

Tons in the year	92,626
Tons per day	254
Pounds per day	507,540
Pounds per day per car	1,071
Pounds per car-mile	11.8
Pounds per car-hour	94
Pounds per passenger	1.9
Pounds per kilowatt-hour	8.8

Case II is a system furnishing from one station current for lighting and for operating 230 miles of electric railway with 500 cars. The figures are for an average month.

Case III is one of the power houses on a large city system. The figures are for an average month.

Case IV is a combined lighting and street railway plant. The figures are given for month of July, one of the heavy months, and for November, one of the light months.

Case V is also a combined lighting and street railway station operating a city system, and an interurban line (by booster). The figures are for 12 months.

The Harrisburg (Pa.) Traction Co. has increased the wages of its employes, the new scale going into effect October 1st. The rate is now equal to the highest paid for similar service in the state. One hundred and sixty-five motormen and conductors are affected.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

PREMATURELY STARTING CAR.

Kellegher v. Forty-Second Street, Manhattanville & St. Nicholas Avenue Railroad Co. (N. Y.), 63 N. E. Rep. 1096. May 27, 1902.

It is doubtless true, the court of appeals of New York says, that it is the duty of carriers of passengers to allow persons entering their car a reasonable time within which to enter, and, if it is prematurely started with such unusual or unnecessary violence as to do the passenger injury while entering, a jury may be justified in finding the defendant guilty of negligence.

PROPERTY ADDED TO PLANT PASSES UNDER PRIOR MORTGAGE.

Westinghouse Electric Manufacturing Co. v. Citizens' Street Railway Co. (Ky.), 68 S. W. Rep. 463. May 27, 1902. "Not to be officially reported."

The law is well settled, the court of appeals of Kentucky says, that property added to the plant of a street railroad, and which becomes an essential and integral part of its road, passes under a mortgage previously executed and recorded covering its entire property and road constructed and to be constructed, although furnished under a contract by which the title was to remain in the seller until payment made.

INJURY TO WOMAN ATTEMPTING TO ALIGHT FROM CAR IN MOTION—INCREASE OF SPEED.

Blakney v. Seattle Electric Co. (Wash.), 68 Pac. Rep. 1037. May 13, 1902.

It need not, of course, be argued, the supreme court of Washington says, that a woman of mature years and discretion cannot recover from a street car company for injuries received by her while attempting of her own volition to alight from one of its cars while the same is in motion; nor need it be argued that it is not negligence per se (or in and of itself) to increase the speed of a car, nor that it is not negligence to do so when a passenger is in the act of alighting therefrom unless the car company knows, or could, by the exercise of reasonable diligence, have known, of that circumstance.

SILENCE DOES NOT RENDER COMPANY LIABLE FOR PAVING BETWEEN TRACKS.

City of Williamsport v. Williamsport Passenger Railway Co. (Pa.), 52 Atl. Rep. 51. May 19, 1902.

Where under its charter a street railway company is not liable for paving or repaving streets occupied by its tracks, or any portion of them, but only for keeping the streets in repair, it is not liable for the cost of paving between its tracks because it had knowledge that a paving company was proceeding to do the paving, and it did not in any way repudiate the alleged implied contract, the supreme court of Pennsylvania holds, when the paving was done by the paving company under a contract made with the city to pave the entire street, but to look to the street railway company only for paving between its tracks.

CONDEMNATION AS AGAINST ABUTTER IN NEW YORK.

Adee v. Nassau Electric Railroad Co. (N. Y. Sup.), 76 N. Y. 589. May 29, 1902.

The second appellate division of the supreme court of New York holds that, under the law of that state, where the establishing and running of a street surface electric railroad in the public streets of a city is an additional burden on the land of the adjoining proprietor, for which compensation must be made, a street surface railroad has power to acquire by condemnation the easement to construct and operate a surface railroad over a public street, as against an owner of abutting land, who also owns the fee of one-half the street in front of his land, and this notwithstanding the

declaration in section 90 of article 4 of the railroad law that "nothing in this section shall be deemed to authorize a street railroad corporation to acquire real property within a city by condemnation."

CONSTITUTIONAL FRANCHISE LEGISLATION.

Smith v. Indianapolis Street Railway Co. (Ind.), 63 N. E. Rep. 849. Apr. 30, 1902.

The supreme court of Indiana holds constitutional the act of 1899 providing, in substance, that it "may be lawful" for any city having a population in excess of 100,000 persons by the last federal census preceding the incorporation of "any street railroad company, now or hereafter organized," to enter into a contract with said company for the granting to said company of a franchise for a term not exceeding 34 years, subject to many conditions, relative to compensation, fares, paving, the use of its lines by suburban and interurban railroad companies, the right of control of the city, etc. It especially does not think that the act violates the constitutional provision that "the general assembly shall not grant to any citizen, or class of citizens, privileges and immunities which, upon the same terms, shall not belong to all citizens."

ATTEMPTING TO DRIVE ACROSS TRACK WITH CAR 75 FEET AWAY—DUTY OF MOTORMAN AT CROSSING, ESPECIALLY WITH VIEW OBSTRUCTED BY ANOTHER CAR.

Schoener v. Metropolitan Street Railway Co. (N. Y. Sup.), 76 N. Y. Supp. 157. May 9, 1902.

It certainly was not an act of negligence on his part, the first appellate division of the supreme court of New York holds, for the driver of a horse attached to a delivery wagon to attempt to cross the street, at a street crossing where he had as much right to the use of the street as the street railway company did, if the latter's car was then 75 feet away, and the jury would have a right to find, if the car were this distance away, that the company was negligent if it did not check the speed of its car and prevent a collision. A duty rested upon the motorman to have the car under control as it approached the crossing, and this duty was increased, if it was true, as contended by the company, that his view of the crossing was obstructed by the car of another company on a parallel track, for which reason he should have exercised more care. He could not approach the crossing at a high rate of speed, and then, when a collision occurred, excuse himself because there was another car in front, which prevented his seeing the crossing.

DILIGENCE REQUIRED TO PROTECT TRAVELERS FROM TROLLEY WIRE—NOTICE TO MOTORMAN AND CONDUCTOR.

Read v. City & Suburban Railway Co. (Ga.), 41 S. E. Rep. 629. Apr. 28, 1902.

When a street railway company with reasonable promptness discovers the sagging of one of its trolley wires, which has been unexpectedly caused by the falling of a wire belonging to another, and immediately takes proper steps to prevent its wire from causing injury to travelers in the street over which the same is suspended, the company, the supreme court of Georgia holds, meets the legal requirements as to diligence under such circumstances.

Notice to the servant of a corporation with respect to a matter over which he has no authority, and as to which he has no duty to perform, the court holds, is not notice to the corporation. So, in this case, if it was not within the scope of the duties of a motorman and conductor to immediately take steps to guard the public from the danger created by the sagging of the company's trolley wire, it would not be proper, in determining whether, after the company became informed of the emergency to be met, it acted with reasonable diligence in taking proper steps to protect travelers passing along the street, to regard notice to the motorman and

conductor as notice to the company itself, and thus place upon it the unreasonable requirement of taking action in the premises before any of its officers or agents who were authorized to act in its behalf had received information of the necessity to do so.

INJURY TO PASSENGER BY RECEIVING ELECTRIC SHOCK FROM HANDHOLDS WHILE ATTEMPTING TO BOARD CAR AND BEING DRAGGED ALONG BY ITS STARTING—CARE REQUIRED OF COMPANY.

Dallas Consolidated Electric Street Railway Co. v. Broadhurst (Tex. Civ. App.), 68 S. W. Rep. 315. March 29, 1902. Re-hearing denied May 3, 1902.

The evidence showed that the party suing in attempting to board a car took hold of the handholds designed to aid passengers in getting on board the cars. He put one foot on the step of the car, and was in the act of getting aboard, when he received an electric shock which fixed his grasp upon the handhold of the car, and while in this attitude the motorman started the car in motion, and he was dragged some distance, when his hand relaxed his hold, and he fell in the street. The electric shock and the violence suffered by having been dragged along by the car inflicted serious injuries upon him. In affirming a judgment in his favor, the court of civil appeals of Texas states that it is of the opinion that the circumstances surrounding the injury were sufficient to raise a presumption of negligence on the part of the company. It says that the handholds and steps of the car were designed to be used by passengers as aids in their entrance to or exit from the cars; the cars and their equipment were under the control and management of the company; and the accident was such as, in the ordinary course of things, would not happen with the use of proper care by those who have their management. Moreover, it is of the opinion that a higher degree of care than is required by law was not imposed upon the carrier by a charge in which the jury were told that the company "owed to its passengers the duty of exercising great care and caution to keep the machinery and appliances of its cars in reasonably safe condition and repair, and to exercise like caution in the operation of its cars."

INJURY FROM ELECTRIC SHOCK TO PEDESTRIAN STEPPING ON RAIL—PRESUMPTION OF NEGLIGENCE—EVIDENCE OF EMPLOYEE.

Braham v. Nassau Electric Railroad Co. (N. Y. Sup.), 76 N. Y. Supp. 578. May 29, 1902.

While crossing the street one afternoon the plaintiff stepped on one of the company's rails and received an electric shock. A judgment in his favor for damages for the resulting injuries is affirmed by the second appellate division of the supreme court of New York. It says that the company claimed that the complaint should have been dismissed—First, because no negligence on its part was established; and, second, because, if a prima facie case of negligence was established in the first instance, the circumstances were conclusively rebutted by the proof that no defect existed at the place of the accident which would permit the escape of the electric current. These claims were untenable. It was clearly established that the shock which the party received would have been impossible if the company's track was in good order. It was further proven that close to the place where he was walking was a joint where two rails met, which, if not properly bonded or welded, would permit the infliction of an electric shock upon any one whose foot should be placed upon it; and there was some evidence that the rails at the time were so laid as not to allow in the usual manner for expansion and contraction, and that such manner of laying the rails was calculated to result in imperfect joints. This evidence, together with that of the shock actually received by the party, established the company's liability, and called upon it for an explanation of the occurrence, in order to relieve it from the charge of negligence, on the principle of *res ipsa loquitur*, or the matter speaks for itself. The presumption of negligence arising from the proof referred to was not so far overborne by the company's evidence as to make the question one of law. The explanatory evidence was principally that of an employee of the company whose duty it was to keep the tracks in order, and who testified that they were in order at the time and

place of the accident. Waiving the question whether this evidence could be regarded as explaining the occurrence, it was clear that, in view of the position and employment of the witness, a submission of the charge of negligence to the jury for determination was required. The happening of the accident under the circumstances tended to prove the existence of conditions necessary to cause it which could not arise without either negligence on the company's part, or a defect of some kind, for which, if such a thing be possible, it was not to blame; and proof merely that no defect whatever existed would not serve to remove the case from the province of the jury, where the proof was furnished by an interested witness in the company's employment, and question of credibility was accordingly a factor.

UNCONSTITUTIONALITY OF STATUTE REQUIRING POLICEMEN AND FIREMEN TO BE CARRIED FREE.

Wilson v. United Traction Co. (N. Y. Sup.), 76 N. Y. Supp. 203. May 7, 1902.

The third appellate division of the supreme court of New York holds unconstitutional and inoperative as against the company chapter 417 of the New York laws of 1895 providing that the mayor of each city of the state and the president of each incorporated village of the state may issue to each policeman and fireman a certificate of the appointment and qualification of such policeman or fireman as such, and it shall thereupon be the duty of every street surface and elevated railroad company carrying on business within such city or village to transport such policeman or fireman free of charge while he is traveling in the course of the performance of the duties of his office. It says that the decision in the *Beardsley Case*, 162 N. Y. 230, which follows the decision of the federal court in *Railroad Co. v. Smith*, 173 U. S. 684, seems to be a clear authority for the proposition that the above statute operates to deprive the company of its property without due process of law. In those cases the companies were required to issue mileage books, at a reduced rate of fare, to those willing to purchase a designated number of miles at one time. In this case the company is required to carry a certain specified class of persons entirely free of charge. If the former is an invasion of the companies' property rights, the latter is equally so; and in neither case is there any process of law provided for, save the mandate contained in the act itself.

Nor does the court consider that the statute can be sustained as a valid exercise of the police power of the state. It says that its evident purpose and effect is to relieve the municipalities referred to therein from a portion of the burden of maintaining their police and fire departments at the expense of the several street railway companies within their limits. Concede that the public safety requires that the public officers mentioned be carried upon such railroads, it is not apparent why, in order to promote that safety, they should be carried free of charge. There is no pretence that the act is necessary to secure their right to ride upon such roads. The sole purpose is to secure their right to ride free. Thus the only advantage secured by the act to the public is that the railroad company, instead of the municipality, pays the fare. Such an advantage may be a public convenience; but the right to take the property of the individual citizen, or of a class, for the sole reason that the proceeds of it would be convenient to aid the municipality in defraying its general expenses, has not yet been conceded as a legitimate exercise of the police power, and this court is not disposed to concede it now.

REQUIREMENTS FOR ENFORCEMENT IN COURT OF EQUITY OF CONTRACT WITH CITY—VALIDITY OF GRANT OF EXCLUSIVE RIGHT TO DECIDE AS TO OCCUPATION OF STREETS—REQUISITES OF ELECTION TO OCCUPY STREETS.

Logansport Railway Co. v. City of Logansport (U. S. C. C., Ind.) 114 Federal Reporter, 688. Mar. 8, 1902.

Before a street railway company can, in a court of equity, complain of the violation by a city of its contract rights, it must show, the United States circuit court district of Indiana, holds, that it has a contract, and that such contract is free from fraud and enforce-

able at law, and one that is fair and reasonable in all its parts, and within the power of the city lawfully to enter into. If the contract is unfair, unreasonable, or against good conscience, a court of equity would be justified in refusing to enforce it, and would leave the party to its remedy at law. The court, too, must enforce the contract, if it enforces it at all, just as it is written; and it has no power, by changing or varying material terms, to make, in effect, a new contract for the parties.

Under ordinances granting the exclusive right to use in perpetuity certain streets, designated by name, and also the right to use and occupy such other streets and bridges in the city as the street railway company, its successors and assigns, might from time to time elect to use and occupy, the court holds that the right granted, except as to the designated streets, was a mere offer, which could only become contractual obligation by the election of the company to use and occupy the streets for railway purposes. Such election must be made in good faith, and evidenced by some open and notorious act brought to the notice of the common council. Until the offer was accepted by such an election, it could be withdrawn.

Moreover, the court holds that it was ultra vires, or beyond the legal power of the common council to surrender its control of the streets of the city in perpetuity to the company. The municipal authorities had no power to grant forever to the company the right, at its own uncontrolled election, to use and occupy such or all of the streets of the city as it might from time to time elect. The right to determine for itself from time to time what streets could be used and occupied for street railway purposes consistently with the public safety and welfare is a power incapable of absolute alienation by the common council. By the ordinances in question, if valid, to the company's election was relegated the question whether or not a street could, with due regard to the comfort and safety of the people, be occupied by a single or a double-track railway. Such a surrender of corporate power in perpetuity to a street railway company cannot and ought not to be upheld. It cannot be supported as a reasonable exercise of the power of a trustee over a trust estate committed to its charge, to be administered in the interest of the public, and for the private advantage and gain of railway or other corporations.

**LIABILITY FOR INJURY TO PASSENGER KNOCKED OFF
PLATFORM OF CROWDED CAR AND TRAMPLED ON
BY PASSENGERS FRIGHTENED BY FLASH—DUTY
OF COMPANY—CARE REQUIRED OF PASSENGER—
PROOF OF DEFECT IN CAR OR APPLIANCES
CONNECTED THEREWITH.**

Davis v. Paducah Railway & Light Co. (Ky.), 68 S. W. Rep. 140. May 7, 1902.

On account of its crowded condition the party suing was on the front end of a motor car, and, according to the proof for her, when the motorman applied the full power the car began to slow up, and there was a flash of light. The motorman called loudly to have the trolley thrown off, and for nobody to get off the car; that there was no danger. The passengers in the car cried, "Fire!" and began to rush out pellmell. The party suing was holding on to the car, but the heat which flashed up burned her hand so that she had to let go, and when she did this the crowd surging by knocked or pushed her off the car and trampled upon her, inflicting very serious injuries.

In reversing a judgment rendered in favor of the company, the court of appeal of Kentucky holds that a company's duty to its passengers is not fulfilled by recent inspection, or by an inspection by a competent employe. The rule, it says, is thus well stated in 2 Shear. & R. Neg. Sec. 495 "Out of special regard for human life, and acting upon the presumption that every man who commits his person to the charge of others expects from them a higher degree of care for his bodily safety than they would bestow upon the preservation of his property, the law very wisely exacts from a common carrier of passengers for hire, in the performance of his duties as such, the utmost care and skill which prudent men are accustomed to use under similar circumstances." This rule was followed in *Railway Co. v. Weams*, 80 Ky. 420, where the court added: "The degree of care and skill increases with the hazards of the mode of conveyance employed by the carrier."

The court next pronounces objectionable an instruction that it became the legal duty of the party suing when going upon the car, to exercise due care and caution, use her eyes, and act with reason-

able care and judgment for her own safety, more especially if she found the car unusually overcrowded with passengers. In lieu of this, it says, the jury should have been told that it was incumbent on the party suing while on the car to exercise such care and caution as might be reasonably expected of a person of ordinary prudence situated as she was.

A still more objectionable instruction, the court holds, was one by which the jury were told that the party suing could not recover for the injuries received by the passengers running over her after she was pushed off the car by them and fell to the ground. If the company's negligence caused the panic among the passengers, and their conduct was the natural result of its negligence, or was such as might reasonably be expected under the circumstances, considering the crowded condition of the car, and the fact that it was propelled by electricity, the company was answerable; although it would not be responsible if the panic among the passengers which caused the injury to the party suing was needless, and there was no apparent danger that might reasonably be expected to cause a panic among the passengers. If the company was negligent, and this negligence produced a flash of fire, followed by smoke in the car, and this caused the stampede of the passengers, and made them run over the party suing, it could not be held as a matter of law that her injury was not the proximate and natural result of the company's negligence.

Furthermore, the court holds that the rule is settled that, where the passenger shows a break in the railroad track, or the breaking of an axle or wheel of a car, he makes out a prima facie case in a suit to recover for an injury received by reason of such defect. This rule applies to all those things which the carrier is bound to supply, and are defective, by reason of which an injury to the passenger occurs. But this court has in a number of cases said that it is better not to instruct the jury as to burden of proof, and it is safest to so frame the instruction as to indicate the burden of proof without expressly referring to it. Under this rule the court should have instructed the jury that, if the injury of the party suing was due to any defect in the car or cars on which she was riding, or the machinery or appliances connected therewith, and she did not, by her own want of ordinary care, contribute to the injury, they should find for her the damages she thereby sustained, unless they believed from the evidence that the company had exercised the utmost care and skill which prudent men are accustomed to use under similar circumstances to ascertain any defects in the car and appliances and secure their safety.

**LIABILITY FOR INJURY AFTER CARRYING VEHICLE 25
TO 40 FEET—PROOF NECESSARY IN PERSONAL IN-
JURY CASE — CONTRIBUTORY NEGLIGENCE
WHICH WILL NOT BAR ACTION—PROXI-
MATE CAUSE OF ACCIDENT—TEST.**

Rider v. Syracuse Rapid Transit Railway Co. (N. Y., 63 N. E. Rep. 836. May 13, 1902.

The general rule, the court of appeals of New York says, is that in an action to recover damages for personal injuries founded upon negligence it is incumbent upon the plaintiff to prove negligence on the part of the defendant and the absence of contributory negligence on the part of the injured party. The courts have, however, ingrafted upon this rule an important exception, and that is that the contributory negligence of the injured party which will bar an action in his behalf must be the proximate, and not a remote contributing cause of the injury. The plaintiff's contributory negligence, it is said, must not only be a contributing cause, but a proximate, and not a remote, cause of the injury. The proximate cause of an event must be held to be that which, in a natural sequence, unbroken by any new cause, produces that event, and without which that event would not have occurred. The plaintiff's fault will not affect his cause of action unless it proximately contributed to his injury. It must be a proximate cause in the same sense in which the defendant's negligence must have been a proximate cause in order to give a right of action. Contributory negligence, however great, is no defense to an action for damages for an injury which was reckless, willful or wanton. When the negligence of the deceased is but a remote cause or antecedent of the injury, while the negligence of the defendant is made the proximate cause of it, then the plaintiff will not be debarred from prosecuting his claim by his negligence, nor will the defendant be excused from the consequences of his.

This action was brought to recover for the death of a man caused by a delivery wagon in which he was riding being struck by an electric car at an intersection of two streets. The accident differed from all such accidents at street crossings only in this respect—that the injury was not inflicted upon the deceased at the instant when the car struck the vehicle, but after carrying it forward upon the track for a distance, which was claimed by the plaintiff to be from 25 to 40 feet, the carriage was overturned, and the driver injured. It was claimed on the part of the plaintiff that the motorman could have stopped the car within the space of 8 feet of the vehicle, while on the part of the defendant the evidence tended to show that it could not be stopped in less than from 50 to 60 feet. Thus, the case turned largely, if not entirely, upon the ability of the motorman to stop a car moving at the rate of from 6 to 9 miles an hour before the collision, and before the carriage in which the deceased was riding was overturned. But the court does not think that the exception to the general rule in cases of this character was properly applied to the facts in this case by an instruction, in substance, that, although the deceased negligently drove upon the railway track, yet the plaintiff could recover if the jury was satisfied that the motorman, upon seeing that the deceased was about to cross, could, by the exercise of reasonable care, have brought the car to a stop before the collision which resulted in the injury. And it holds that it was error to refuse to charge that, if the jury found that the deceased was negligent in going upon the track as he did, there could be no recovery, and that he was not permitted to take doubtful chances as to whether it was safe to cross.

The contributory negligence of the injured party, the court says, cannot be taken from the jury except in cases where it is clear that there was some new act of negligence on the part of the defendant that was the proximate cause of the injury. The negligence of the deceased, if any, was substantially concurrent with that of the motorman, if he was negligent at all. The whole collision was the work of but a moment of time, and to attempt to separate what took place before the contact of the car with the vehicle from what took place afterward would be to create distinctions and refinements that in the end would practically abrogate the rule in such cases that the injured party cannot recover when his negligence is a contributing cause of the injury. In this case, if the deceased was in fact negligent in driving upon the track, when the approaching car was so near as to render the act dangerous, then such negligence could not be regarded as remotely connected with the accident, within the meaning of the rule stated, but a proximate concurrent cause which precluded a recovery. Unless the character of the accident is such that it can be fairly said that the negligence of the injured party is but a remote cause, the exception is not applicable. In determining whether the cause of the accident is proximate or remote the same test must be applied to the conduct of the injured party as is to be applied to the defendant. The conduct of the latter cannot be judged by one rule and that of the former by some other rule.

CARE REQUIRED IN APPROACHING STREET CROSSINGS—FAILURE TO GIVE WARNING—INJURY TO BOY ON TRACK 20 FEET BEYOND CROSSING—UNREASONABLE OR DANGEROUS RATE OF SPEED—DUTY TO YOUNG CHILDREN—RESPONSIBILITY OF CHILD OF SIX OR SEVEN—EXTRA CARE REQUIRED AT CROSSING NEAR SCHOOL.

Chicago City Railway Co. v. Tuohy (Ill.), 63 N. E. Rep. 907. Apr. 16, 1902. Rehearing denied June 4, 1902.

It is incumbent upon those in control of a street car, the supreme court of Illinois holds, to exercise a greater degree of care or watchfulness at street intersections than at other places along the route. Drivers, gripmen and motormen of street cars are obliged at all times to exercise reasonable care in the conduct of their cars; but the requirement of reasonable care imposes upon them a more exacting attention when they approach street crossings in a crowded city, where vehicles and pedestrians may always be expected in front of them. The failure under such circumstances to ring the bell, sound the gong, or give other proper warning, is undoubtedly evidence of negligence to be submitted to a jury under all the circumstances, whether there is an ordinance requiring such precautions or not. The increase of danger to the public at such crossings demands a corresponding increase of vigilance and energy on

the part of such driver, gripman and motorman. They ought to notice whether or not the tracks are clear when they approach such public crossings and sound the gong or warning.

In the case, where a boy between five and six years of age was injured, the evidence tended to show that it was about 20 feet beyond a crossing, and that at the time he was looking towards the track, talking with another boy, 11 years old, standing upon the sidewalk or curb. The court intimates that the boy injured was so near to the crossing as to have required a slackening of the speed of the car. But even if he was not sufficiently near the crossing to justify the application of the increased vigilance required of a street car company in approaching a crossing, yet, it says, there was evidence tending to show that the speed of the tram was unreasonable and dangerous. Street cars propelled by electricity cannot be lawfully run at a rate of speed which is incompatible with the lawful and customary use of the highway by others. Here the boy had as much right to be upon the street as the company. A street railway company has no property interest in the street, and therefore no right to run its cars at a rate of speed which will interfere with the customary use of the street by others of the public with safety. Such cars can be more readily and quickly stopped than the train of an ordinary railroad. Where the motorman or gripman runs his car at such a rate of speed that he is prevented from keeping control of it, so as to stop it within a reasonable distance upon an appearance of danger to others, the rate of speed at which he propels the car is to be deemed unreasonable or dangerous. It has been held that, where an electric car was running at the rate of 10 or 11 miles an hour over a crossing in a much-frequented street, without giving any signal, there was such evidence of negligence as justified a submission of the case to a jury.

The evidence also tended to show that when the car stopped it had probably passed the boy by about 75 feet, and the court says that it is a question of fact for the jury whether the gripman or motorman on such a car keeps such a lookout as the circumstances demand, or gives such warning of approach as is necessary when he discovers that a child is upon the car track or approaching it, and the circumstance that the car has run an unusual distance before it stops is some evidence of improper management. When a young child is discovered approaching the car track with the apparent intention of crossing in front of a moving car, or is discovered on the track, it is certainly the duty of the gripman to exercise a high degree of diligence in order to prevent injury to the child. A verdict in favor of the plaintiff will not be disturbed where it appears that a street car approaches a street crossing at a very fast rate of speed, without any alarm, while a boy is standing on the track in full view of the motorman, or standing in the center of the track, with his back towards the car.

Moreover, the court says that it is of the opinion, upon further consideration, that, where the testimony shows that a child is only six years old, or less, he is incapable of such conduct as will constitute contributory negligence. In other words, a child of the age of only six years, or under, is exempt from responsibility in the matter of contributory negligence, and so far as the exercise of due care for his own safety is concerned. Again, it says that, in view of the authorities in Illinois, which it quotes, it is certainly justified in holding that a child under six years of age is prima facie incapable of exercising care for his own safety, so that negligence cannot be imputed to him, and in such case it devolves upon the party defending against liability for injuring him to prove that he has sufficient capacity and intelligence to exercise care for his own safety. And still again, it says that it holds, in analogy to the rule of the common law, which exempts children under seven years of age from criminal responsibility, that up to the age of seven years a child is incapable of such conduct as will constitute contributory negligence, and that the court may so declare as a matter of law.

As to the point sought to be made with regard to the boy's intelligence and capacity to care for himself from the fact that he had been allowed to go alone to a public school for more than a month, to reach which it was necessary to cross the tracks, but which was not more than a block and a half or two blocks from his home, the court says that the presumption was that, in passing the school, the cars obeyed the law, which demands greater care in view of the crossing of the street at that point by children going to school. It did not follow, therefore, that in going to the school every day, which was so short a distance from his home, the boy was running the same dangerous risk as he would run in crossing the track at any other point.

MERSEY TUNNEL RAILWAY.

The power station, machinery and track work for the Mersey Tunnel railway in England are all being pushed rapidly to completion and the last of the main generators and engines for this plant are about to be shipped from the Westinghouse works at Pittsburg. These generators are of 1,200-kw. capacity and are to be direct connected to vertical cross compound Westinghouse corliss engines of 1,500 h. p. each. A separate generating plant will supply the lighting of the power house, all stations, sidings, etc., and will consist of two compound-wound 200-kw. generators of 650 volts, direct connected to Westinghouse compound engines running at 250 r. p. m. The total output of the generating plant will be 6,000 h. p. for railway use and 600 h. p. for lighting. The Westinghouse electro-pneumatic system of control will be used and the rolling stock will consist of 60 cars, each 60 ft. in length. Five cars will be operated in a train, the first and last of which will be motor cars equipped with four 100-h. p. motors each, and Westinghouse high-speed air brakes.

The Mersey railway, connecting Liverpool and Birkenhead, passes under the river Mersey through a double track tunnel. The length of the line is 4 1/2 miles and the total length of track, including sidings, is about 12 miles. The only competition which the road has is from the ferry boats on the river, and its traffic is very large. The passengers carried amounted to between 7,000,000 and 8,000,000 per year with the steam locomotive system. The road is built to standard gage, the rails being of the ordinary English bull-head type, weighing 80 lb. per yard. The line is to be equipped with a third rail system with the conductor rail outside of the running track. The latter will not be used as a return conductor, but a fourth rail will be placed between the tracks for this purpose. The third and fourth rails will be similar in size and arrangement and this plan will prevent any destruction to buried pipes, etc., by electrolytic action. Both conductor rails will be T rails in 60-ft. lengths and will weigh 100 lb. per yard and be carried on stoneware insulators spaced 7 or 8 ft. apart. It is expected that the trains will be run on a three-minute headway.

CARD INDEX FOR CABLE RECORDS.

We illustrate herewith a card index system for keeping records of cables which is in use on the Aurora, Elgin & Chicago Ry., the details of which were arranged by Mr. Ernest Gonzenbach, the electrical engineer of the company.

There are a large number of comparatively short cables used on this road for connecting the ends of the third rails at street cross-

CABLE NO.	1158-2	LOCATION	HX, S. Rail	SIZE	1 mil C M	
DATE INSTALLED	July 17	1902	LENGTH	148 ft	SPEC	Paper
REMARKS						
DATE	RES IN OHMS	REMARKS	DATE	RES IN OHMS	REMARKS	

ing, and each of these cables is numbered and lettered. A separate card is used for each cable and at the top of the card is recorded the number of the cable, its location, its size in circular mils, the date on which it was installed, its length and the character of the insulation. Under this data are two lines left for general remarks. Whenever a cable is tested the date on which the test took place is entered on the card, as well as the resistance of the cable in ohms, and a blank is also left for inserting any general remarks in connection with the test.

This card index system provides an extremely handy method for

ascertaining the condition of every cable on the line, and as the cards are arranged according to numbers, the exact condition of any cable can be readily found at any time it may be required. Each card also comprises a brief history of a cable and shows just what troubles, if any, have been found during the life of the cable.

WESTERN NOTES.

A special election is to be held in San Francisco on December 2d, at which a proposition for the city to acquire the Geary Street Railroad at the expiration of its franchise, is to be submitted to a popular vote. The present franchise expires on November 6, 1903, and it is proposed to issue bonds to the amount of \$700,000 to pay the cost of the property and to equip the system.

Negotiations are said to have been concluded for the purchase of the franchises, track, rolling stock, etc., of the Hawaiian Tramways Co. by the Honolulu Rapid Transit & Land Co. The purchase price is in the neighborhood of \$300,000 and Mr. C. C. Moller, who represents the Hawaiian Tramways Co. in Honolulu, negotiated the sale.

The Oakland Transit Co. is preparing to install on the Hayward's electric line, a block and signal light system similar to that in use on steam railroads. This company is building six 40-ft. double truck, standard gage electric cars, having a seating capacity for 40 passengers, at its shops near the Piedmont power station. These cars are to be equipped with four motors each, making them capable of attaining high speeds.

MASSACHUSETTS STREET RAILWAY RULINGS.

The railroad commissioners of Massachusetts have, under a new approval law, adopted a set of rules under which certain conditions shall be uniform throughout the state. They will require rails weighing not less than 60 lb. per yd. and ties not less than 7 ft. long, 6 in. thick with 6-in. face, and spaced not more than 2 ft. between centers, shall be used; that the roadbed shall be constructed with at least 18 in. of suitable ballast below base of rails and properly drained; that when practicable the railway shall be built continuously either on one side or in the center of the highway and separate from the driveway, with a clearance from any obstruction of at least 4 1/2 ft. on tangents and proportionally more on curves; that the roadway independent of the railway shall be of sufficient width to properly accommodate other travel; that crossings of the railway from one side to the other of the highway shall be avoided and shall only be permitted where provision is made for proper regulation respecting the operation of cars and restriction of speed.

The board also calls for plans in each case showing the place the rails are to occupy in the highway and the location of each pole. The board also adds that these requirements will not exclude other suitable conditions imposed by local boards or by themselves in special cases.

The board has handed down a decision dismissing a petition of the Waltham company for the extension of its franchise into the town of Lincoln. In this it makes several rulings that are likely to be standards in the future. It says that the term "constructed railway," the statutory requirement before it can extend into another town, does not mean an absolutely finished construction or one sufficient merely to show the good faith of the company, but rather a substantial construction.

The board does not accept literally the statutory provision that a railway must be constructed to the boundary line before the company can petition for a location in the second town. It believes that there is no need that this should be done before bringing a petition. A company with an established railway in one town should know whether it can secure a location in an adjoining town before it builds a branch solely to connect with it. The latter course might entail a waste of money and needless capitalization should a location in the adjoining town subsequently be denied by the selectmen.

Owing to the theft of 1,600 ft. of trolley wire from the lines of the Elizabeth (N. J.), Plainfield & Central Jersey Railway Co., the lines at Westfield were recently tied up from an early hour in the morning until 10 a. m.

REPORT OF THE COMMITTEE ON "RULES FOR THE GOVERNMENT AND INFORMATION OF CAR SERVICE DEPARTMENT EMPLOYEES."

Presented at the Detroit Convention of the A. S. R. A., accepted and ordered printed.

For the discussion of this report see "Daily Street Railway Review," Oct. 11, 1902, page 715.

In effect 12301 a. m. Modeled on the standard code of the American Street Railway Association.)

GENERAL NOTICE.

The rules herein set forth apply to and govern on all lines operated by the Railroad Co.

They shall take effect and shall supersede all prior rules and instructions in whatsoever form issued which are inconsistent therewith.

In addition to these rules, special instructions will be issued from time to time, as may be found necessary, and such instructions posted on the various bulletin boards, whether in conflict with these rules or not, which are given by proper authority, shall be fully observed while in force. Bulletin boards are located at the following points and must be consulted daily by each employe of the transportation department:

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.....
.....

Every employe whose duty is in any way prescribed by these rules must always have a copy of them at hand while on duty and must be familiar with every rule.

The head of each department will supply copies of these books to his subordinates, see that they are thoroughly understood, enforce obedience to the rules and report all violations to the proper officer.

All employes are required to be polite and considerate in their dealings or intercourse with the public; the reputation and prosperity of the company depend upon the promptness with which its business is conducted and the manner in which its patrons are treated by its employes.

All employes will be regarded in line for promotion, advancement depending upon the faithful discharge of duty and capacity for increased responsibility.

While for the effective management of a large system the observance of stringent rules and the maintenance of strict discipline are necessary, that enforcement must be impartial as between employes.

Employes may be charged with and required to pay for any damage done to the property of this company for which they are responsible, or for any loss or expense incurred by the company by reason of carelessness, neglect or disobedience of these rules.

Employes must refrain from the use of profane or indecent language and from improper or ungentlemanly conduct; politeness and courtesy must be observed in their dealings with one another as well as with every one with whom they come in contact in the performance of their duties.

In the absence of the proper officials to whom they may apply for advice, assistance or authority all employes are expected to use good judgment and discretion in dealing with matters not covered in these rules.

.....
Chief Executive Officer.

GENERAL RULES.

1. The safety of passengers is of the first importance; all work must be entirely subordinated to safety, first, and then to the regularity and punctuality of the service and the comfort and convenience of the passengers. Line repair men, emergency crews and track men will be required to subordinate their work in accordance with this rule to the requirements of the operation of the road.

2. Employes of any grade will be considered as accepting or continuing in employment subject to the dangers incident to this hazardous occupation.

(a) The fact that any person enters or remains in the service of the company will be considered as an assurance of his willing-

ness to obey its rules. No one will be excused for a violation of them even though such rules are not included in those applicable to his department.

(b) Employes of this company will not be identified with or engage in any other business except with the specific permission of the head of the department in which employed.

(c) Employes shall not make assignments of pay; such assignments will not be recognized or honored by the company.

3. If in doubt as to the meaning of any rule or special instructions, application must at once be made to the proper authority for an explanation; ignorance is no excuse for neglect or omission of duty.

4. If an employe become incapacitated from sickness or any other cause, the right to claim compensation will not be recognized; an allowance, if made, will be a gratuity justified by the circumstances of the case and the previous good conduct of the employe.

5. When an employe is discharged from the company's service, he will not be re-employed without the consent of the head of the department from which he was discharged.

6. Employes when leaving the service of the company must sign receipt for their final pay and return to the company all of its property with which they have been entrusted; in default of such return they will be charged in final settlement for all such articles short.

7. No employe will be allowed to absent himself from duty without special permission from the proper officer, nor will any employe be allowed to engage a substitute to perform his duties while he is absent.

8. The use of intoxicating drink on the road or about the premises of the company is strictly forbidden; no one will be employed or continued in employment who is known to be in the habit of using intoxicating liquor; smoking by an employe while on duty is forbidden.

9. In the event of any of the company's apparatus, breakage of the overhead line, charging a pole in the public street, unsafe settlement of building or structures, etc., whereby imminent danger of personal injury is caused, the first employe discovering the fact must arrange to protect the danger point, advising the proper authorities by the first available means of the character and location of the trouble; he must not relinquish such responsibility until properly relieved.

10. All medical examinations in behalf of this company of injured persons will be conducted by the regularly appointed medical examiner. Medical attendance to injured persons, whether employes or other persons, will not be supplied by this company except in unusual emergencies.

(a) Whenever, in emergency, any authorized official deems it advisable to call an outside physician such official must immediately notify the claim department, giving the name of the physician called and the reason therefor.

(b) In ordinary cases of personal injury if proper attention to the injuries cannot be given by an employe using the "emergency cases" provided for rendering first aid to the injured an ambulance call is usually sufficient, accompanied by prompt notice to the claim department.

In the case of an accident wherein the question may be raised as to the condition of the car, either motor or trailer, such car must be "run in" at once to either the home or nearest depot, passengers thereon transferred and the car immediately and thoroughly inspected by the shop foreman, who will promptly make special report thereon to the superintendent.

11. Information concerning the affairs of the company must not be given to any one except its authorized representatives, who, if unknown, shall in all cases show proper credentials before information is given.

12. Each employe of the transportation service must have a reliable watch, maximum variation allowed . . . seconds daily,

which shall be kept in good and accurate condition and compared daily with the standard time of the road.

13. The collection or solicitation of money by employes of this company from other employes or any other persons in the nature of fees, gifts, etc., is forbidden.

(a) The solicitation of advertisements or contributions for entertainments or similar purposes by or on behalf of any employe or employes of this company is also prohibited.

14. Intoxicated, disorderly or otherwise obnoxious persons are not allowed on the cars operated by this company; conductors are authorized to refuse to carry any such person.

15. Large, bulky packages will not be carried in the passenger cars of this company—passengers will be accepted with only such bundle or packages as can conveniently be carried on the lap or satchel or valise of reasonable size. Freight will be carried only under the conditions and the tariff as bulletined.

16. Under no circumstances shall any article be hung on any brake handle of any car nor shall any obstruction be so placed or allowed to remain as to hinder access to and use of any brake.

17. Dogs or small animals will be transported in the passenger cars of this company only under the conditions bulletined.

INSPECTORS.

18. Inspectors report to and receive instructions from their superintendent, daily, before they are due to go on duty.

19. They will be expected to set an example to the other unformed employes in the neatness of their attire, the excellence of their deportment and their loyalty and devotion to the company's interests.

(a) Each inspector will be supplied with the following equipment:

- One pair rubber-handled pliers.
- One pair rubber gloves.
- Small roll adhesive insulating tape.
- Ten feet insulated wire.
- Supply of fuses—where used.
- Light switch plugs.

20. Inspectors must be thoroughly conversant with all rules and instructions issued, render all assistance in their power in carrying them out and report all violations to their superior officer.

(a) They will be responsible for all time tables, running times and time points; they will see that cars are operated on schedule time and properly spaced; when blockades occur the movement of cars will be under their direction.

(b) They will also satisfy themselves that all new men under instruction within their territory by regular motormen or conductors are properly instructed.

21. Inspectors will arrange for any extra service needed and withdraw unnecessary service on their lines in accordance with the requirements of the traffic, keeping their superintendent advised thereof; at all times their effort will be to improve the service.

(a) They will facilitate the movement of cars or trains carrying mail and give special attention to chartered cars.

22. Inspectors must be familiar with the different types of motors and controllers and be able to remedy slight defects occurring on the road.

23. Inspectors have authority to relieve conductors and motormen on duty while on their road on account of sickness or any other cause that would prevent them from properly doing their duty.

(a) They must remain on that part of the line or division assigned to them unless it is absolutely necessary to take a car in charge.

(b) They will see that line repair and track men and emergency crews while at work do not unnecessarily interfere with the regular operation of the road.

(c) When a fire occurs to interfere with the operation of the cars they must notify terminal depots of the lines affected, order out the emergency crews of that district and see that hose jumpers or other appliances are procured as promptly as possible.

(d) During the winter season they will see that heaters in cars are regulated in accordance with outstanding instructions; electric

heaters must be turned off to one notch in case the power runs low; if necessary they will be cut out altogether.

24. Inspectors will note in detail the condition of the cars, whether properly cleaned, heated, ventilated, lighted and equipped, and that all signs are properly displayed.

(a) When a car becomes disabled so that it cannot be repaired on the road they will have the following car push it to the first turnout and transfer the passengers to the next car of the same line; after the delayed cars shall have passed, such car will be hauled to the nearest depot. When a car is being pushed a drawbar must be used to connect the two, movement must be slow, proper care exercised and the reversing switch set on the disabled car in the direction in which the car is moving.

(b) They will carefully check the load with the register on every car they board; in case of discrepancy they will take up immediately with the conductor, reporting the occurrence to the superintendent.

(c) When transferring passengers from one car to another (Sec. A) they will require the conductor to whom transferred to ring up the number in their presence and will then note on that conductor's day card the number transferred, with statement or cause, signing the memorandum.

(d) They will be familiar with the transfer points of all lines and be able intelligently to direct the traveling public.

25. Inspectors will promptly report all defects in track or overhead work to the proper officer at once and take necessary precautions to avoid accidents.

(a) In case of break in the overhead line or serious derailment of cars they will at once notify the nearest emergency station, stating cause and location of trouble, which must be promptly repaired; for this purpose the nearest telephone will be used—if charge therefor be made the superintendent will refund the amount.

(b) Should the armature, terminal wires, brush-holders, brush or any part of a motor break that motor must be cut out.

(c) They must see that the track is properly sanded when necessary, especially on grades, approaching junction points, terminals and crossings; they must see that switches and guard rails on curves are kept clean and properly lubricated.

(d) If any buildings are to be moved across the track or any excavation under or alongside the track, the fact must be reported to their superior officer at once.

(e) In the event of a snow storm they will report to their superintendent promptly for duty and assignment as required.

(f) They will render every assistance possible upon arrival at the scene of an accident, secure the names and addresses of as many witnesses as may be possible and make written report to the claim department, giving in detail all the information obtainable. Their aim will, however, be to so thoroughly train car crews that no accident occurring could have been avoided.

26. They must arrange to be notified in case of fire, blockade or severe storms and must at once take charge of the operation of the line or lines until properly relieved.

(a) In case of snow storms they must arrange for snow plows and sweepers to be run and the lines kept open. They must arrange to sand and salt the rail when necessary, giving special attention to grades, junction points and railway crossings.

RECEIVERS OF THE COMPANY'S MONEY.

27. Receivers will report to and receive their instructions from the superintendent; they will comply with instructions from the accounting or treasury department.

DEPOT MASTERS.

28. Depot masters report to and receive their instructions from the superintendent or the inspector.

29. The depot master will have charge of the depot, barn or terminal and the company's property at which they are located, and will see that all worn-out, broken or defective articles are returned for new; they will have charge of all persons employed thereat, unless otherwise instructed, and will see that every employe reads the bulletin board at least once daily.

30. They must attend to the proper arrangement of cars, see that they leave promptly on time and that all cars are promptly cleaned, heated, lighted, inspected and equipped.

31. They must see that all employes reporting at that depot, terminal, line or division are prompt and efficient in the discharge of their various duties.

32. They must see that conductors and motormen are ready for duty at the time required and are provided with all the appliances necessary for the safety and proper management of the cars.

33. They must preserve order about the depots, preventing confusion, delays, loitering, drinking of liquor, gambling, etc.; eating in cars is permitted only at those terminals having no other facilities.

34. They must not allow conductors and motormen to go on duty unless they present a neat and cleanly appearance, are properly uniformed and are physically fit for duty.

35. They must require all articles found in the cars or on the company's property to be promptly delivered to the designated office or person, all such articles to be plainly marked with the name of the finder, time and date when found, together with place or car in which found; persons inquiring for lost property will be directed to the lost property clerk.

36. No transfer of cars or property shall be made from the depot without an order from proper authorities, and they must immediately notify their superintendent of the transfer desired or made.

37. They must see that all the blank forms and reports used in the transaction of the company's business are properly filled out and forwarded—especially accident reports, which must be given utmost dispatch.

38. They must see that conductors and all others handling the company's money turn in the money, transfer and other tickets, etc., to the designated persons promptly in accordance with the requirements of the treasurer—they must promptly call to account any one failing to do so.

39. In case of snow storms they must report promptly at their depots to assist in getting out plows, sweepers, sand and salt cars, etc., and assisting in so far as they may in keeping the road open.

GENERAL RULES FOR CONDUCTORS AND MOTORMEN.

40. Conductors and motormen report to and receive their instructions from the superintendent or his authorized representative; conductors will also be governed by the instructions of the accounting department which may be issued relative to the handling of transfers or receipts.

(a) The bulletin board must be consulted before starting and at the end of each day's work.

41. The conductor has charge of the car; the motorman is under his direction and will obey his orders (so far as reasonable). The motorman is directly responsible for the handling and condition of the equipment.

Under no circumstances shall both motorman and conductor be away from the car at the same time, unless properly relieved; in the absence of the conductor the motorman is held responsible for the car and its management and must notify the conductor the number of passengers who have entered in his absence.

42. Conductors and motormen must be neat and clean in appearance and wear the uniform and badge prescribed by the company—the badge must be kept in good condition and worn on the front of the cap, and the uniform must be clean and in good repair.

(a) A deposit will be required for the small property of the company entrusted to conductors and motormen; this deposit will be returned at termination of service, when such property must be returned; in default of such return deduction from the deposit will be made in accordance with the bulletined penalties.

(b) Under no circumstances shall employes exchange badges with each other; the official badge must never be worn by another than the person to whom issued.

43. Before leaving the car house or starting from a terminal or after relieving a crew, motorman and conductor will see that all signs are properly adjusted and displayed—each will be held responsible for his end of the car.

(a) While on the road all safety devices must be in place and the different articles of car equipment fully operative; for this the motorman and conductor will be held severally responsible.

44. It is the duty of both motorman and conductor to be on the lookout for passengers; motormen must never run by or pass passengers unless instructed so to do by the conductor or an inspector, when they must either point to the rear or call out "Take the next car."

(a) When approaching passengers on a street on which several lines of cars are operated or on which the cars run to different destinations conductors and motormen must announce to intending passengers the route and destination of their cars.

(b) Should a motorman at any time attempt to diminish the receipts of his car by running ahead of time or too near his leader or by not promptly stopping car for passengers, or shall directly or indirectly harass a conductor or be guilty of any misconduct, the conductor must report the fact at once to the inspector or the superintendent.

45. When any fire department vehicle, ambulance or this company's emergency wagon is running on the street, cars must be promptly stopped until such vehicle has passed, avoiding as far as possible stopping on a cross street or alongside standing cars or wagons.

(a) Motormen will receive and carry on their platforms, in lieu of a baggage compartment on the car or train, all mail sacks with which they may be entrusted, either United States or company mail. They will stow securely and handle carefully all such mail matter.

46. Conductors and motormen must conform to time table in running their cars, be particular in making time points as laid out on the time cards and avoid loitering on the line.

(a) When unavoidably delayed on the line the time lost is not to be made up by fast running as soon as the fact is noted, but by running slightly faster over the entire remaining length of the trip, and then only when this can be done with safety.

(b) When running through dark spots on the road or through fog banks or at any other time when the clear view of the tracks is limited, the motorman shall, except on private right of way, check the speed of his car and run only at such rate as will enable him to stop within the limit of his vision. Conductors for permitting a violation of this rule will be held equally responsible with the motorman.

(c) Crews of all special, express, chartered, mail, supply or other cars while on the road are subject to and must be familiar with the rules, regulations and requirements of the lines on which they are to run; all cars running on the road are subject to the jurisdiction of the superintendent.

(d) When, in case of blockade, a car is run around such obstruction and on tracks not usually used by cars of that line, or in handling mail, express chartered, official or special cars, the crew must see that all switches used are left in the same condition as when found. When under these circumstances a motorman has occasion to turn a switch he shall, after passing over it, stop, give the conductor the proper bell signal notice and the latter will then reverse the switch, making sure it is fully and properly thrown before boarding his car and giving the signal to start.

(e) In case of blockade it may be that several cars of one line will be bunched; upon the block being lifted such cars will spread again and not crowd together to destination. For the observance of this rule conductors will be held equally responsible with motormen.

(f) When either on or off their time a crew will not switch a car back or turn short of its signed destination without specific authority from an inspector or an authorized representative of the superintendent, excepting in the single case of an accident occurring and the car being disabled or required, under these rules, for inspection.

47. Conductors and motormen on duty are not allowed to sit down while the car is in motion except seats are provided for that particular purpose by the company, and then only on specified sections of the line as bulletined.

(a) Conductors and motormen on duty must not shout, signal or telegraph to motormen or conductors on passing cars or on the street nor carry on any unnecessary conversation with each other or any other person.

(b) The reading of newspapers, books or any other matter

than pertains to the immediate conduct of the company's business, while on duty, is prohibited.

48. No one but the duly authorized officers of the company will be allowed to stand on the front platform of passenger cars or ride on any other cars run over these lines. Exception can be made only in favor of policemen on duty and then only in emergency cases.

49. When passengers attempt to get off the car while it is in motion the motorman or conductor must call out to them, "Wait till the car stops." When passengers are alighting and a car is approaching in an opposite direction notify them to look out for the car on the other track.

50. Employees while riding free must not occupy seats to the exclusion of paying passengers or hold any conversation with motorman or conductor of the car. This rule applies generally to all free passengers.

51. When cars are run in the house in the day or night the conductor will see that the lights are turned off and the seats in closed cars turned up; the motorman must see that the controller is on the "off" position, the brakes are set, the power circuit is broken from the car by removing the trolley from the wire, securing the shoe up from the rail, throwing off the main motor or overhead switch and the power handles (also air when used) are deposited with the proper custodian or in the proper place, together with switch iron and all other tools or implements as required by bulletin.

52. On double track when a car or train is standing still, receiving or discharging passengers, any car or train approaching in the opposite direction must make a full stop directly opposite the front of the standing car or train; on single track when a car or train is approaching a car or train standing on a siding the motorman of the oncoming car or train will have his car or train under absolute control and run with extreme caution.

53. No car or train shall under any circumstances be backed up more than feet without the pole (in overhead construction) being changed, and then only with the conductor on the last or rear platform to give the back-up signal when the way is clear and to protect the rear against accident.

54. The motorman must bring the car to a full stop at steam railroad crossings, not nearer than one hundred feet to the nearest track. He will not proceed until the conductor has gone ahead to the track to be crossed, looked both ways and from that point given his signal by hand, flag or lantern to start. The motorman will also observe the utmost watchfulness for approaching trains and should, in his judgment, danger be imminent from any source he will refuse to start until the crossing is clear and free from all danger. When the conductor has gone ahead of car the motorman before starting will look back and see that no one is about to get on or off the car. This rule can only be abrogated by bulletin notice covering such crossings as are protected by gatemen or flagmen or tower-switchmen at points where the crossings are protected by interlocking signals and derail switcher; in such cases the conductor will remain on the car or train, holding the trolley rope over the crossing.

55. The motorman must bring the car to a full stop at all trolley or electric road crossings and junction points, and must not proceed until he receives the proper signal from the conductor. (This rule can be abrogated only as the preceding and only at similar points.) The conductor must not give the signal to go ahead until a full stop has been made. Conductors and motormen will be held jointly responsible for a violation of this rule.

56. If for any cause the motorman has stopped the car without a signal and a passenger should want to get on or off, the conductor will give the signal to stop the same as if the car were in motion. The motorman must wait for the conductor's signal before starting the car, whether he has received the signal to stop or not.

57. Cars must not pass on curves unless the motormen know there is ample clearance.

(a) Speed must be reduced on all curves and switches; on public thoroughfare the speed at such points must not exceed miles per hour.

(b) The car must not be stopped on a curve except to avoid accident.

(c) When running on public streets the conductor on any trol-

ley line will signal the motorman to go ahead if he has the trolley rope in his hand when approaching a curve; should the motorman fail to receive the signal he will signal the conductor and, failing response, should stop before reaching the curve. The conductor must hold the trolley rope around curves and under special overhead work.

58. Time tables of the different lines will be posted at for the government and information of employees. They will show the assignment of crews to the different runs and the starting time from the terminal of the several trips of each run.

(a) Employees will receive notice of temporary changes (or patches) of time tables by the posting at of a sign reading "new table" or "table changed." They will be expected to keep themselves posted concerning current time tables and all changes thereof.

(b) New time tables will be posted not later than — o'clock p. m. of the day previous to their becoming effective. Temporary changes (or patches) of time tables on account of weather or other variable conditions are likely to occur at any time.

59. There shall be a seniority list at each depot which shall show the names of all conductors and motormen in consecutive order according to the date of their assignment to that depot, excepting that for purposes of discipline a man shall have lost any numbers in his chronological standing. When vacancies occur conductors and motormen, each on their own list, will be advanced in seniority in accordance with their then standing on the list.

(a) When changes are necessary in the assignment of crews and runs on time tables (old or new) they will be made according to the seniority listing of the men, to take effect as far as possible on Mondays only.

60. Compensation will be a certain rate per hour or per trip, according to the line where employed; the rate will be the same for conductors and motormen.

(a) In assigning men for duty on regular runs or week-day time tables it shall be done in accordance with the seniority list and the runs given away in the following manner:

1—Full pay straight runs (early and late and night cars in sequence).

2—Full pay swing runs (early and late in sequence).

3—Straight trippers (early and late in sequence according to 39Y).

4—Swing trippers (early and late in sequence according to pay).

61. All conductors and motormen shall be considered as either regular or extra men; regular men are those that have regular runs on the week-day tables; extra men are those that are not assigned to regular runs on the week-day tables. When first appointed conductors and motormen will serve as extras, working up gradually to regular runs.

62. There shall be at each depot a daily working list which shall show the names of all extra men in the order in which they stand for work on the following day.

(a) The daily working list shall be a revolving list; that is, when first for work is assigned for work his name (provided his work for that day shall have amounted in value to at least \$—) shall be dropped to the bottom of the working list and work shall not fall to him again until every man whose name followed his on the working list of that day shall have been excused, jumped, suspended, discharged or put to work.

63. There shall be a daily excused list at each depot which shall show the names of all men, regular and extra, who have been excused, suspended or discharged, and the names of those who will fill their places for the day.

(a) When an extra man is excused for but one day his name shall be dropped to the bottom of the working list of that day, irrespective of whether work would have fallen to him or not.

(b) No conductor or motorman will be excused from duty until he sees his name posted on the excused list, except in case of sickness, when his written statement of the fact must be sent to the agent to whom he reports at the depot by at least such time as he would personally report for duty were he going to work; no telegraph or telephone message will be accepted.

(c) It shall be understood that conductors and motormen excused on account of sickness and so marked on the excused sheet

are off for an indefinite time, which shall be not less than two days nor more than thirty days. At the end of thirty days, unless the sick leave shall have been extended upon proper application, the absentee may be dropped for non-attendance.

(d) When an extra or regular man who has been marked off sick desires to return to work he must report to the designated agent before 6 o'clock p. m. of the day previous to the one on which he wishes to return to work so he may be marked up for work the next day.

(e) Any conductor or motorman absenting himself for ten days or more without having been excused and without being heard from shall, in the discretion of the superintendent, have his name dropped from the seniority list and be discharged for non-attendance. Should he return within ten days he shall give satisfactory explanation of his absence to the superintendent before resuming work.

64. The working and excused lists shall be posted at each depot daily not later than 4 o'clock p. m.

(a) The names of conductors and motormen not shown on the time tables as in charge of regular runs will be shown on the excused list or the working list.

(b) Unless otherwise marked on the excused list or the working list, extras must be in attendance at the depot at least 45 minutes before starting time of the first car out in the morning and be prompt in attendance on all changes during the day thereafter until assigned for work.

65. Regular men shall be assigned, in so far as possible, on Sunday, holiday or special day time tables according to the seniority list; extra men shall be assigned on such tables after the last regular man desiring it has been assigned, according to their standing on the daily working list—that is, the extra standing first for work on Sunday morning, for instance, shall be given the first run following the regular men, and so on. An exception may be made to this when necessary to insure to certain men their proper amount of rest between the time of their week-day and Sunday assignment.

66. Conductors and motormen having regular runs must report verbally to the designated agent not less than 45 minutes nor more than 1 hour before their starting time from the depot. If he is not at his post they will await his return and then report.

(a) When a crew is to relieve another crew at a distant point from the depot the conductor and motorman must report to the above designated agent not less than 45 minutes nor more than 1 hour plus the running time before the starting time from the point of relief.

(b) No compensation will be allowed for reporting as required in the above rules.

(c) The above rules apply as well to the latter part of swing runs.

(d) Extras when assigned temporarily for regular runs are subject to the above rules.

67. A conductor or motorman shall be considered to have been "jumped" when he has been superseded for work by another for the following reasons:

1—Failure to report to the designated agent in accordance with the requirements of rules 63 to 66 inclusive.

2—Failure of conductor or motorman to be on his car at the starting time, even though he had reported to the proper agent at the proper time. This is applicable to all trips, unless the conductor has been excused by the same agent or authority.

3—Failure of extra men to report in accordance with the rules governing regular men when they are assigned for regular runs.

4—Failure of extra men to respond to call for work during changes.

5—Failure to respond to call for work or to report at the expiration of time for which they have been excused or at time marked on the working list.

(a) When necessary to assign conductors and motormen from one depot for temporary service at another depot, their names shall be shown on the working or excused list at their own depot with the time they are expected to report at the depot where they are to work; and failure to so report in accordance with these rules will result in being jumped.

(b) In case of delay from blockade, especially at hours of the day when headway is long, should it be clearly proven that a conductor or motorman was prevented by such blockade from reaching his depot previous to his reporting time, and providing there was no other way for him to reach the depot, the jump shall not be counted.

(c) In the matter of discipline for being jumped, regular and extra men shall be upon the same footing and so far as possible they shall be treated alike. An accurate record of each and every jump will be kept.

(d) Penalties for jumps shall be as follows:

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68. Bell signal rules:

Conductors to motormen—

CONDUCTORS MUST KEEP THEIR HANDS OFF THE BELL SIGNAL CORD OR ROPE EXCEPT WHEN IN THE IMMEDIATE ACT OF TRANSMITTING A SIGNAL.

One signal, car standing at transfer point, motorman will then signal the number of passengers boarding the car by the front platform.

Two signals, car standing, go ahead—all clear.

Three signals, car standing, back the car slowly—all clear.

One signal, car in motion, stop at the next street, station or other designated point.

Two signals, car in motion, conductor has hold of trolley rope and is on the rear platform ready to take the curve; or, on answer to the motorman's signal of a possible obstruction standing or moving alongside the track near the car, that the car can pass slowly.

Three signals, car in motion, danger—stop immediately, emergency.

Four signals, car in motion, passengers to be transferred to the intersecting line—motorman will so signal.

Conductors will be careful to give each signal clearly and distinctly.

Motormen to conductors—

Motorman must not assume any signal is INTENDED—they must require a clear and distinct stroke of the bell for each.

One signal, car standing, one passenger has boarded car by front platform; this is to be repeated after the conductor's signal for the information as often as necessary to cover the case.

Two signals, car standing, conductor will reverse switch over which car has just passed.

Three signals, car standing, car must be backed. Is all clear?

Four signals, car standing, conductor is needed forward.

One signal, car in motion, approaching a curve, conductor will hold rope; or, on approaching a possible obstruction standing or moving alongside the track near the car, on receiving this conductor will promptly respond after taking proper action, as above.

Two signals, car in motion, conductor will immediately set the rear brake and stop the car.

A succession of quick signals is notice to conductor that trolley has left the wire.

(a) Air, gong or whistle signals—

One signal,

Two signals, to be sounded on approaching a cross street or any danger or to give notice of approach.

Three signals, another car is following on the same time and rights, a headway behind. **ON SINGLE TRACK LINES THIS SIGNAL MUST BE REPEATED IN ACKNOWLEDGMENT BY THE MOTORMAN OF THE CAR OR TRAIN PASSED.**

Four signals, approaching an intersecting line is notice to the crew of the car on that line that passengers are to be transferred to them.

(b) Classification signals—

These are conveyed to all concerned by a lamp or flag on the forward end of the car, carried in the bracket provided for the purpose. Their significance is as follows: **WHITE** light or flag signifies the car or train is an extra and running on no scheduled time.

GREEN light signifies another car or train is following a space

distance behind and running on the same time and rights. Motorman on any car carrying this signal must notify the motorman on each car passed (on single track lines) by the signal (Rule 68a), as provided, and the motorman so notified will repeat the signal in acknowledgment; in case a reply is not promptly made the motorman giving the signal will stop and verbally notify the other, reporting the occurrence to the superintendent on reaching the end of the run.

(c) Color signal rules—

RED invariably signifies danger, and a red flag by day or a red light at night is the order to stop. Under NO circumstances will such a signal be passed without a full stop having been made within not less than ten nor more than one hundred feet BEFORE the signal is reached, and the conductor must make certain that any further order or instructions intended are received and thoroughly understood before he gives the signal to start.

GREEN signifies the necessity for caution, and a green flag by day or a green light at night is the order to proceed with the car or train under absolute control.

WHITE, when used for signaling, indicates safety; but the swinging of a white lantern at night over or alongside the track is a signal to stop. A white lantern is also used at night hung on the gates protecting a railroad crossing to indicate the position of the gate.

(d) Fixed signal rules—

SIGN signals, such as "stop," "slow" or "breaker" signs, are placed at points requiring special protection; special instructions will be issued covering their position and use.

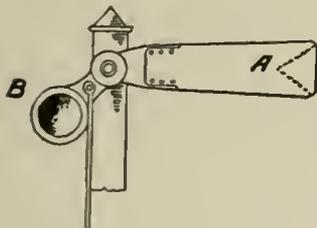


FIG. 1.

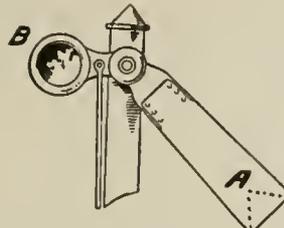


FIG. 2.

SEMAPHORE signals, as shown in figures 1 and 2, are of two classes, "HOME" and "DISTANT."

The home signal is supplied with a red lens, B, and the blade, A, of the signal is painted red and is square-ended, as shown by the full lines in the illustration. When in the position shown in Figure 1 this signal will show a red light at night and the signal in this position is an absolute order to stop (see Section C above). Such stop must be made not less than ten feet nor more than one hundred feet distant from and BEFORE reaching the signal, and the car or train must not proceed, when so stopped, until the signal is "cleared." The clear or safety position of the home signal is shown in Figure 2 by the blade being in an inclined position which will show a white light at night, and when in this position gives permission to the car or train to proceed.

The distant signal is supplied with a green lens, B, and the blade, A, is painted green and is "fish-tailed," as shown by the dotted lines on Figures 1 and 2. When in the position shown on Figure 1 this signal will show a green light at night and the signal in this position is an order to proceed only with the car or train under perfect control, this order to remain in force until the next signal is reached or the point or obstruction to be protected by slow speed has been passed. The clear or safety position of the distant signal is shown in Figure 2 by the blade being in an inclined position, which will show a white light at night, and when in this position gives permission to the car or train to proceed without slackening speed.

When two or more semaphore signals of the same class are located on the same post the top blade (and light) governs the right-hand track or route; the next lower signal governs the next track or route to the left of the first, etc.

A SIGNAL IMPERFECTLY DISPLAYED OR THE ABSENCE OF A SIGNAL AT A PLACE WHERE A SIGNAL IS

USUALLY DISPLAYED must be regarded as a danger signal and the fact reported at the first opportunity to an inspector or the superintendent.

SPECIAL INSTRUCTIONS FOR CONDUCTORS.

69. Conductors must be civil and attentive to all passengers, especially ladies, children and elderly persons. They will endeavor to provide seats for all, when necessary requesting passengers to sit closer together.

(a) Conductors must announce distinctly the names of streets and stations, in each case calling the following street or station immediately on leaving or passing any street or station. They will also announce the approach to any point of considerable travel and at transfer stations or points will announce the lines to which transfer is made and their destinations.

(b) Conductors must keep the rear platform, doorway and brake free from obstruction as far as possible and not allow passengers to stand in front of the controller box. When the platform becomes crowded they will request passengers standing there to step inside the car.

(c) On closed cars when passengers crowd inside the rear door the conductor must request them to move forward and make room for others. Under no circumstances will conductors allow passengers to ride on the bumpers, roof or side step (especially when crossing a bridge) except

(d) Conductors must see that passengers do not place their feet upon the seats.

(e) Conductors must give particular attention to the ventilation of closed cars. No set rules can be issued to cover; good judgment must be employed to secure the comfort of passengers.

(f) Conductors will be governed in the handling of heaters in the cars by the instructions as bulletined.

(g) Smoking will be permitted

70. Conductors must never under ANY circumstances operate the controlling mechanism of the car or train; should the controller on the head end of the car or motor car prove defective and inoperative the conductor will take position at the head end of the car or train and transmit signals to the motorman, who will then run the car or motor car from the rear end of the car or from the rear end of the forward motor car of the train. In this event only half speed shall be used in such movement and the conductor must have protected the rear end of his car or train from any following car or train as per detailed bulletin instructions. While in this position the motorman will look out for any passengers desiring to leave the car. Should the motorman become incapacitated the conductor will at once stop the car or train and protect it.

(a) On double-track lines the in-track gates front and rear must be kept closed and the in-track side steps securely fastened up. Should such appliances become out of order on the road the conductor will be particular to guard against accidents occurring therefrom and will turn the car in upon reaching the end of trip or the depot.

(b) When possible to avoid it conductors must not give the go-ahead signal from any point other than the rear platform of the car or forward car of the train, and then only after being careful to see that all is safe.

(c) The conductor shall never leave the car for any purpose while on the road without first notifying the motorman, who will then be in responsible charge of car and passengers.

(d) In case of thunder storm the conductor will turn on the light circuit and keep lights burning until all signs of lightning are past; in case any considerable stop is made the conductor will remove the trolley wheel from the wire until ready to proceed.

(e) When another equipped car is being towed its pole must be drawn down and tied to the dash rail.

(f) When two cars are coupled for running or a trailer is used the signal for starting must be given by the conductor on the rear car first, after each stop, and promptly repeated by the conductor on the forward car, each conductor being careful to know that passengers are safely on or off his car. Should the two cars be under the charge of a single conductor he must not give the

starting signal unless standing on one of the platforms between the cars, and then only after satisfying himself that all is safe.

(g) Except in case of absolute necessity to avert accident, the conductor must never remove the trolley from the wire until after the power has been shut off and the car stopped.

(h) When not otherwise engaged the conductor must be on the rear platform of the car, or if a trailer is used on the front platform of the trailer on the lookout for passengers who wish to board or leave the car; while on the stand the conductor must be near the rear platform of the car or train to solicit passengers and give information; when on a grade the conductor must be on the rear platform of the car or on the front platform of the trailer used, ready to apply the brake if necessary; when passing any transfer point the conductor as well as the motorman must be on the lookout for the transfer signal from an approaching car on the other line, in order that passengers may make the transfer without undue delay.

(i) The conductor will see that the light circuit of the car is in good order before leaving the depot and will turn the lights on and off as needed; in case other than electric lights are used he will be sure to see that they are always ready for use and light them when necessary, but will not fill kerosene lamps. He must, with the motorman, make sure the headlight is burning brightly on the head end of the car after nightfall.

(j) Where tail lamps are used the conductor must see that they are in proper condition for use and at sunset he will see that they are lighted and kept burning on their proper position on the car.

71. Conductors must not take charge of or become responsible for any article not paying transportation charges as per freight tariff posted, except only articles used in the company's service and placed on their car by an authorized employe of the company.

(a) Conductors must promptly turn in to the authorized receivers of such property all articles found in their car or on the company's property, noting on a tag attached to each article their name, trip, date, time and place of finding.

(b) Conductors will prohibit all begging, peddling or vending on their car or train except by the agents of the company authorized by this company to so sell; in no case, however, should any attempt be made to remove such vendor, etc., from the car while it is in motion, and no threat or intimidation should be used to such persons.

72. A day card or train card will be furnished the conductor upon reporting for work by the agent to whom he reports, such card calling for information which must be filled out in detail and in accordance with bulletined instructions for each half-trip. Conductors will make up this card at the end of every half-trip and will be held strictly responsible for the accuracy of each and every statement made thereon. On the back of this card conductor will note any occurrence on each trip of which memorandum should be made; such card shall be turned in with the transfers and money collected to the receiver of moneys at the end of each day's work or at the end of any number of consecutive trips.

(a) Conductors will receive transfer pads and a punch from before starting work each day or swing and will return the unused transfers with the punch to after each swing or day's work; when making such return they will be given a properly numbered check which will serve as a receipt for the punch.

(b) Each conductor must provide himself with \$..... in change before going on duty.

(c) Before taking car out of house or from terminal when beginning work, conductor must see and know that the register is securely bolted and locked to the register block; for the condition of the register the conductor will be held strictly responsible.

(d) The conductor will see that the register is set in the proper direction in which he is about to move and will turn the direction only as instructed by bulletin notice.

(e) The conductor must promptly collect and register the fare of each passenger on the car, if possible within a block after boarding it, except at such points where an agent of the com-

pany shall have made the collection—as shown in bulletined orders—and excepting in such cases as scheduled herewith where the passengers are entitled to free transportation:

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(f) Conductors must not collect fares when approaching railroad crossings, transfer points, curves or switches.

(g) After making collection of fares conductor shall count the number of passengers on the car or cars and know that, excepting for the free, collection has been made from each and registration properly made. Fares must be registered singly as collected and not in bunches. When compelled to make change he will face the rear of the car, or, if on a trailer and working the train alone, face forward.

(h) If, after his fare has been collected and registered, the passenger discovers he is on the wrong car, the conductor will exercise his judgment as to return of the fare; if refunded, the conductor must not fail to ring up each other fare collected thereafter, but will make a note of the occurrence on the back of his day card and deduct the amount from the amount thereon called for to be turned in to the company's receiver. Also, when a conductor registers more fares than he collects such mistake can be corrected only by reporting it to the office.

(i) When passengers are transferred from one car to another at any place other than a regular transfer point the number of persons transferred, cause of such transfer and number of each car will be noted on the back of each day card and signed by each conductor engaged in the transaction; such persons will be registered on the car they board, but no further fares will be collected from them. If an inspector be present his signature must be secured on each day card as authorizing the transfer. The conductor must remain in charge of the disabled car until relieved.

(j) Should a conductor for any reason change his car after commencing his day's work he must not only note the number of the new car on the face of his day card opposite the half-trip on which the change occurred, but as well note on the back of the card the reason for the change and any damaged or filthy condition in which the new car or its equipment may be found.

73. When any conductor has any personal knowledge of an accident occurring in which any property may be damaged or any person or animal is likely to or may have been injured he will make prompt report of all the facts in the case to his depot immediately upon arrival at that point and as soon as possible fill out in exact and full detail a blank form provided for his use in such cases headed "Conductor's Accident Report." If the conductor was a passenger on a car involved in the accident or a nearby eyewitness of the occurrence or reaches the spot in time to do so, he will render every possible assistance to the conductor of the car and secure the names of as many witnesses not on the car as he can. If in charge of a car involved in any disturbance or accident he will secure the names and addresses of all possible witnesses, whether they actually saw the occurrence or not; in any event securing the name and address of every lady on the car. It is much preferred to have a witness write his own name and address if he can be induced to do so. Soon as the accident report is filled out it must be delivered, with the name slips of witnesses, as promptly as possible to the authorized representative of the superintendent.

(a) In case of serious accident the conductor or, if he so delegate, the motorman must immediately report the case by nearest telephone or telegraph to the nearest operating depot, dispatcher or division point, stating briefly the nature and probable extent of the trouble so that adequate assistance can be sent.

(b) The conductor must never eject a person from the car for disorderly conduct or non-payment of fare unless they get the names and addresses of witnesses. They will use no more force than is necessary in making the ejection, first bringing the car to a full stop at a traveled road, street or highway, a regular stopping point for passengers or a station.

(c) For each light of glass maliciously or wantonly broken

by a passenger or bystander the conductor will collect from the offender the sum of \$. . . and turn in such collection with his fare returns for the day or swing; a note must be made on the back of the day card to cover the occurrence and refer to the remittance.

SPECIAL RULES FOR MOTORMEN.

71. While the car or train is in motion responsibility for safe running and its safe handling lies with the motorman; he must never attempt at such time to do anything but handle the controlling mechanism and watch the road ahead, being prompt to give warning of his approach to danger points or on the appearance of danger.

(a) Under NO circumstances will any motorman permit another motorman or any person, other than a student placed by proper authority with him for instruction, to run the car or train of which he is in charge while he is on duty.

(b) Upon leaving the operating position, box or platform for any reason whatsoever when the train or car is standing, the motorman must remove and carry with him the controller and reverse handles (together with the power brake handle where power brake is used), and must in all cases have shut off the current through the controller, broken the circuit through the car (by throwing the overhead circuit breaker, main motor or cut-out switch) and fully set the brake.

(c) Under no circumstances and for no cause whatsoever shall the motorman leave the operating position, box or platform of any motor while the car or train is in motion, except in the single case that an accident endangering himself is imminent and he shall have done all he can to stop and reduce to a minimum the impending damage to person or property.

75. Motormen are expected to become familiar with the electrical and mechanical construction of the cars in order to be able to meet emergencies arising on the road; they will be held directly responsible for the condition of that equipment.

(a) They must make it their special business to carefully examine all parts of the car before leaving the barn, depot or terminal or taking charge of the car to see that all safety devices, signal gong, foot gong, air whistle, fender, controller reverse, sand boxes, etc., are in place and in good and fully operative condition headlight glass and reflector clean and after sunset the light on the forward end of the car or train is burning properly and brightly.

(b) They will see that all tools required to be carried are on the car or motor; where fuses are used they will be sure to have a sufficient supply of the proper design and amperage and shall never use heavy wire or any substitute therefor for a fuse. They must have at all times an ample supply of sand to cover any possible demand.

(c) Motormen must apply to the shop foreman in charge of cars for any specific information regarding operation which they do not thoroughly understand or regarding any part or parts of machinery or electrical apparatus or wiring which is liable to get out of order on the road or during service.

(d) They will never attempt to do any work on motors unless the circuit through the car has previously been broken by throwing the main motor switch, the overhead circuit breaker or withdrawing the trolley from the wire; they will never do such work with any loose metal article in an upper pocket, which is liable to fall out and cause ultimate if not immediate damage.

(e) They will examine motor and journal bearings as often as may be possible and if too warm the fact must be promptly reported; the armature, field coils, diverter coils and commutator should never get so hot that it is impossible to hold the hand on them. Motormen must never try to run a motor that is seriously out of order, but shall promptly cut out the motor at fault.

76. When current is cut off between the power house and the motors the motorman shall throw the controller handle to the "Off" position and come to a stop to ascertain the cause; if in the day time he will turn on the light circuit to determine if the power is on the line. If the rail be dead or dirty and power is on the line, connection must be established with the nearest live rail and the wheel by the conductor, contact being broken with the wheel first to avoid a shock. Both controllers should be tried; if one works the trouble is in the other; if neither works, with

power on the line, a fuse has probably been blown. In that event the conductor will remove the trolley from the wire or the motorman will break the circuit through the car before anything else is done, and then if on examination a new fuse is found to be necessary the motorman will remove and retain to be turned in the stubs or ends of the former fuse and, after placing the new fuse in position, set up the binding screws, holding it tightly in place, being very careful to secure a good contact at each end. Should the new fuse be blown the motor at fault, as designated by the position of the controller handle at which the blowing occurred, should be cut out. If both motors prove disabled so as to prevent the self-movement of the car the circuit must be broken through the car and assistance called for; in the case of a multiple-unit train, if the other motors in the train can propel it, the train will be moved in accordance with Rule 70.

(a) In case the power is cut off and the brake is found to be defective, the motorman before signaling the conductor to set the rear brake will set the reverse handle opposite from the direction in which the car is moving, throw the controller handle to the last position and allow it to so remain until the effect takes place, then, being careful to throw the handle to the "Off" position. Should this for any reason prove inoperative the motorman will promptly signal the conductor to apply the rear brake.

(b) The motorman must not reverse the power under usual running conditions; reversing is a severe strain upon the apparatus, especially when the car is under high speed. When necessary to reverse, and the car has been brought to a full stop, the motorman will return the handle to the "Off" position and apply the brake fully.

(c) When tracks are covered with water or slush motormen will run slowly and carefully, with power off where possible in order that the splash of the water may not cause a short-circuit in the motors or wiring of the car. They must never try to run through water so high as to touch the bottom of the motor-shell.

77. Before completing the circuit through the car on starting to work the motorman will see that the controller handle or cylinder indicator points to the "Off" position; main motor switch or overhead circuit breaker will then be closed and the brakes released before the power is applied to start the car. In starting at any time power should be applied gradually and fed with only proper speed in order that no damage may be done the equipment or injury caused to passengers by the sudden jolt. The controller handle must never be thrown on the last point if the car does not start on the preceding points.

(a) Motormen must conform to time table requirements as closely as possible, regulating speed in accordance therewith and with the limits of the time point cards. If a motorman should be delayed he will not undertake to recover the time lost in the minimum distance, but, IF IT BE ENTIRELY SAFE TO DO SO, he will run slightly faster during the entire run, aiming to reach destination or end of trip as nearly on time as may be possible.

(b) Motormen shall never run ahead of time unless directed to do so by an authorized officer of the company.

(c) On descending grades the motorman shall allow the car to coast as much as possible with power thrown off, always being careful to keep the car under control and never allowing it to run down hill faster than the motors will take it up the same hill. Coasting being good and economical practice, will be done wherever possible.

(d) In stopping, brakes will be applied gradually to reduce the deleterious effect of a sudden retardation of motion in all service stops; just before the car or train comes to rest the brakes will be released slightly or partially kicked off so as to obviate the recoil that would otherwise ensue.

(e) Brakes must never be applied while the current is being used nor current applied while the brakes are on; serious consequences are liable to follow disregard of this rule.

(f) When, on applying brakes, the wheels are felt to be slipping the motorman will release the brakes partially, start sand to running and again set up the brakes.

78. Motormen will sound the gong with a double signal when approaching a station, standing car (see Rule 68a) or at any other times when necessary to call attention to the movement of

the car; where air whistle is used this signal will be given thereon.

(n) Motormen will use particular care when approaching or passing schoolhouses or any other places where children are wont to congregate, having speed materially slackened and cars under control.

(o) Where streets are dug up or excavations are made under, alongside or near the tracks, motormen will observe particular care in running, taking no risks. In passing men at work in the streets or along the tracks particular care will be used.

79. Motormen will observe the minimum spacing distances as bulletined allowed between any two cars moving in the same direction on the same track.

(a) On limited curves (where two cars cannot pass) when two cars arrive at the same time the car on the outer track has the right of way.

(b) On double track lines a car will be run slowly approaching and passing a car in slow motion in the opposite direction.

(c) Motormen must throw off power immediately before striking a curve, or before passing over or under any circuit breaker, special work, insulated joint, slip joint, frog or any similar mechanical contrivance.

(d) When any vehicle is seen in the track ahead or so close thereto that a car may not pass it the motorman shall slacken speed and not approach nearer than feet until he has received the conductor's signal that the car will pass.

(e) Motormen will not run over any sticks, stones or other small obstructions on the rail, but will see that the track is at all times clear.

80. Motormen must never run against a facing switch point when meeting a car without first coming to a full stop and then proceeding only with the car under perfect control. This rule refers particularly to all crossovers and curves having switch points facing opposite to that in which the car is going.

(a) Motormen must not pass over any switch until they KNOW that the tongue is properly and fully turned, and then only at reduced speed. Particular care must be taken when switches are covered with snow or water.

81. Every motorman, after having run any car, whether for a day or but a single trip, will, upon being relieved and before leaving the depot, report the condition of the car or cars he has handled on the shop sheets provided; these sheets will show the run number and the motorman will enter thereon opposite his run number (or below the regular runs if he has been on an extra car) the number of the car he had on that run or any part thereof on that day, any defects of the car or its equipment and sign his name thereto. No excuse will be accepted for failure to so report.

(a) When any motorman has any personal knowledge of an accident occurring in which any property may be damaged or any person or animal is likely to or may have been injured he will make prompt report of all the facts in the case to his depot immediately upon arrival at that point and soon as possible fill out in full and exact detail a blank form provided for his use in such cases headed "Motorman's Accident Report." If the motorman was a passenger on a car involved in the accident or a nearby witness of the occurrence or reaches the spot in time to do so, he will render every possible assistance to the crew of the car. If running a car that becomes involved in any disturbance or accident, he will see to securing as many names from witnesses to the occurrence from the sidewalk or adjacent stores as may be possible, giving such names to his conductor.

Respectfully submitted,

J. C. BRACKENRIDGE,
E. C. FOSTER,
T. E. MITTEN,
W. E. HARRINGTON,

Committee.

A car which has been remodeled and handsomely furnished by the Topeka (Kan.) Railway Co., was christened with imposing ceremonies on the eve of being again put into service, September 26th. The name conferred was Pearl in honor of a member of the local fashionable set, who performed the christening rites in the preferred way by smashing a bottle over the coupling rod of the car.

ROADMASTERS AND MAINTENANCE OF WAY CONVENTION.

The 20th annual convention of the Roadmasters' and Maintenance of Way Association was held in Milwaukee, Wis., September 9, 10 and 11 and about 80 members were present. The meeting was opened by an address of welcome by Mr. J. H. Stover, representing the mayor, which was responded to by Capt. Isaac Burnett, the first president of the association. Twenty-three new members were elected and Mr. J. H. Linsley was elected an honorary member.

The program for the first session included a report on the education of young men for foremen and the discipline of section men. At the afternoon session an address was made by Mr. J. P. Brown, secretary and treasurer of The International Society of Agriculture. Mr. Brown advocated the starting of tree plantations by railroads for growing tie timber and mentioned in particular the catalpa speciosa plantations of the Illinois Central and the Boston & Maine Railroads. This was followed by the report of the committee on track jacks and a paper entitled "Should Rails be Curved Before Laying" by J. C. Rockhold of the Santa Fe. A report on right of way fences, cattle guards and wing fences was read and was followed by a paper on "Track Drainage" by Mr. J. M. Meade of the Santa Fe. The morning of the second day was devoted to a discussion of a gasoline inspection car made by the Sheffield Car Co. Mr. J. M. Huss, representing the makers, described the car and explained its method of working. A paper was then read by Mr. C. Buhner describing his method of converting old rails into steel ties. This was followed by a general discussion on ties, tie plates and tie preservation. At the final session on Thursday the report on new and improved appliances was read and received without discussion. The following officers were elected: President, John Doyle, superintendent of tracks, Pere Marquette; first vice-president, F. R. Coates, chief engineer, Chicago Great Western; second vice-president, J. A. Kerwin, roadmaster, Missouri, Kansas & Texas; secretary and treasurer, Charles McEniry, general roadmaster, Chicago, Rock Island & Pacific (Northern District); members of the executive committee, C. E. Jones, roadmaster, Chicago Burlington & Quincy, and J. L. Single, division supervisor, Long Island Railroad. The place selected for the next meeting is Kansas City, Mo. It was decided to have a four days' meeting.

SIDNEY (AUSTRALIA) TRAMWAY SYSTEM.

A new power house for the Sidney tramway system has recently been completed. This additional power house, which is located at Ultimo, Sidney, has been built preliminary to the change of a large part of the company's cable and steam roads to electric propulsion.

The Balmain line has already been converted into an electric line and this will be succeeded by the Waverly and Bondi lines in a few weeks. All the other lines of the company will be electrically equipped in turn. Four steam roads operated by this company, known as the North Shore, Dulwich Hill, Leichhardt and Glebe Point lines, were converted into electric lines before the new power house was built. These changes have brought a new class of rolling stock into use and the company now has 338 electric cars in operation in Sidney. The new cars are all equipped with Christensen air brakes.

The company has four large car barns already built at Ultimo, Newtown, Rush Cutter Bay and North Sidney, and three large new sheds are being erected at Ft. MacQuarie, Waverly and Rozelle Bay. These barns are all provided with track pits so that inspection and minor repairs can be carried out on any car in whichever barn it is located.

During the last fiscal year 107,000,000 passengers were carried by the company, and its receipts amounted to \$3,158,750. There were 104 miles of track operated and the employes of the company numbered 4,075.

The Seattle (Wash.) Electric Co. will construct a freight depot at Ballard, Wash. Nearly all freight that is brought into that city is carried by the electric company.

The Montpelier Electric Light & Railroad Co., with headquarters at Mont Pelier, Idaho, has been incorporated with a capital of \$25,000. The directors are J. A. Bostan, L. C. Miller, Charles Hoff, J. A. Bagley and W. E. Raines.

**WASHINGTON, BALTIMORE & ANNAPOLIS
SINGLE PHASE RAILWAY.***

BY B. G. LAMME.

The Washington, Baltimore & Annapolis Ry. is a new high-speed electric line extending from the suburbs of Washington to Baltimore, a distance of about 31 miles, with a branch from Annapolis Junction to Annapolis, a distance of about 15 miles. The overhead trolley will be used, and schedule speeds of over 40 miles per hour are to be attained. This road is to be the scene of the first commercial operation of an entirely new system of electric traction.

The special feature of this system is the use of single-phase alternating current in generators, transmission lines, trolley car equipment and motors. It constitutes a wide departure from present types of railway apparatus, and while retaining the best characteristics of the present standard direct current motor system, the use of alternating current makes it possible to avoid many of the bad features.

The standard direct current railway equipment possesses several characteristics which fit it especially for railway service. These characteristics have been of sufficient importance to overbalance many defects in the system. In fact, a far greater amount of effort and engineering skill has been required for overcoming or neutralizing the defects, than for developing the good features possessed by the system. By far the most important characteristic possessed by the direct current system is found in the type of motor used on the car. The direct current railway motor is in all cases a series-wound machine. The series motor is normally a variable field machine and it is this feature which has adapted the motor especially to railway service. Shunt-wound motors have been tried and abandoned. All manner of combinations of shunt, series and separate excitation have been devised and found wanting, and in many cases the real cause of failure was not recognized by those responsible for the various combinations. They all missed to a greater or less extent the variable-field feature of the straight series motor. It is true that a variable field can be obtained with shunt or separate excitation, but not without controlling or regulating devices, and the variation is not inherently automatic, as in the series motor.

Polyphase and single-phase induction motors do not possess the variable field feature at all, as they are essentially constant-field machines. They are equivalent to direct current shunt or separately excited motors, with constant field strength, which have been unable to compete successfully with the series motor. The variable field of the series motor makes it automatically adjustable for load and speed conditions. It also enables the series motor to develop large torques without proportionately increased currents. The automatically varying field is accompanied by corresponding variations in the counter e. m. f. of the armature, until the speed can adjust itself to the new field conditions. This feature is of great assistance in reducing current fluctuations, with a small number of steps in the regulating rheostat. Any increase in current, as resistance is cut out, is accompanied by a momentary increase in the counter e. m. f., thus limiting the current increase to a less value than in the case of a constant field motor.

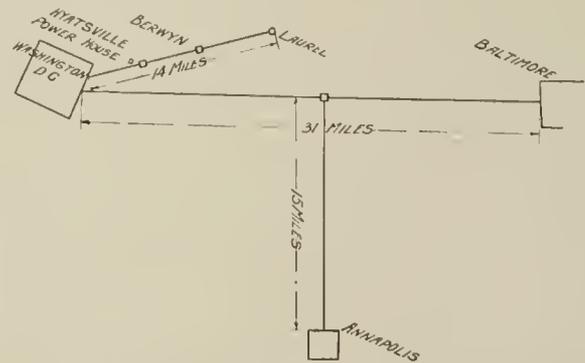
Next to the type of motor, the greatest advantage possessed by the direct current system lies in the use of a single current or circuit, thus permitting the use of one trolley wire. The advantages of the single trolley are so well-known that it is unnecessary to discuss them. For third rail construction, the use of single current is of even greater importance than in the case of the overhead trolley. It is seen, therefore, that it is not to the direct current that credit should be given for the great success of the present railway system, but to the series type of motor and the fact that up to the present time no suitable single-phase alternating current motor has been presented.

Some of the undesirable features of the direct current railway system should also be considered. The speed control is inefficient. A nominally constant voltage is supplied to the car, and speed control is obtained by applying variable voltage at the motor terminals. This variation is produced by the use of resistance in series with the motor, with a loss proportional to the voltage taken up by

the resistance. By means of the series-parallel arrangement, the equivalent of two voltages is obtainable at the motor terminals without the use of resistance. Therefore, with series-parallel control, there are two efficient speeds with any given torque, and with multiple control there is but one efficient speed with a given torque. All other speeds are obtained through rheostatic loss, and the greater the reduction from either of the two speeds, series or parallel, the lower will be the efficiency of the equipment. At start, the rheostatic losses are always relatively large, as practically all the voltage of the line is taken up in the rheostat. For heavy railroad service, where operation for long periods at other than full and half speeds may be necessary, the rheostatic loss will be a very serious matter.

The controlling devices themselves are also a source of trouble. An extraordinary amount of time and skill has been expended in perfecting this apparatus. The difficulties increase with the power to be handled. The controller is a part of the equipment which is subjected to much more than ordinary mechanical wear and tear, and it can go wrong at any one of many points. The larger the equipment to be controlled, the more places are to be found in the controller which can give trouble. The best that can be said of the railway controller is that it is a necessary evil.

Another limitation of the direct current system is the trolley voltage. Five hundred volts is common at the car and 650 volts is very unusual. By far the larger number of the railway equipments in service to-day are unsuited for operation at 600 volts, and 700 volts in normal operation would be unsafe for practically all.



ROUTE OF THE WASHINGTON, BALTIMORE & ANNAPOLIS RY.

The maximum permissible trolley voltage is dependent upon inherent limitations in the design of motors and controllers. The disadvantages of low voltage appear in the extra cost of copper and in the difficulty of collecting current. In heavy railroad work the current to be handled becomes enormous at usual voltages. A 2,400-h. p. electric locomotive, for example, will require between 3,000 and 4,000 amperes at normal rated power and probably 6,000 to 8,000 amperes at times. With the overhead trolley these currents are too heavy to be collected in the ordinary manner, and it is a serious problem with any form of trolley or third rail system which can be used. It is evident that for heavy service, comparable with that of large steam railways, a much higher voltage than used in our present direct current system is essential, and the use of higher voltage is destined to come, provided it is not attended by complications which more than overbalance the benefits obtained.

A further disadvantage of the direct current system is the destructive action known as electrolysis. This may not be of great importance in interurban lines, chiefly because there is nothing to be injured by it. In city work its dangers are well-known, and very expensive constructions are now used to eliminate or minimize its effects.

From the above statements it is evident that an alternating current railway system, to equal the direct current system, should possess the two principal features of the direct current system, viz: A single supply circuit and the variable field motor, and to be an improvement upon the direct current system, the direct current should avoid some of the more important disadvantages incident to the present direct current apparatus.

The system must, therefore, be single phase. The importance of using single-phase for railway work is well known. The difficulties and complications of the trolley construction are such that several alternating current systems have been planned on the basis

*Read at the 100th meeting of the American Institute of Electrical Engineers, New York, Sept. 26th, 1902.

of single phase supplied to the car, with converting apparatus on the car to transform to direct current, in order that the standard type of railway motors may be used. Such plan are attempts to obtain the two most valuable features of the present direct current system. The polyphase railway system, used on a few European roads, employs three currents, and therefore does not meet the above requirement.

The motor for the alternating current railway service should have the variable speed characteristics of the series direct current motor. The polyphase motor is not suitable, as it is essentially a constant field machine, and does not possess any true variable speed characteristics. Therefore it lacks both of the good features of the direct current railway system. A new type of motor must, therefore, be furnished, as none of the alternating current motors in commercial use is adapted for the speed and torque requirements of first-class railway service. Assuming that such a motor is obtainable for operation on a single-phase circuit, the next step to consider is whether the use of alternating instead of direct current on the car, will allow some of the disadvantageous features of the direct current system to be avoided.

The direct current limits of voltage are at once removed, as transformers can be used for changing from any desired trolley voltage to any convenient motor voltage. Electrolytic troubles practically disappear. As transformers can be used, variations in supply voltage are easily obtainable. As the motor is assumed to have the characteristics of the direct-current series motor, speed control without rheostatic loss is practicable when voltage control is obtained. This combination, therefore, allows the motor to operate at relatively good efficiency at any speed within the range of voltage obtained. If the voltage be varied over a sufficiently wide range, the speed range may be carried from the maximum desired down to zero, and therefore, down to starting conditions. With such an arrangement no rheostat need be used under any conditions, and the lower the speed at which the motor is operated, the less the power required from the line. The least power is required at start, as the motor is doing no work and there is no rheostatic loss. The losses at start are only these in the motor and transforming apparatus, the total being less than when running at full speed with an equal torque. Such a system, therefore, permits maximum economy in power consumed by motor and control. This economy in control is not possible with the polyphase railway motor, as this motor is the equivalent of the direct current shunt motor, with which the rheostatic loss is even greater than with the series motor.

The use of alternating current on the car allows voltage control to be obtained in several ways. In one method a transformer is arranged with a large number of leads carried to a dial or controller drum. The Stillwell regulator is a well-known example of this type of voltage-control. This method of regulation is suitable for small equipments with moderate currents to be handled. The controller will be subject to some sparking, as in the case of direct current apparatus, and therefore becomes less satisfactory as the car equipment is increased in capacity. Another method of control available with alternating current is entirely non-sparking, there being no make-and-break contacts. This controller is the so-called "induction regulator," which is a transformer with the primary and secondary windings on separate cores. The voltage in the secondary winding is varied by shifting its angular position in relation to the primary. With this type of voltage controller, very large currents can be handled, and it is especially suitable for heavy equipments, such as locomotives. It is thus seen that there is one method of control available with alternating current, which avoids the inherent troubles of the direct current controller. The induction regulator is primarily a transformer, and all wear and tear is confined to the supports which carry the rotor. Therefore the objectionable controller of standard direct current system can be eliminated, provided a suitable alternating current motor can be obtained. This ideal type of controller is not applicable to the polyphase railway motor, in which speed control can be obtained only through rheostatic loss. The polyphase control system is even more complicated than the direct current, as there must be a rheostat for each motor, and two or three circuits in each rheostat. It is thus apparent that by the use of single-phase alternating current with an alternating current motor having the characteristics of the direct current series motor, the best features of the direct current system can be obtained, and at the same time many of its disadvantages can be avoided.

This portion of the problem therefore resolves itself into the construction of a single-phase motor having the characteristics of the direct current series motor. There are several types of single phase alternating current motors which have the series characteristics. One type is similar in general construction to a direct current motor, but with its magnetic circuit laminated throughout, and with such proportions that it can successfully commutate alternating current. Such a motor is a plain series motor, and can be operated on either alternating or direct current and will have the same torque characteristics in either case. Another type of motor is similar in general construction to the above, but the circuits are arranged in a different manner. The field is connected directly across the supply circuit, with proper control appliances in series with it. The armature is short circuited on itself across the brushes, and the brushes are set at an angle of approximately 45° from the ordinary neutral point. The first of these two types of motors is the one best adapted for operation in large units.

This is the type of motor which is to be used on the Washington Baltimore and Annapolis Ry. Several motors have been built and tested with very satisfactory results, both on the testing stand and under a car. The results were so favorable that the system was proposed to the Cleveland Engineering Co., representing the Washington, Baltimore & Annapolis Ry., and after investigation by their engineers, it was adopted. A description of the apparatus to be used on this road will illustrate the system to good advantage.

Single-phase alternating current will be supplied to the car at a frequency of 16 2/3 cycles per second, or 2,000 alternations per minute. The current from the overhead trolley wire is normally fed in by one trolley at approximately 4,000 volts. Within the limits of the District of Columbia two trolleys are employed, as by Act of Congress the use of rails as conductors is prohibited in this District, presumably on account of electrolysis. In this case the trouble, of course, will not exist, but the contracting company has been unable to obtain permission for the grounded circuit.

The alternating current to the car is carried through a main switch or circuit breaker on the car, to an auto-transformer connected between the trolley and the return circuit. At approximately 300 volts from the ground terminal a lead is brought out from the auto-transformer and passes through the regulator to one terminal of the motors. For starting and controlling the speed, an induction regulator is used with its secondary winding in series with the motors. This secondary circuit of the regulator can be made either to add to, or subtract from the transformer voltage, thus raising or lowering the voltage supplied to the motors. The regulator therefore does double duty. The controller for direct current motors merely lowers the voltage supplied to the motors but cannot raise it, but an alternating current regulator can be connected for an intermediate voltage, and can either raise or lower the motor voltage. In this way the regulator can be made relatively small, as it handles only the variable element of the voltage and the maximum voltage in the secondary winding is but half of the total variation required.

In the equipments in question, the range of voltage at the motor is to be varied from approximately 200 volts up to 400 volts or slightly higher. The transformer on the car will supply 315 volts, and the secondary circuit of the regulator will be wound to generate slightly more than 100 volts when turned to the position of its maximum voltage. This voltage of the regulator is about one-fourth of that of the motors at full voltage. The regulator can consequently be made relatively small, in comparison with the motor capacity of the equipment. It has been found unnecessary to use much lower than 200 volts in this installation, as this allows a comparatively low running speed, and approximately 200 volts will be necessary to start with the required torque. The greater part of this voltage is necessary to overcome the e. m. f. of self-induction in the motor windings, which is dependent upon the current through the motor and is independent of the speed of the armature.

There will be four motors of 100 h. p. on each car. The full rated voltage of each motor is approximately 220 volts. The motors are arranged in two pairs, each consisting of two armatures in series, and two fields in series, and the two pairs are connected in parallel. The motors are connected permanently in this manner. Since voltage control is used, there is no necessity for series parallel operation, as with direct current motors. To ensure equal voltage to the armatures in series, a balancing or equalizing action is obtained by the use of a small auto-transformer connected perma-

cently across the two armatures in series, with its middle point connected between them. The fields are arranged in two pairs, with two fields in series and two pairs in multiple. This parallels the fields independently of the armatures, which was formerly the practice with direct current motors. It was a defective arrangement with such motors, as equal currents in the field did not ensure equal field strengths in the motors, and the armatures connected in parallel, therefore, could be operating in fields of unequal strength, with unequal armature currents as a direct result. With alternating currents in the fields, the case is different. The voltage across the fields is dependent upon the field strengths, and the current supplied to the fields naturally divides itself for equal magnetic strengths. The chief advantage in paralleling the fields and armatures independently is, that one reversing switch may serve for the four motors and one balancing transformer may be used across the two pairs of armatures. The ordinary direct current arrangement of armatures in series with their own fields can be used, with a greater number of switches and connections.

The general arrangement of the auto-transformer, regulator, motors, etc., is shown in Fig. 1.

The induction regulator or controller, resembles an induction motor in general appearance and construction. The primary winding is permanently short-circuited on itself. The function of this short-circuited winding is to neutralize the self-induction of the secondary winding as it passes from the magnetic influence of the

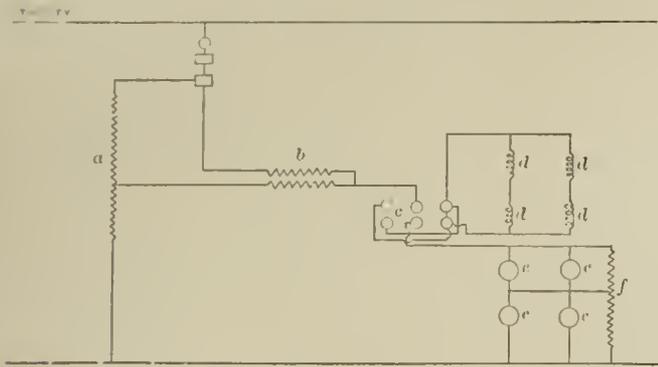


FIG. 1.

primary. The regulator is wound for two poles, and therefore is operated through 180° in producing the full range of voltage for the motors. One end of the primary winding of the regulator is connected to the trolley, and the other to a point between the regulator and the motors. It thus receives a variable voltage as the controller is rotated. There are several advantages in this arrangement of the primary in this particular case. First, the regulator is worked at a higher induction at start, and at lower induction when running, the running position being used in these equipments for much longer periods than required for starting. Second, when the motors are operating at full voltage the current in the primary of the regulator passes through the motors but not through the auto-transformer or the secondary of the regulator. This allows considerable reduction in the size of auto-transformer and regulator.

The motors on the car are all of the straight series type. The armature and field being connected in series, the entire current of the field passes through the armature as in ordinary series direct current motors. The motor has eight poles, and the speed is approximately 700 revolutions at 220 volts. The general construction is similar to that of a direct current motor, but the field core is laminated throughout, being necessary on account of the alternating magnetic field. There are eight field coils wound with copper strip and all connected permanently in parallel. The parallel arrangement of field coils serves in equalizing the field strength in the different poles, due to the balancing action of alternating currents in parallel. This arrangement is not really necessary, but it prevents some bad usage, and therefore has been used. With equal magnetic strength in the poles, the magnetic pull is equalized over with the armature out of center.

The structure is similar in general construction to that of a

direct current motor. The fundamental difficulty in the operation of a commutator type of motor, on single-phase alternating current lies in the sparking at the brushes. The working current passing through the motor should be practically no more difficult to commutate than an equal direct current, and it is not this current which gives trouble. The real source of trouble is found in a local or secondary current set up in any coil, the two ends of which are momentarily short-circuited by a brush. This coil encloses the alternating magnetic field, and thus becomes a secondary circuit of which the field-coil forms the primary. In the motors of the Washington, Baltimore and Annapolis Railway, this commutation difficulty has been overcome by so constructing the motor that the secondary or short-circuit current in the armature coil is small, and the commutating conditions so nearly perfect that the combined working and secondary currents can be commutated without sparking. This condition being obtained, the motor operates like a direct current machine and will give no more trouble at the commutator than ordinary direct current railway motors. Experience covering a considerable period in the operation of motors of 100 h. p. capacity indicates that no trouble need be feared at the commutator.

An extended series of tests were made with these motors at the Westinghouse shops at East Pittsburgh, both in the testing room and under a car. Fig. 2 shows curves of the speed, torque, efficiency and power factor plotted from data from brake tests.

It should be noted that the efficiency is good, being very nearly equal to that of high-class direct current motors. The power factor, as shown in these curves, is highest at light loads and decreases with the load. This is due to the fact that the power developed increases approximately in proportion to the current, while the wattless component of the input increases practically as the square of the current. The curve indicates that the average power factor will be very good. The calculations for the W., B. & A. Ry. show that the average power factor of the motors will be approximately 86 per cent.

The average efficiency of these equipments will be much higher during starting and accelerating than that of corresponding direct current equipments, as rheostatic losses are avoided. When running at normal full speed, however, the efficiency will be slightly less than with direct current. This is due to the fact that the alternating current motor efficiency is slightly lower than the direct current, and in addition there are small losses in the transformer and the regulator. The alternating current equipments are somewhat heavier than the direct current, thus requiring some extra power, both in accelerating and at full speed. Therefore, for infrequent stops the direct current car equipment is more efficient than the alternating current, but for frequent stops the alternating current shows the better efficiency. Tests on the East Pittsburgh track verified this conclusion. But the better efficiency of the direct current equipment with infrequent stops is offset with the alternating current by decreased loss in the trolley wire, by reason of the higher voltage used, and by the elimination of the rotary converter losses. The resultant efficiency for the system will therefore be equal to or better than that of the direct current.

In the W., B. & A. Ry. contract the guarantee given by the Westinghouse Electric and Manufacturing Co. states that the efficiency of the system shall be equal to that of the direct current system with rotary converter sub-stations.

There is one loss in the alternating current system which is relatively much higher than in the direct current. This is the loss in the rail return. Tests have shown that at 2,000 alternations it is three to four times as great as with an equal direct current. This would be a serious matter in cases where the direct current rail loss is high. But the higher alternating current trolley voltage reduces the current so much, that the alternating current rail loss is practically the same as with direct current at usual voltages. In many city railways the direct current rail loss is made very low, not to lessen waste of power, but in order to reduce electrolysis. In such cases the alternating current rail loss could be higher than direct current, thus decreasing the cost of return conductors. More numerous transformer sub-stations, with copper feeders connected to the rail at short intervals will enable the rail loss to be reduced to any extent desired.

At a frequency of 2,000 alternations per minute is used, the lighting of the car and the sub-stations was at first considered to be a serious difficulty, due to the very disagreeable winking of ordi-

ary incandescent lamps at this frequency. Two methods of overcoming the winking were tried, both of which were successful. One method was by the use of split phase. A two phase induction motor was run on a single-phase 2,000 alternating circuit, and current was taken from the unconnected primary circuit of the motor. This current was, of course, at approximately 90° from the current of the supply circuit. A two-phase circuit was thus obtained on the car. Currents from the two phases were put through ordinary incandescent lamps, placed close together. The resulting illumination a few feet distant from the lamps showed about the same winking as is noticed with 3,000 alternations. With two filaments in one lamp the winking disappears entirely. A three-phase arrangement would work in the same way.

A much simpler method was tried which worked equally well. This consisted in the use of very low-voltage lamps. Low voltage at the lamp terminals allows the use of a thick filament with considerable heat inertia. Tests were made on lamps of this type at a frequency of 2,000 alternations, and the light appeared to be as

are placed in partially closed slots. There are four coils per pole. The proportions of these machines are such that good inherent regulation is obtained without saturation of the magnetic circuit. The rise in potential with non-inductive load thrown off will be approximately 4 per cent. An alternative estimate was furnished for the generators proposing 20,000 volts instead of 15,000. The simplicity of the type of winding used, and the low frequency, are both favorable for the use of very high voltage on the generator. As 15,000 volts was considered amply high for the service, the engineers for the railway considered it inadvisable to adopt a higher voltage.

There are to be two exciters, each of 100 kw. capacity at 250 revolutions. The exciters are wound for 125 volts normal. The armature of each exciter has, in addition to the commutator, two collector rings, so that single-phase alternating current can be delivered. It is the intention to use the exciters as alternators for supplying current to the system for lighting when the large generators are shut down at night.

The main station switchboard comprises three generator panels, one load panel, and three feeder panels. High-tension oil-break switches are to be provided, operated by means of controlling apparatus on the panels. The switches, bus-bars and all high-tension apparatus will be in brick compartments separate from the board. In each generator circuit there are two non-automatic oil-break switches in series; and on each feeder circuit there are two overload time-limit oil-break switches in series. The two oil-break switches in series on the same circuit can be closed separately and then opened to test the switches without closing the circuit. With the switches in the closed position they are both operated at the same time by the controlling apparatus, to ensure opening of the circuit, and to put less strain on the switches, although either one is capable of opening the load. There will be nine transformer substations distributed along the railway line. Each station will contain two 250 kw. oil-cooled lowering transformers, supplying approximately 1,000 volts to the trolley system. Two transformers are used in each station so that in case of accident to one transformer the station will not be entirely crippled.

It is the intention of the railway company to operate a direct current road already equipped with the direct-current system. The present direct current car equipments are to be retained, but the current will be supplied from a rotary converter sub-station fed from the main system of the W. B. & A. Ry. As this system is single-phase, it is necessary that single-phase rotaries be used in the substations. There are to be two 200 kw. 550-volt rotary converters. These are 4-pole, 500-revolution machines. The general construction of these machines is very similar to that of the Westinghouse polyphase rotary converters. The armature resembles that of a polyphase rotary except in the number of collector rings, and in certain details of the proportions made necessary by reason of the use of the single-phase. The commutating proportions are so good that any reactions due to the use of single-phase will result in no injurious effect. The field construction is similar to that of a polyphase rotary. The laminated field-poles are provided with dampers of the "grid" or "cage" type, a form used at present in the Westinghouse polyphase rotary converters. The dampers serve to prevent hunting, as in the polyphase machines, and also to damp out pulsations due to single-phase currents in the armature. The damper acts to a certain extent as a second phase. Each rotary converter is started and brought to synchronous speed by a small series alternating current motor on the end of the shaft. The voltage at the motor terminals can be adjusted either by loops from the lowering transformer or by resistance in series with the motor, so that true synchronous speed can be given to the rotary converter, before throwing it on the alternating current line.

From the preceding description of this system and the apparatus used on it, some conclusions may be drawn as to the various fields where it can be applied to advantage. It is evident that a good field for it will be on interurban long-distance lines such as the W. B. & A. Ry. On such railways, high trolley voltage and the absence of converter sub-stations are very important factors.

For heavy railroading also, this system possesses many ideal features. It allows efficient operation of large equipments at practically any speed and any torque, and also avoids the controller troubles which are ever present with large direct current equipments. It also permits the use of high trolley voltage, thus reducing the current to be collected. In this class of service the advan-

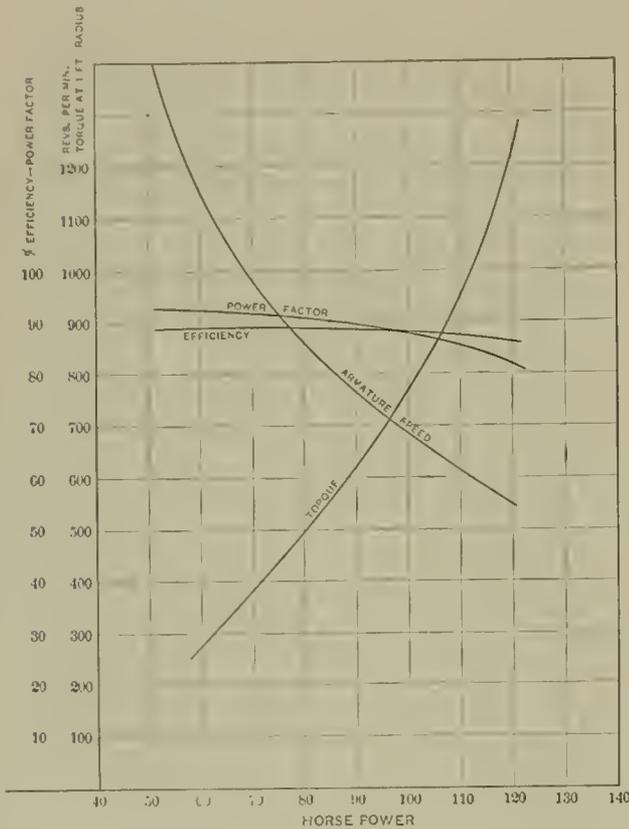


FIG. 2.

steady as that from the ordinary high-frequency incandescent lamp. The low voltage is not objectionable in this case, as a number of lamps can be run in a series, as in ordinary street railway practice, and any voltage desired can readily be obtained, as alternating current is used on the car.

There will be an air compressor, driven by a series alternating current motor, on each car, for supplying air to the brakes and for operating the driving mechanism of the controller. The details of this mechanism are not sufficiently near to completion to permit a description of it. The method used will be one which readily allows operation on the multiple-unit system.

The generating station contains some interesting electrical features, but there is no great departure from usual alternating current practice. There will be three 1,500 kw. single-phase alternators. These are 24-pole machines operating at 83 revolutions and wound for 15,000 volts at the terminals. They are of the rotating field type, with laminated magnetic circuits and field-coils of strap on edge. The field-coils are held on the pole-tips by copper supports, which serve also as dampers to assist in the parallel running. The armatures are of the usual slotted type. The armature coils

tages of this alternating current system are so great that it is possible that heavy railroading will prove to be special field for it.

For general city work, this system may not find a field for some time to come, as the limitations in the present system are not so great that there will be any urgent necessity for making a change. It is probable that at first it will be applied to new railways, or in changing over steam roads rather than in replacing existing city equipments. One difficulty with which the new system will have to contend, is due to the fact that the alternating circuit equipments cannot conveniently operate on existing direct current city lines, as is the present practice where interurban lines run into the cities. It will be preferable for the alternating current system to have its own lines throughout, unless very considerable complication is permitted. When the alternating current system applied to interurban and steam railways finally becomes of predominant importance, it is probable that the existing direct current railways will gradually be changed to alternating current as a matter of convenience in tying the various lines together.

As was stated above, alternating current equipments cannot conveniently be operated on direct current lines. It does not follow, however, that the motor will not operate on direct current. On the contrary, the motor is a first-class direct current machine, and if supplied with suitable control apparatus and proper voltage it will operate very well on the direct current lines. This would require that the motors be connected normally in series, as the voltage per motor is low. A complete set of direct current control apparatus would be needed when the alternating current equipment is to be run on direct current, and considerable switching apparatus would be necessary for disconnecting all the alternating current control system and connecting in the direct current. The complication of such a system may be sufficient to prevent its use, at least for some time to come.

In some cities, very strict laws are in force in regard to the voltage variations in various parts of the track system. The permissible variations are so small in some cases that an enormous amount of copper is used for return conductors; and in some cases special boosters are used in the return circuits to avoid large differences of potential between the various parts of the track system. The object in limiting the conditions in this manner is to avoid troubles from electrolysis. The alternating current system will, of course, remedy this.

For city work, it is probable that voltages of 500 or 600 would be employed instead of 1,000 or higher. The transformers and controllers can be designed to be readily changed from full to half voltage, so that low voltage can be used on one part of the line and high voltage on another. As the car equipments of such railways are usually of small capacity, it is probable that speed control will be obtained by means of a transformer with a large number of leads carried out to a control drum, rather than by means of the induction regulator, as the latter device is much more expensive in small units. This is chiefly a question of cost, and if the advantages of the induction regulator are found to overweigh the objection of high first cost, then it will be used even on small equipments.

In the W., B. & A. Ry. the generators are wound for single phase. In the case of large power-stations with many feeders, the generators may be wound for three-phase, with single-phase circuits carried out to the transformer sub-station; or three-phase transmission may be used, with the transformers connected in such a manner as will give a fairly well balanced three-phase load.

There are many arrangements and combinations of apparatus made possible by the use of alternating current in the car equipments, which have not been mentioned, as it is impracticable to give a full description of all that can be done. But enough has been presented to outline the apparatus and to indicate the possibility of this new system which is soon to see the test of commercial service.



Senator Stephen B. Elkins is reported to have purchased the Morgantown (W. Va.) & Kingbridge R. R., a 14 mile steam road running out of Morgantown, which will ultimately be extended to Kingbridge. Senator Elkins is the owner of extensive coal lands along the line and proposes putting in a large number of coke ovens. It is stated that the road may be used as a feeder for the system which the Wabash interests project building to Pittsburg from some point on the West Virginia Central.

ENGLISH CALIFORNIA CARS.

We have received from the Electric Railway & Tramway Carriage Works, Ltd., of Preston, England, photographs of the California style of car which they are building. The car adheres pretty closely to the original California design in many of the leading features, as will be seen by a glance at Fig. 1. A pair of transverse seats, however, are all that are used at the ends and these are placed back to back.

The seats are made with round corners, but evidently there was difficulty in producing the end panel for it has only a single curve and apparently does not have a pocket for the post, nor a complete

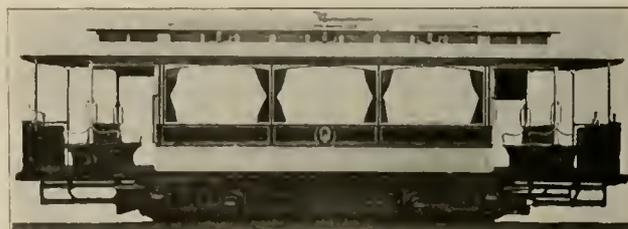


FIG. 1 ENGLISH BUILT CALIFORNIA CAR.

bearing on the post. The windows in the body are the usual English type, very large, and fitted with drapery curtains as well as roller blinds. The platform steps are novelties. They are shown on a larger scale in Fig. 2. This design is evidently forced upon the construction by the narrowness of the body and the limited space available.

The height of the body made two steps necessary. The lower one had to be cut away to make room for the truck to swing on curves.

The width was limited to such a degree that the steps had to be placed vertically one above the other. To give standing room on the lower step the upper one is cut away in the center. The design is ingenious, but it is not one which would be adapted except under



FIG. 2 ARRANGEMENT OF STEPS.

the compulsion of circumstances. The platforms or open ends have little or no protection, curtains close the openings next the car body, but they only come down to the seat level. The seat end panel is curved in such a way as to make it impossible to bring the curtains lower. The car as a whole is an instructive example of the California design modified to meet the wants of the English climate, and the requirements of a narrow gage road where a minimum space in the street limits both width and length. In America there are fortunately for car designers but few cities in which unlimited space for rolling stock cannot be obtained. On the Continent, however, it is not unusual to have a limiting width of 7 ft. or less to contend with.



The Wheeling (W. Va.) Traction Co. on October 1st began running cars on the new Wheeling & Western Ry. to Pascoe, four miles distant, and also on that day began operations over part of a 16 mile extension to St. Clairsville, O., from the present terminus of the company's "Brookside" division, west of Bridgeport, O. One of the company's new 1,000 h. p. units was started and has since been working satisfactorily.

"CECO" ELECTRICAL MACHINERY.

The Christensen Engineering Co., of Milwaukee, has just placed upon the market complete new lines of electrical machinery, including direct current motors and generators, alternators and transformers, known as the "Ceco." For several years this company has been manufacturing electric motors for driving air compressors used in connection with the well-known Christensen air brake equipments on electric cars, and we understand that more than 6,500 of these motors are in highly satisfactory service throughout the world. The company has also built a large number of motors of various capacities for driving air compressors used in general commercial service, and all the motors for driving machine tools and shafting in its own works. In order to manufacture these motors the company has maintained an extensive equipment, particularly suited to the purpose, and some time ago it was decided to greatly increase the company's manufacturing facilities and to develop a complete line of electrical machinery of the highest grade.

The policy of the Christensen company has always been not to place any apparatus upon the market until the entire work of development has been satisfactorily completed, and the reputation and success of the air brake apparatus are largely due to this policy. Therefore the company has made no announcement regarding its electrical apparatus until the various lines were completely developed and severely tested. The company is now



DIRECT CURRENT TYPE C. E. OPEN MOTOR.

prepared to build machines up to 1,500-kw. in capacity, suitable for general power, railway or lighting service.

The line of "Ceco" motors known as Type C. E., ranging in capacity from 2 to 50-h. p., is illustrated herewith. These motors are made in three styles, open, semi-enclosed and enclosed. The standard styles are belted, but any motor can be geared or direct connected to the driven machine or shaft. The C. E. motors are for general service in industrial establishments of every kind where a high grade, durable and reliable machine is required.

The frame or magnet yoke to which the poles are secured is cylindrical in shape. It is composed of a single steel casting. The bearing brackets are secured to the frame by bolts. The terminals are mounted on top of the frame where they are not liable to be accidentally touched, but where they are readily accessible in case it is desired to change the connections in order to reverse the direction of the motor. The two bearings are supported by two end brackets, which are identical and interchangeable, so that the motor is symmetrical and pleasing in appearance. The semi-enclosed style is the same as the open, but with the addition of four perforated malleable iron cover plates. The plates fit into four open spaces between the arms of the end brackets, and can be quickly and easily removed or replaced. The enclosed style is the same as the semi-enclosed except that the cover plates are solid instead of perforated. Either style of cover plates will fit into the open style motor, consequently the same motor may be used as open, semi-enclosed or enclosed.

The field poles are built of laminated sheet steel. The larger machines have four poles, and the smaller sizes are built with two only, thus permitting the use of a commutator that can be insulated far more satisfactorily than is possible in small machines of the usual four-pole construction. The poles are bolted to the yoke so that a rigid construction is obtained, and the pole is easily removable without disturbing the armature.

The field winding is composed of machine formed coils accurately wound by automatic machinery. Any field coil can be readily and quickly removed without disturbing the armature by simply withdrawing the pole as explained above. The armature core is built up of punched disks of soft sheet steel slotted around the periphery to receive the armature winding. These disks are re-annealed and insulated after being punched, before assembling.

The shape of the punching is such, that when assembled on the steel shaft openings are provided for ventilation parallel to the shaft. Additional ventilation is secured by the use of radial air ducts.

The armature coils are all machine wound. Those for the smaller motors are of wire, while those for the larger sizes are composed of copper bars. The coils are all carefully insulated, then dipped into a bath of special insulating compound, and finally placed in a drying oven until they are thoroughly baked. Surface bands are used to retain the coils in the slots on the smaller sizes, while the same result is secured in larger sizes by the use of retaining wedges placed in specially provided notches near the top of each slot.

The commutator is built up of pure hard-drawn lake copper



ARMATURE FOR DIRECT CURRENT "CECO" MOTORS

segments insulated from each other by sheets of the highest grade of mica, of hardness corresponding to that of the copper, so that a smooth and even wearing surface is presented to the brushes. The segments are of generous length and depth, to insure cool running, and allow ample margin for wear. The commutator is easily removable from the armature shaft, tapped holes being provided in the face of the commutator sleeve for that purpose. As the commutator is usually the cause of more trouble than all other parts of a motor combined, unusual care has been given to the design and construction of this important element of the "Ceco" motors.

Carbon brushes are used, and the brush holders are of the Christensen company's coil spring reaction type. They are very simple in design and absolutely reliable in operation. The brush holder studs to which the holders are secured are mounted upon a yoke, which is fastened to the inner side of the bearing bracket. Each brush can be readily adjusted and any brush can be quickly and easily removed while the motor is running.

The brush contact area is such as to make the current density as low as is consistent with economical design. Wear of the commutator is provided for by radial adjustment of the brush-holder studs. After the brushes are properly set no shifting is required, and the motor operates without noise and without sparking.

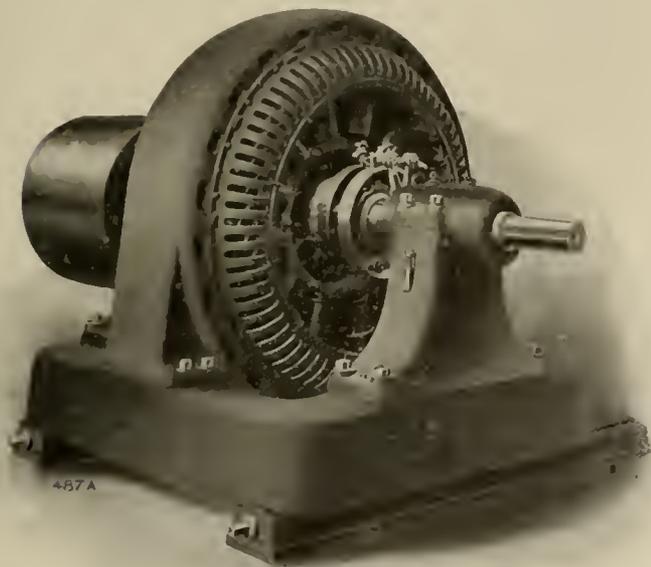
The bearing surfaces are generous in area. Self-aligning babbit bearings with the well-known self-oiling ring arrangements are provided.

The motors are mounted on a cast iron sub-base which is composed of a single casting, thus insuring perfect alignment. Belt tension is accomplished by moving the motor upon the sub-base in the usual manner.

The "Ceco" motors are designed to operate at their rated loads without the temperature of the armatures rising more than 30° C. The rise in temperature of the field coils under these conditions is not to exceed 40° C., and of the commutator 45° C. The machines are intended to operate from no load to full load with the brushes in a fixed position without sparking, and also operate for two hours with 25 per cent overload and for two or three minutes with 50 per cent overload without injurious heating or sparking.

These motors will operate in any position in which the shaft is horizontal. This is accomplished by shifting the bearing brackets on the frame so that the oil chambers remain in the proper position, whether the motor is secured to the floor, the ceiling or the side wall.

A rigid system has been established for the inspection of the parts of each machine while under construction, and there is no poor material or workmanship to hide under canvas, rope, or



250-KW. THREE-PHASE BELT DRIVEN ALTERNATOR.

other "protecting" material. When completed each machine is given a severe running and high insulation test. Then the frame is rubbed with a good filler and painted. All bright parts are polished, so that in addition to being compact in design, substantial in construction and superior in performance, each machine presents a graceful and pleasing appearance.

All the "Ceco" alternators, whether belted, engine type or direct couple, are of the revolving field type, thus leaving the armature stationary and easily accessible. By this form of construction the difficulties of properly insulating the armature coils which have caused much trouble in rotating armatures are eliminated.

The frame consists of cast iron housings, into which rings of laminated steel with inwardly projecting teeth are assembled, thereby forming slots for receiving the armature windings. The armature is designed with six slots per pole so that it may be wound or rewound for single, two, or three phase, as required. The armature frames for the belt-driven alternators are cast in one piece, while the frames for the direct driven machines are divided horizontally. All the armature coils for each "Ceco" alternator are of the same size and shape so that they are interchangeable. The coils are specially insulated, so that they will stand without injury, the highest temperature that will ever be reached in service.

The poles are built up of laminated steel upon a cast iron spider, which is mounted upon a forged steel shaft. In the large sizes the laminated poles are assembled upon a steel ring which is carried on the shaft by means of the cast iron spider. The individual poles are in all cases easily removable with their coils,

without dismantling the machine. The field coils are composed of rectangular copper strap bent on edge. The collector rings are made of cast iron, and carbon brushes are used, thus reducing the tension required, and the wear of the parts. Standard frequencies are 60 and 25 cycles per second. With the exception of the smaller sizes "Ceco" alternators can be wound for any voltage up to 15,000. The temperature rise when running continuously with full load at any power factor will not exceed 35° C. in the armature or 40° C. in the fields. At 25 per cent current overload the corresponding temperatures will not exceed 40° C. and 50° C. The machines are all designed so that they will carry satisfactorily a 50 per cent current overload for two hours at any power factor without injurious heating.

The Christensen Engineering Co. is entering the electrical manufacturing business with exceptional advantages. Its present works were completed but two years ago and no expense was spared in providing every facility for the rapid, accurate and economical manufacture of its product. The equipments of machine tools, cranes, special machines, etc., is unusually extensive, modern, and complete. The foundation for a 250 ft. extension to the main machine shop, which is 186 ft. in width, has just been completed. There are three stories, and this extension will provide 88,000 additional sq. ft. of floor space.

PITTSBURG AND WHEELING UNITED BY TROLLEY.

Direct communication between Pittsburg, Pa., and Wheeling, W. Va., via electric lines will be inaugurated within three years, if the plans of the Washington & Canonsburg Railroad Co. are consummated. The latter was organized six months ago to take over and extend the lines of the Washington (Pa.) Electric Street Railway Co., which for the last 10 years has operated a five-mile electric system in the borough of Washington. Francis J. Torrance, president of the old company, and ex-Senator Arthur Kennedy, of Pittsburg, were principally instrumental in effecting the reorganization, and now propose to extend the system, under a new charter, which was recently obtained, to Canonsburg, a distance of 10 miles, and to build another line in the direction of Pittsburg. The distance from Washington to Wheeling is 33 miles, and a portion of this route is already served by electric lines, so that but 18 miles remain to be built in that direction. Connections will probably be made between the proposed extension of the Washington & Canonsburg company and the Wheeling & Elm Grove R. R., which latter was recently converted from a steam dummy line into an electric system, and is now operated to West Alexander, 18 miles from Washington. A portion of the track laying between Washington and Canonsburg has been completed, and this line is to be open for traffic within six months. Formerly the Washington lines were operated by power supplied by the Washington Light & Power Co., but for the 10-mile extension to Canonsburg it is proposed to erect a large power house at an estimated cost of \$100,000. The equipment of the plant will be entirely Westinghouse, and the capacity will be from 1,700 to 2,000 h. p. The proposed single track system between Washington and Canonsburg will be of standard construction, 70-lb. rails being used, and all railroad crossings will be made overhead. The crossings include a number of steel bridges, the longest of which will be 500 ft. in length, and will span the Panhandle tracks at Houstonville. The bridges are being constructed by the Fort Pitt Bridge Works at Canonsburg.

The promoters recently arranged for a bond issue to the amount of \$650,000, the proceeds of which will defray the expenses of the improvements and extensions at present under way, and the cost of constructing the proposed extensions east of Canonsburg.

The Quincy (Ill.) Horse Railway & Carrying Co. recently donated the earnings of its system for a day to the two hospitals in the city. At a subsequent meeting of the hospital trustees a resolution of thanks to Manager Chubbuck was passed.

In Paris, France, a provisional authorization has been granted for an overhead electric railway along the Rue Quatre Septembre and the Rue Reamur, into the heart of the city. The Paris papers deplore the extension of the trolley system as having the effect of marring the beauty of the French capital.

NEWS OF THE MONTH.

The Manhattan Railway Co., New York City, began operating trains on its newly completed third-rail electric system on the Sixth Ave. elevated road between the 58th St. station and Rector St., October 1st, with entirely satisfactory results. The work of substituting electricity for steam as a motive power on the remainder of the system is rapidly progressing, but until the change shall be effected over the entire line, the express and local service to Harlem will be made as usual by locomotive trains. The greater effectiveness of the electric service, which has thus far been demonstrated by experiment, is largely the result of the decreased weight of the trains. Trains are made up of six cars, four of which are motor cars, the weight of their motor equipment, about 18 tons, being five tons less than the weight of the old locomotive. Also, the motive power of the new trains is about four times greater than that of the trains formerly in use. Work is rapidly being pushed on the unfinished section through 53d street, connecting Ninth and Sixth Aves., and so soon as it shall be completed trains on the west side will be propelled by electricity.

The Brooklyn Rapid Transit Co. has acceded to the petition of residents of the Eastern District, by reducing the fare on the elevated line from the Eastern District to Brighton Beach from 15 to 10 cents. Transfers from the Lorimer St. line to the Brighton Beach line are now issued at Malbone St. and Flatbush Ave. The Rapid Transit company expects, if the conditions in the labor market are favorable, to complete the power house now in course of construction at First St. and Third Ave., Brooklyn, by spring, at which time the change of motive power to electricity on all trains will be effected. In view of the scarcity of anthracite, the company has secured a large supply of soft coal, and is equipping all its cars with modern heating apparatus in preparation for cold weather.

The plans for relieving the congestion at the Brooklyn Bridge terminal, which were prepared by Neils Poulson and submitted by the Manufacturers' Association of Brooklyn, were finally disapproved by the committee to which they had been referred for investigation by Mayor Low. Mr. Poulson had offered two suggestions, one providing for a change of switching arrangements for the bridge and elevated trains which would do away with tail tracks and have each train discharge and load simultaneously, and one providing for a new method of operating the trolley cars. The former plan was deemed ingenious but impracticable, as it would entail a grade crossing for all incoming trains at a time when such trains are loaded with passengers. After further investigation the committee formulated a new plan, which involves the construction of four additional loops at a point midway between the present loops and the end of the station, and the changing of the position of the galleries to a place directly beneath the bridge platform so that the trolley cars may pass under them. Bridge Commissioner Lindenthal has approved the recommendations of the committee, and if the proposed change be effected in accordance with these plans, the expense will be borne by the Brooklyn Rapid Transit Co. Subsequently, the engineers of the latter company submitted plans to Mr. Lindenthal providing for the location of tracks on Liberty St. for convenience in handling traffic during rush hours, and for the establishment of a bridge plaza at the Brooklyn terminal at Liberty St.

Mr. William Barclay Parsons, chief engineer of the Rapid Transit Commission, in an interview prior to his departure for Europe on October 7th, stated that satisfactory progress was being made on the subway, and that the work of laying rails would probably be begun in December, by the end of which month it is expected to have seven miles of four-track road completed. According to the plans of the Commission, the main section will be opened next October, 15 months within the time limit of the contract. Contracts have been let for the stations, which will be of three classes, one appropriate to the residence district, one to the shopping district, and one to the commercial section below 14th St. The stations will be designed with a view to securing artistic effects, a distinctive color scheme for each section of the road having been adopted. Panels, outlined in colored tiling will be used, and the stations will be lighted by electric lamps recessed in the ceilings, and protected by ground glass shields. Wood will be dispensed with in the construction of the stations to as great a degree as possible, the walls and partitions being of vitrified

brick and white glass tiles, and the ceilings of white glass tiles, suspended from the roof beams. Some of the stations will be provided with elevators for the convenience of transferring passengers to the street, and the station equipment will in most cases include telephone booths and telegraph stations. The stairways will be twice as numerous as those of the elevated roads, and much wider. Outgoing and incoming passengers will be kept entirely separate.

An accident, insignificant as such, but interesting from a mechanical point of view, happened on September 30th at the bridge across the Coney Island Creek, which was completed some two months ago by the Brooklyn Rapid Transit Co. to replace the antiquated structure of the old Nassau Co. The new bridge, which was described in the "Review" for February, 1902, met the approval of the Government, and is in every way a substantial structure. It is not equipped with a draw, but is arranged to fold up in the manner of a fan, the shore end of the girders being worked on a pivot. Owing to a defective eyebolt at the lower extremity of the suspender rod, the latter gave way, without warning, and the swinging portion of the bridge fell, each separate section striking the water with a tremendous splash. A train was due at the time of the accident, but through the prompt action of the watchman was stopped before it reached the bridge. It would have been practically impossible for the train to run into the creek in any event, as ample means of protection had been provided against the remote contingency of accident. Repairs were soon effected, and the bridge was again in use before night.

The reports which were recently circulated to the effect that negotiations were under way looking to the consolidation of the North Jersey Street Railway Co., the Jersey City, Hoboken & Paterson Street Railway Co. and the Orange & Passaic Valley Railway Co. are denied without qualification by both E. F. C. Young, president, and David Young, vice-president and manager, of the North Jersey Street Railway Co., in an interview with the press. The North Jersey company has experimented with satisfactory results in the use of a new heating and ventilating apparatus on its cars between Jersey City and Bergen Point. A portable furnace is placed in the center and under the floor of the car, the hot air issuing through the grating or register in a degree corresponding to the draft which is obtained from the open ventilators under the car ceiling. When the furnace is not in use, the basin holding the fuel may be removed, thus obviating all danger of fire. Mr. David Young has endorsed the plan as being eminently practicable, economical and efficient.

It was reported from New Brunswick, September 29th, that if coal were not received within a week, the electric railway system would be shut down, or else horses would be used as motive power. Though there has been no further news of such a crisis having been precipitated, the statement has been made that the local company was obliged, by reason of the scarcity of coal, to reduce its service on suburban lines, and to lay off a number of conductors and motormen in consequence.

The Pittsburg Railways Co. has effected a number of important changes in its service, among which is the extension of additional routes to Wilkesburg. The "Liberty & Lincoln Ave." cars, which formerly had their terminus on Lincoln Ave., are operated over the route known as "East Wilkesburg via Liberty and Frankstown." Cars on the "Grant and Shady" route, formerly having their terminus at Shady Ave., run out Fifth Ave. to Penn Ave., to Trenton St., to Rebecca St. and to Hay St. in Wilkesburg, returning via Franklin St., Penn Ave., Highland Ave. and Fifth Ave. to Grant St. The fare between Coraopolis and McKees Rocks has been reduced from 10 to 5 cents. Transfers will now be issued between Greenfield Ave. cars and cars on the Monongahela division. The foundations for the steel viaduct across the tracks of the Pennsylvania R. R. at Wilmerding have been completed, and the viaduct, which will be 1,230 ft. long and will cost \$150,000, will be completed as soon as the steel shall be delivered. When finished, it will form a connecting link in the 30-mile loop extending from Pittsburg through Braddock, East Pittsburg, Wilmerding, East McKeesport, McKeesport and Dravosburg.

The Philadelphia Rapid Transit Co. and the city authorities of Philadelphia have reached an agreement whereby the piers of the Market St. bridge will be extended on the south, and the entire bridge will be moved several feet in the direction of Chest-

nut St. The piers at the north end will also be extended for a considerable distance and strengthened to support the elevated structure, an arrangement which will permit cars emerging from the subway at 23d St. to proceed over the elevated road in a westerly direction.

The Harrisburg (Pa.) & Mechanicsburg Electric Railway Co. has granted its employes an increase of wages of 1½ cents an hour, the new rule going into effect October 1st.

A lineman in the employ of the Conestoga Traction Co., at Lancaster, Pa., recently sustained a shock of 2,300 volts of electricity, and except for severe burns on the hands is now not much the worse for it. He had ascended a pole to cut a supposedly dead wire, which, however, was crossed with one that was heavily charged. He was in contact with the wire for five minutes before he was released from his perilous position.

The new electric line between Reading and Kutztown, a distance of 16 miles, was recently opened for traffic. Connections with existing lines afford a direct route from Reading to Allentown.

The southern division of the Central Market Street Ry., in Columbus, has been completed, and an experimental trip was made over the lines September 27th. Although the conditions were not favorable to a rapid service, the run from the south corporation line to Rich and Third Sts. was made in 20 minutes, and the circuit of the interurban loop was made in 10 minutes, clearly proving that a satisfactory schedule can be maintained when the regular service shall be initiated.

October 1st, the lower house of the Ohio Legislature adopted the Guerin amendment, providing that differences between street railway companies and their employes shall be settled by compulsory arbitration. Other provisions of the amendment apply to the regrants of franchises, affecting in particular the franchises of the Cincinnati Street Railway Co., and require that all franchises granted to street railway companies shall contain an arbitration clause, and that arbitration may be invoked by a petition of five or more employes of any company. The House, by a vote of 51 to 31, accepted the amendment as applying to all regrants of franchises.

The Columbus, London & Springfield Railway Co. contemplates a through service from Columbus to Cincinnati, and for this purpose proposes to build an additional line from Lafayette to Somerford, which will eliminate a considerable portion of the distance. The company is pushing work on its sub-stations, which will be located at West Jefferson and London, and on the main power house, at Medway, which is to be completed in the early winter. The inauguration of a through service to Dayton is now under consideration.

The Columbus, Delaware & Marion Electric Railroad Co. has opened its lines between Delaware and Columbus, and it is stated that the company's general offices and headquarters will be removed to Delaware so soon as the entire system shall be ready for traffic. The installation of the power house at Stratford has been completed and a number of 66-ft. cars of the heavy interurban type have been received.

The Cleveland, Elyria & Western Railway Co. opened its new lines to Norwalk, via Elyria and Oberlin, October 2d, the first round trip being made by a special car which started from the Public Square in Cleveland at 10 a. m., carrying Messrs. A. H. and F. T. Pomeroy, respectively president and manager of the company, and some 35 guests. A regular hourly service has since been maintained. The new steel bridge at Birmingham is one of the notable features of the construction of the road.

The Toledo, Bowling Green & Southern Traction Co. expects within a month to begin operating freight cars between Bowling Green, Toledo and Findlay, the power for this service to be supplied from the new plant at Cygnet. Three trips per day in each direction will be made, and the company will appoint a superintendent for the freight service.

The Indianapolis Street Railway Co. has broken ground for a new carhouse which will have a capacity for housing 300 cars. The brick and the structural iron work have been contracted for, and work will be pushed with all possible rapidity. A part of the new building will be used as an auxiliary power station.

Three 40 ft. interurban cars have been received at Richmond, Ind. from St. Louis shops, and will be added to the service between Richmond and Cambridge City. Other cars will be received this winter for the line between Richmond and Eaton, O., which will be opened

in the spring. The latter road will afford a through route between Indianapolis, Richmond and Dayton, O. Grading is now under way between Cambridge City and Knightstown.

Three obstreperous passengers on the lines of the Union Traction Co. of Indiana, between Alexandria and Elmwood recently created a panic among the passengers by drawing revolvers and firing several shots, the bullets burying themselves in the woodwork uncomfortably near to the passengers' heads. On arrival at Elmwood the rowdy element was subjugated by the police and steps were taken by the traction company to prosecute the offenders.

Four suits for damages against the Union Elevated Railroad Co. of Chicago, were filed October 1st by the owners of property abutting or adjacent to the elevated loop. In these cases it was claimed that property values had deteriorated since the structure had been built by reason of its shutting out the light and air, and through the noise occasioned by the operation of trains. Altogether, the suits for damages for such cause which are pending aggregate from \$500,000 to \$1,000,000, and there would probably be a greater sum involved if the statute of limitations did not render claims of this sort invalid if brought subsequent to October 3d, on which day five years had expired since operations were begun on the loop. Mr. Clarence A. Knight, general counsel for the Northwestern Elevated R. R., in an interview stated that there was not a modern building facing the elevated structure of the loop that is not getting from 25 to 100 per cent more rent than in 1897, when the loop was built. Among the prominent petitioners for damages in the present instance are Leon Mandel, for \$50,000; Mandel Brothers, for an equal amount, and the Central Trading Co., for \$5,000, these cases being submitted to the Superior Court; and P. H. Sexton, in the Circuit Court, for damages to the amount of \$100,000 for damages to property at Clark and Van Buren Sts. On September 29th, William McCoy, the proprietor of a hotel at Clark and Van Buren Sts., brought suit for \$150,000 damages against the Union Elevated loop and the lines using it.

The elevated railways of Chicago, during the month of September, did, in general, a better business than is recorded for any September during the history of their operations. In comparison with the corresponding month last year the Metropolitan West Side Elevated Ry. increased its traffic 24.39 per cent; the Northwestern Elevated R. R., 18.28 per cent, and the South Side Elevated R. R., 13.25 per cent. The Metropolitan carried a daily average, during the month, of 107,751 passengers, as compared with 88,226 in September, 1901; the Northwestern carried 63,970 as compared with 54,965, and the South Side carried 76,572 as compared with 67,626. The exceptionally pleasant weather and the large number of retail openings during the month account for the excessive traffic on the elevated lines.

The city engineer of Chicago has submitted an opinion as to the probable cost of subway construction in Chicago, if it should be finally decided to follow the initiative of New York in adopting underground transportation. According to this estimate, a subway extending from curb to curb and excavated at a depth of not more than 20 ft., would cost \$1,500,000 per mile, which is \$1,000,000 per mile less than the estimates of such construction work in New York, where the excavations are being made through solid rock. The pressure of the larger buildings in the down town district in Chicago would, in Mr. Ericson's opinion, forbid the construction of a "double-deck" or two-story subway.

At Aurora, Ill., a stretch of about 50 ft. of track in North Broadway sank to a depth of six inches during a recent heavy rain storm.

It is stated that the Big Four R. R. contemplates installing electric motive power on its interurban lines on the Cairo division, between Danville, Ill., and Ridge Farm, a distance of 17 miles.

The St. Louis (Mo.) Transit Co. is considering introducing a new grooved surface rail in that city, such as is commonly used in the east. The principal advantage offered by this pattern is that teamsters will find it less convenient to monopolize the company's right of way on occasion, since the rail does not afford a good hold for wagon wheels.

The reports issued by the Butte (Mont.) Electric Railway Co. show that since May 1st, over 393,299 passengers have been transported over the electric lines in the city of Butte. A large proportion of the summer travel over the lines was due to the special amusement features afforded at the suburban parks and resorts.

The Burlington Route has opened its new electric interurban line between Lead and Deadwood, S. D., the construction of which

has been in progress for more than a year. The road was originally the old Deadwood Central, which was purchased by the Burlington and converted into an electric system, as the steam equipment was inadequate to handling the enormous traffic between the two cities by reason of the steep grades en route. A regular service over the electric line has been established and the trains are well patronized.

A regular through service over the lines of the Seattle-Tacoma Interurban Ry. was inaugurated September 20th. Cars have since been running on a two-hour headway.

The Seattle Electric Co. has under consideration a plan for erecting a freight depot at Ballard, Wash., and for improving the inter-urban service between that city and Seattle. Negotiations have been opened for securing a site for the proposed freight depot.

STRIKE VIOLENCE AT NEW ORLEANS.

The recent street railway strike at New Orleans furnishes an example of aggressiveness on the part of the strikers and of a conservative and effective policy on the part of the New Orleans Railways Co. which has seldom been paralleled in instances of similar strife. The strike was declared on September 27th, the contention of the employes being that the company had violated the terms of agreement whereby the strike of last April was settled. The assertion was made that in view of the company's abrogation of such terms, the contracts under which the employes had agreed to work until April, 1903, were cancelled, and a demand was then presented for radical changes in the conditions of service. A new wage scale was proposed, under which motormen and conductors should receive 25 cents per hour, and 10 consecutive hours should comprise a day's work; runs of less than five hours should be counted as extra runs, and regular wages should be paid to men laid off pending investigation of complaints against them. It was demanded that employes should have an unquestioned right to join any association they might desire to join, and that no employe should be discharged for his connection with labor organizations. The wage to be paid to head pitmen, pitmen and pitmen's helpers was stipulated. These amendments to former contracts were presented on Thursday, September 25th, and the company answered the demands on the following day, refuting the proposition that the terms of contract had been violated and requiring the men to return to work under the old contract until the alleged abrogation should be established by proof. Strike was declared on September 27th, and on Thursday, October 2d, the men qualified their demands, proposing to work eight hours a day at the rate of 25 cents an hour, but this proposal was promptly rejected by the company. The long and tedious strike which ensued paralyzed street railway traffic in New Orleans. The efforts of Mayor Capdevielle, the police board and a committee representing prominent merchants of the city, to effect a compromise were unavailing, and on October 3d, the merchants proposed shutting the principal retail shops until the strike should be settled, a measure which would have involved throwing 5,000 clerks out of employment, and was later abandoned. The mobs of strikers contented themselves with cutting the company's wires and damaging such property as was easily accessible, their demonstrations being held in check by the company's having suspended operations. October 6th Mayor Capdevielle issued an order to the company to resume regular service on the following day, and the company prepared to do so, but was stopped by a subsequent order from the mayor, who had some new cause to believe that a compromise would be reached before the time appointed for the starting of the cars. The first attempt to resume service was made at 10 a. m., October 8th, when a car, manned by a non-union crew and protected by special police, started from the Canal St. barn despite the threats and missiles of a great mob of strikers. The car had not proceeded a block before an obstruction was placed upon the track which brought it to a stop, and a concerted movement was made to drag the crew from the platform. The action precipitated a fight in which about 50 shots were fired, resulting in serious wounds to four or five on either side, one officer on board the car receiving a bullet wound in the head from which he is not expected to recover. A squad of mounted police succeeded in clearing the streets, but the attempt to move the cars from the Canal St. barn was abandoned for the day. Warrants were sworn out in the Federal Court for the arrest of all who participated in the riot, on the ground that the service of the mail cars was interrupted. Immediately after the disturbance the mayor sent for General Glynn, with a request

that the troops at his command be called out to preserve the peace in New Orleans. The answer was returned that the troops were ready to respond to any demand made upon them, but that nothing could be done until orders had been received from the governor. On the following morning Governor Heard, who had been absent from New Orleans, arrived in the city, and gave orders that the local troops be assembled at their armories to co-operate with General Glynn and the New Orleans authorities in the suppression of violence. Before the militia was actually on the scene, however, 150 policemen, mounted and on foot, were stationed at intervals along Canal St. for a distance of a mile and a half, and with this protection three cars were started over the line without being molested by the crowds which witnessed their departure from the barns.

October 11th Governor Heard issued an ultimatum proposing a basis of settlement which was submitted to both the company and the executive committee of the union for approval. The terms proposed provided for a 10-hour day at the rate of 20 cents per hour. Seven and one-half hours should be the minimum time to which the employes should be reduced, and when employed for fewer hours they should, notwithstanding, receive pay for said minimum. The company immediately acquiesced to those and other terms proposed by the governor. The committee, on the other hand, after demurring for five hours, finally declined the ultimatum, and submitted a counter proposal for arbitration which the governor refused to consider. The strikers persisted in this demand until the afternoon of October 12th, when the union almost unanimously accepted the governor's ultimatum on a secret ballot. The men returned to work on Monday morning, October 13th.

PENNSYLVANIA RAILROAD FRANCHISE BEFORE NEW YORK ALDERMEN.

The matter of granting the Pennsylvania R. R. a franchise to enter New York City now rests with the New York City board of aldermen, negotiations having been concluded, so far as the rapid transit board is concerned, by the passing of the franchise without a dissenting vote, October 9th. Mayor Low's determination to incorporate into the franchise a clause binding the railroad company to pay its laborers a certain rate of wages and to limit the number of working hours per day was met by the persistent refusal of President Cassatt of the Pennsylvania to accept such terms, or to compromise on the appointment of a board of arbitration to settle labor difficulties. The issue had reached a point where the city had either to accept the terms of the railroad, or reject an improvement of incalculable utility which will cost approximately \$50,000,000.

Previous to the passing of the franchise, the Rapid Transit Commission, on October 2, gave a hearing on the matter before representatives of capital and labor, at which ex-Mayor Abram S. Hewitt, in a speech, strongly advocated granting the franchise on such terms as the railroad should consider desirable, since, in his opinion, the Pennsylvania would be conferring an inestimable benefit to the city directly, and on the labor classes indirectly by so enormous an undertaking.

The arbitration clause subsequently proposed by Comptroller Grout was objected to as calculated to invite all sorts of strike troubles and the answer of President Cassatt, on the 9th inst. was decisive, whereupon the Rapid Transit Board passed the franchise.

VAN DORN-ELLIOTT ANNOUNCEMENT.

The Van Dorn-Elliott Electric Co., of Cleveland, O., makes the following announcement to the trade: "We are pleased to inform you that we have made certain changes in our factory which we believe will be of mutual benefit to our customers and ourselves. We have greatly increased our facilities for making armature and field coils, a department that heretofore has not been equal to the demands. Mr. J. Norman Elliott has been appointed general superintendent of our factory, succeeding Mr. W. H. Elliott, who is not now in any way connected with us. Mr. J. T. Thompson, one of the best known winders in the country, is now foreman of our winding department. With our increased facilities we believe that our customers' interests will be better taken care of than ever before."

ACCIDENTS OF THE MONTH.

A head-on collision occurred on the afternoon of September 27th, on the Medford division of the Boston & Northern Street Ry., near Tewksbury, in which the motorman of the southbound car was probably fatally injured, and slight injuries were sustained by several passengers. The southbound car, owing to an alleged defect in the signals, did not wait at the proper turnout for the passing of the other, but proceeded for half a mile at a fair rate of speed, when, at a turn in the track, it met and telescoped the northbound car.

Fourteen passengers were injured in a collision between a repair car and a passenger car on the Brockton lines in Raynham, Mass., September 30th.

Two cars on the lines of the Hartford (Conn.), Manchester & Rockville Tramway Co. met in a head-on collision between Rockville and Talcottville at 2:45 p. m. September 24th, and both were badly damaged. One of the cars was running off schedule on a special trip to accommodate the crowds at the Rockville fair, but it has not been ascertained whether the motorman of the special or he of the regular car was to blame. Both motormen and many of the passengers jumped from the cars when it was plain that a collision could not be avoided, and several were injured in doing so.

September 21st a head-on collision occurred between a large interurban car on the Bristol branch of the Interstate Consolidated Street Ry., of Pawtucket, R. I., and an open car on the Crescent Park line. The failure of the block signals to operate is assigned as the cause. Of a total of 50 passengers, but four were injured, and these but slightly.

The blowing out of a fuse in one of the cars of the Coney Island & Brooklyn R. R. near the Brooklyn Bridge, on September 21st, resulted in burns and slight injuries to 11 passengers. The bursting of flames through the floor of the car created a stampede which was more dangerous than the original cause of disturbance.

Two cars on the Hudson Valley Ry. came together in a head-on collision near Ballston Spa, N. Y., early in the afternoon of October 3d. No one was injured as the cars were not going at a high rate of speed, and the force of the impact was not sufficient to throw either car from the track. The responsibility is believed to rest upon one of the motormen who is alleged to have passed a switch without orders to do so.

A rear-end collision between a Fort Lee car and a car on the Hudson Heights line, at Union Hill, N. J., occurred on the evening of September 26th, resulting in injuries to 10 passengers. Both cars were speeding down a sharp grade from the West Shore ferry but a few rods apart when the car ahead came to a stop. The rails were slippery, and the motorman of the rear car was unable to slacken speed. Both platforms were demolished, and several persons were imprisoned in the wreckage.

A collision at Columbus, O., between a West Broad St. electric car carrying seven passengers and a freight train at the Little Miami crossing, at 5:30 p. m. September 30th, resulted in demolition of the street car and injuries to all the passengers. The electric car was descending a hill when the motorman saw a freight engine and a cut of coal cars obstructing the crossing; he applied the brakes, but without effect as the rails were slippery. The collision completely severed the vestibule from the main body of the car.

A similar accident occurred in Cleveland at 4:15 a. m., October 1st, a north-bound Willon Ave. car being struck by a freight train at the crossing of the Erie R. R. According to witnesses the gates were not lowered. The conductor, on approaching the crossing, closed the derailing switch and signaled the motorman to proceed, but, as the electric car was crossing the labyrinth of tracks, a cut of coal cars, with no engine attached, which was being shunted to a siding, crashed into the car at about a third of the distance from the rear end. The entire side of the electric car was smashed and a portion of it was thrown some distance from the tracks. None of the 12 passengers was so seriously injured as to require being carried from the scene in the ambulance.

At Indianapolis, on the afternoon of September 26th, a switch engine on the Belt R. R. struck an electric car on the Shelby St. line and hurled it for a distance of 10 ft. where it fell against an electric light pole. The pole was broken in two and fell, carrying the wires with it, but the electric car was not damaged to a great

extent, and no one was seriously injured. The conductor is alleged to have been responsible.

Fifteen persons were injured in an accident which occurred on the Elston Ave. lines, Chicago, at 10:15 p. m. September 21st. The car jumped the track at Rockwell St. and fetched up against the side of a house. Neither the conductor nor motorman was held to be responsible.

Traffic on the North Clark St. lines in Chicago was blocked for nearly three hours on the evening of September 27th, by the breaking of a spring in the grip clutch when the gripman attempted to change cables at Clark and Elm Sts. Three persons were injured by the sudden stopping of the car when the accident occurred.

The wreck of a freight train on the Chicago & Alton Ry., at 35th St., Chicago, at 7 p. m. October 1st, involved serious damages to an electric car on the 35th St. lines which was waiting at the crossing for the freight to pass. The wreck resulted from a defect in the air brakes, and eight cars were hurled from the tracks, some of them demolishing an adjacent tower house, and one bumping into the electric car. Passengers were thrown from their seats and a panic ensued in which several were trampled upon. The motorman escaped by jumping from the front platform.

A car on the Chicago & Joliet Electric R. R., nearing Lamont on the afternoon of October 4th, struck a steer which has strayed upon the track and was hurled into the ditch. Several of the passengers were bruised.

Eight persons were injured in a collision on the interurban lines between Fort Worth and Dallas, Tex., on the morning of September 29th. The cars collided on the main track while running at high speed.

HOLLOW FORGED SHAFTS.

The Bethlehem Steel Co., of South Bethlehem, Pa., issued an attractive souvenir for distribution at the convention of the American Street Railway Association. The book is neatly illustrated and describes a number of the hollow forged shafts made by this company for a large number of street railway engines. The book gives the dimensions of forgings made of the different grades of steel used, which are nickle steel oil tempered, nickle steel annealed, carbon steel oil tempered and carbon steel annealed. The tensile strengths and elastic limits of these different forgings is also tabulated. A description is given of Harveyized nickle steel burglar proof armor plate vault built by this company for the Philadelphia Savings Fund Society, the door of which alone weighs 16 tons. The company's marine forgings are also illustrated and described and special mention is also made of the shaft for the tow boat "Sprague" having the largest stern wheel shaft ever made, its outside diameter being 31 in. and its length over all 47 ft. 2 in. The pamphlet concludes with a view of the works of the Bethlehem Steel Co., which cover an area of about 75 acres.

N. A. CHRISTENSEN, MILWAUKEE.

Mr. N. A. Christensen, of Milwaukee, makes the following announcement for the information of the trade:

The Christensen Engineering Co., with which I have been connected as superintendent since its organization, and am still engaged as consulting engineer, and with which my other interests remain undisturbed, will hereafter manufacture my air compressors connected with air brakes exclusively. This will place under my control the manufacture of air compressors for all other uses. The previous correspondence in relation to such compressors not connected with air brakes for electric cars, together with the plans, specifications and patterns, have become my property. The air compressors furnished by me will be manufactured by the Christensen Engineering Co. under my designs, specifications and inspection, insuring the same excellency in design, detail and workmanship which the products of this company have always possessed. It also leaves me free individually to extend the introduction of my system of air compressors in a rapidly extending field. There are now in use over 7,000 of these compressors of all sizes and capacities constructed under my patents and used for various purposes. My engineering and sales offices are located in the Herman Building, corner of Wisconsin St. and Broadway, Milwaukee, where I will be pleased to see inquiring and interested friends.

TWO HEAVY SNOW PLOWS.

The J. G. Brill Co. calls special attention to two types of snow plows designed for extra heavy service, one a single truck shear plow for suburban and outlying lines of city systems, and one a double truck plow for interurban service.

The single truck plow is claimed to be the heaviest and most

in.; length of adjustable shear, 10 ft. 7 in.; width of adjustable shear, 2 ft.; length of wings, 4 ft.; weight without motors, 12,500 lb.

The double truck plow is in reality a snow plow, electric locomotive and construction car combined. By this combination weight and power are economically obtained. The upper and lower plows are removable and when taken off uncover short platforms at each end, fitted with couplers, and the car can be used as an ordinary



SINGLE TRUCK PLOW—J. G. BRILL CO.

effective shear plow ever built for double-track service. The double shear boards, the upper one stationary and the lower one vertically adjustable with play of 8 in., present a large and firm front to the work. The shear boards are set at the unusually acute angle of 45 degrees, reducing the resistance. The adjustable shear boards are stoutly held in place by four guides 3 in. in diameter. The adjust-

construction or freight car. At the approach of winter the plow attachments can be placed in position with little trouble.

The levers are raised and lowered parallel with the ground, instead of at an angle, and thus obstacles near the rails are avoided. The long-handled levers which raise the levelers make the operation easy and rapid.



DOUBLE TRUCK SNOW PLOW—J. G. BRILL CO.

able wings are designed to deliver the snow sufficiently far to the side to prevent its being readily thrown back on the rails. Diggers are included in the equipment. Levelers may be added if desired.

The standard dimensions are as follows: Length over all, 27 ft. 2 in.; length over end sills, 16 ft. 9 in.; width over side sills, 6 ft.; length of upper shear, 8 ft. 6 in.; width of upper shear, 1 ft. 1½

The dimensions of the plow are as follows: Length over all, 36 ft. 11 in.; length over end sills, 20 ft. 6 in.; width over side sills, 6 ft. 11 in.; length from point to side of adjustable plow, 8 ft.; width of adjustable plow, 2 ft. 6 in.; length from point to side of upper plow, 7 ft.; width of upper plow, 1 ft. 6 in.; length of leveler, 12 ft.; weight without motors, 23,000 lb.

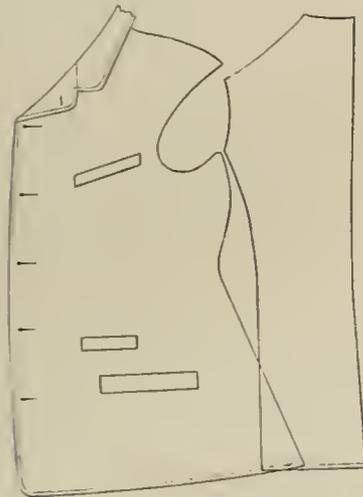
STANDARD UNIFORMS AT BUFFALO.

Through the courtesy of Mr. T. E. Mitten, general manager of the International Railway Co., of Buffalo, N. Y., we present descriptions and specifications for the style of uniform selected as standard for the trainmen of that system. Every detail of this uniform is the result of careful deliberation, and it is believed the whole suit, including overcoat and cap, will prove exceptionally durable, neat in appearance, and at the same time reasonably inexpensive.

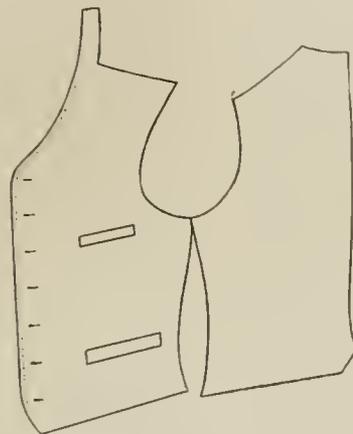
The company issues the following specifications:

COAT.

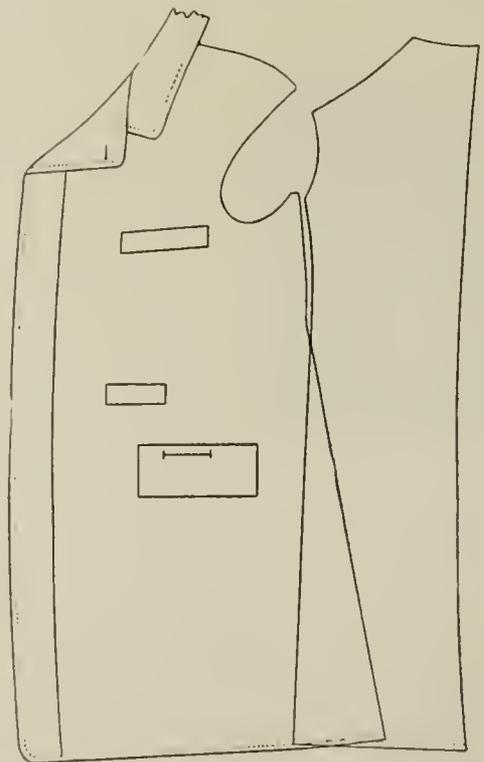
Cloth required, 13 1/4 yards.
 Coat, 5-button single-breasted sack, lapel rolled to first button, corners slightly rounded.
 Length, to extend 1 in. below the crotch seam.
 Edges, double stitched 1/4 in.
 Seams, plain.
 Cuffs, 3 in. deep with two buttons on each, and stitched to match edge.



Coat.



Vest.



Overcoat.



Summer



Winter.

BUFFALO STANDARD UNIFORMS AND CAPS.

Pockets, 6 outside and 6 inside; all to be finished with welt, made of heavy duck and well stayed to prevent sagging.
 Body lining, heavy Italian cloth.
 Sleeve lining, extra durable cotton stripe.
 Cloth, No. 6615 Middlesex 24-oz. standard blue.
 Buttons, to be furnished by the company.

VEST.

Cloth required, 1/4 yards.
 Velt, single breasted, no collar, 7 buttons, opening 9 to 10 in.
 Edges, to correspond with coat.
 Pockets, 2 upper and 2 lower outside, 1 inside.
 Lining, extra durable cotton stripe.
 Back, heavy Italian cloth.
 Cloth, same as coat.
 Buttons, to be furnished by the company.

TROUSERS

Trouser, at knee and bottom medium size.
 Cloth required, 1 1/8 yards.

Two top or side pockets, 2 hip and 1 watch pocket. Seat lined.
 Seams, cord 1/8 in.
 Cloth same as coat and vest.

OVERCOAT.

Cloth required, 2 1/2 yards.
 Overcoat, single breasted, fly-front; collar 2 1/2 in.
 Edges, stitched double 5/8 in.
 Seams, welt 5/8 in.
 Pockets, 1 outside breast pocket with welt, 2 outside ticket pockets with welt, 1 ticket pocket inside of large lower right hand pocket, 2 lower pockets with flaps, 2 inside breast pockets.
 Body lining, heavy wool cloth.
 Cloth, No. 620 Waterloo 30-oz. standard blue.

CAPS.

Caps are specified as the standard uniform cap for summer and winter as made by a local firm.
 Uniform cloth, Middlesex 24-oz. standard blue No. 6615, for suits can be secured from the office of the superintendent of transportation at \$2.25 per yard net; and Waterloo 30-oz. standard blue

No. 620, for overcoats, at \$3.25 per yard net. The tailoring may be done by any responsible firm, but the company has made arrangements with a prominent local tailoring establishment to furnish uniforms in accordance with the prescribed specifications at the following prices, these figures including the repairing and pressing of all garments for two years after date of purchase:

Overcoats	\$16.00
Suits	15.00
Coat	8.50
Vest	1.75
Trousers	4.75
Cap, summer .....	.75
Cap, winter .....	.95

The cloth required for a full suit of average size is 3 1/4 yards. All uniforms must pass inspection of the superintendent of transportation before being worn on duty. Winter caps are to be worn from December 1st to April 1st. Motormen may wear black sweaters from December 1st to April 1st. Trainmen must invariably wear white collars, black ties and black shoes.

PERSONAL.

MR. J. SANFORD POTTER has been elected a director of the Whitehall (N. Y.) & Granville Railway Co. in the place of ex-Judge Lath.

MR. GEORGE D. WIDENER has been elected president of the Philadelphia Traction Co., one of the subsidiaries of the Philadelphia Rapid Transit. Mr. Widener is vice-president of the latter company.

MR. WILLIAM H. TUCKER, formerly superintendent of one of the principal divisions of the Old Colony Street Railway Co., at Fall River, Mass., has been appointed manager of the Jacksonville (Fla.) Electric Co.

MR. A. V. ABBOTT, of Westinghouse, Church, Kerr & Co., in making a recent trip over New York to Chicago, covered 600 miles of the distance over electric lines. Mr. Abbott stopped at Detroit, en route, to visit the convention.

MR. GRIER HIRSH, vice-president of the York Street Railway Co. and the York County Traction Co., and also president of the York National Bank, is one of the most active members of the executive and operating departments of the railway companies with which he is connected. Mr. Hirsh is a representative of one of the oldest families in southern Pennsylvania, and was born in York County, Jan. 29, 1863. He is of German descent, his forefathers having settled in Lancaster County as early as 1742. His father, Samuel S. Hirsh, was born in Adams County, and being a man of large means, led a life of retirement, although serving as a director of the First National Bank of York. His mother was Margaret J. Lewis, daughter of James Lewis, at one time presi-



GRIER HIRSCH.

dent of the York National Bank, a position now filled by Mr. Grier Hirsh. On the death of his father, Mr. Hirsh who was an only child, inherited a large estate which placed him among the millionaires of York. He was educated at the York County Academy and the York Collegiate Institute and afterwards entered the Pennsylvania Military College, of Chester, Delaware County, from which he graduated in 1880. He then entered Princeton University from which he graduated in the class of 1884. Returning to York he immediately entered into active business life and became interested in a number of financial, real estate and railroad enterprises. He is a director of the York Gas Co., of the York Water Co., of the Baltimore & Harrisburg Railroad Co., of the York Trust, Real Estate & Deposit Co., of the York, Gettysburg Turnpike Co. and has served for a time as president of the York Gas Co., the York & Maryland and the York & Liverpool companies. In 1895 he succeeded his uncle, G. Edward Hirsh, as president of the York National Bank. Mr. Hirsh, in connection with Capt. W. S. Lanus, was one of the organizers of the York Street Ry. and the York County Traction Co. of which he is now vice-president. In 1887 he married Miss Julia Mayer, a daughter of John L. Mayer, a prominent lawyer of York County. His home is at Springdale, on the outskirts of York. During the past year Mr. Hirsh was president of the Pennsylvania State Bankers' Association.

MR. EDW. WAGENHALS, formerly superintendent of the Millcreek Valley Street Railway Co., has been appointed manager of the New York & Philadelphia Traction Co. which is about to open a new road from Trenton to New Brunswick.

MR. WALLACE D. LOVELL, of Newton, Mass., is reported to have retired from the management of the Lovell electric railway system in southern New Hampshire in order to devote his time to promoting electric plants in the White Mountains. Mr. Lovell will be succeeded by Mr. Howard A. Biels, of Chicago.

MR. JAMES P. GILBERT, who has been general superintendent of the New York & Ohio Co., Warren, Ohio, maker of Packard lamps and transformers, has resigned that position and will take the general management of the Standard Electrical Manufacturing Co. at Niles, Ohio, maker of the Standard incandescent lamp.

MR. RANDOLPH PEYTON, assistant superintendent of the Berkley division of the Norfolk (Va.), Portsmouth & Newport News Railway Co., has been transferred to Norfolk to assume the charge of the company's railway and lighting interests in that city. Mr. Peyton will be succeeded at Berkley by Mr. Allen MacKenzie.

MR. E. W. GOSS recently resigned as president of the Middletown (Conn.) Street Railway Co. in order to give his undivided attention to the Milford, Holliston & Framingham Street Ry., of which he is treasurer and superintendent. Mr. Oliver Gildersleeve, of Portland, will succeed Mr. Goss as president of the Middletown company.

MR. GEORGE C. MURRAY has resigned as superintendent of equipment of the Brooklyn Rapid Transit Co., to become superintendent of the repair department of Rossiter, McGovern & Co. Mr. Murray, on severing his 10 years' connection with the former company, was presented by the employees of the repair shops with a gold watch and chain, and a diamond locket.

MR. H. P. O'DOUGHERTY, who for the past six years has been superintendent of the San Jose (Cal.) & Santa Clara Railway Co., has resigned that position to become master mechanic of the Los Angeles Traction Co. On his departure from San Jose, Mr. O'Dougherty was presented by the company's employees with a diamond-studded watch chain and a gold chain.

MR. CHARLES S. KIMBALL, who is connected with the Interurban Street Railway Co., of New York City, as designer of structural steel and track work, was married on October 8th to Miss Margaret E. Ireland, at St. Nicholas' Episcopal Church, New York. Mr. Kimball's best man was Mr. F. G. Clark, electrical superintendent of the 96th St. power station of the Interurban company.

MESSRS. LOUIS F. HYDE and CHARLES S. BAXTER, comprising the firm of Hyde & Baxter, which has had charge of the legal and claims department of the Boston Elevated Railway Co. since its organization, have resigned for the purpose of entering into a general practice under the same firm name. They will remain, however, at the head of the legal department of the Boston Elevated until the company shall find satisfactory successors.

MR. JOHN W. RAMPEE, formerly chief engineer at the power house of the Worcester (Mass.) Consolidated Street Railway, has resigned to enter the employ of the Slater Cotton Mills at Pawtucket as chief engineer. On the eve of his departure from Worcester Mr. Rampee was visited at his residence by a party of street railway employes who presented him with several handsome presents as a memorial of their regard.

LT.-COL. HORATIO A. YORKE, of the royal engineer army corps of England, and chief inspecting officer of railroads for the Board of Trade, London, arrived in New York on the steamship Celtic, September 28th, for a month's tour of the principal cities of the East. Mr. Yorke has been commissioned to prepare a report on the workings of American railroads and on the underground conduit systems employed in America.

MR. E. F. FOOTE, general traffic manager of the British Electric Traction Co., is at present in this country securing experienced men to return with him to England to fill places in the British company's repair shops and offices. Mr. Foote was formerly general manager of the Union Traction Co., of Rutherford, N. J., and was subsequently connected with the New Jersey & Hudson River Railway & Ferry Co., removing to Gateshead, England, in March of this year to take charge of one of the constituent properties of the British Electric Traction Co. The introduction of American methods on this road soon resulted in an increase of traffic of 75

per cent. and Mr. Foote was assigned to the management of a larger property in Scotland, owned by the same company. His present position requires his surveillance of some 40 different roads in the United Kingdom, on which the innovation of modern transportation methods is resulting in deserved success.

MR. JOHN H. VAN BRUNT, formerly superintendent of the St. Joseph (Mo.) Railway, Light, Heat & Power Co., has been appointed general manager of all the company's property in St. Joseph. Mr. John Van Brunt has been associated for several years in the management of the St. Joseph railways with his brother, Mr. W. T. Van Brunt, president of the company, and is thoroughly familiar with all the details of the system.

MR. HARDIN H. LITTELL, formerly president and general manager of the Louisville (Ky.) City Railway Co. prior to the consolidation of the railways at Louisville, has been elected president of the Springfield & Central Illinois Railway Co. which was recently organized by Kentucky and Illinois capitalists to construct an interurban system between Springfield, Ill., Bloomington, Decatur and Jacksonville. Mr. Littell at present resides in Buffalo, N. Y.

MR. PHILIP DAWSON has become a partner in the firm of Kirke L. Waller & Manville, which will conduct a consulting engineering business at 89 Great George St., Westminster, London, under the name of Kincaid, Waller, Manville & Dawson. Mr. Dawson is well known to the engineering profession, as the author of numerous papers before the institutes of civil engineers, mechanical engineers and electrical engineers, of which societies he is a member or an associate.

MR. W. G. WAGENHALS severed his connection with the Millcreek Valley Street Railway Co., of Cincinnati, on the merger of that company with the Hamilton, Glendale & Cincinnati Traction Co. under the title of the Cincinnati & Hamilton Traction Co., and will be succeeded by Mr. W. G. Gilpin, formerly of Washington, D. C. Mr. Wagenhals has been connected with the Millcreek Valley company since its organization and was the builder of the extension to Hamilton.

MR. JOHN FRITZ, of Bethlehem, Pa., who is famed as an inventor as well as the head of a great industry of Pennsylvania, attains his 80th birthday on October 31st, on which night a banquet will be given in his honor, at the Waldorf-Astoria, in New York. The auspicious occasion will mark the founding of the John Fritz Gold Medal, a cherished project of the eminent octogenarian for encouraging achievement in the industrial sciences. Annually, a medal will be awarded by a committee representing the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers for the most distinguished performance in engineering for the current year, the conditions of the award to be prescribed by the committee which will be selected by the governing councils of the several societies. The medal will be designed by the American sculptor, Mr. Victor D. Brenner.

MR. W. W. WHEATLEY, superintendent, and Mr. W. B. Yerrance, assistant superintendent, of the surface lines of the Brooklyn Heights Railroad Co., resigned their respective positions October 1st, and it is stated that for the present the duties of these officers will be performed by Mr. Dow S. Smith, general superintendent of the Brooklyn system. Mr. Wheatley was formerly connected with the Chicago & Northwestern Ry. and the Louisville & Nashville R. R. in the capacity of train dispatcher, and was at one time assistant superintendent of the Buffalo division of the West Shore R. R. He entered the service of the Brooklyn Rapid Transit Co. in 1896 as superintendent of the southern division, and three years later succeeded Mr. Ira McCormack as superintendent of all the surface lines. For several years Mr. Wheatley was secretary of the New York Railroad Club, and in 1900 became first vice president of that organization. It is announced that both Mr. Wheatley and Mr. Yerrance, will, after a few months' vacation, enter the service of the Metropolitan Street Railway Co., of New York City.

OBITUARY

MR. WINFIELD SCOTT STRATTON, president of the Colorado Springs Rapid Transit Co., died at Colorado Springs, September 14th, aged 54 years. Mr. Stratton was a native of Jeffersonville, Ind., where he resided until 20 years old, learning the trade of the carpenter and draftsman, at which he subsequently worked in Sioux City, Omaha and Lincoln, Neb. He settled in Colorado Springs in 1872, where his experiences were those common to the average prospector until 1891, when he began the operation of the Independence mine and rapidly accumulated a fortune which is reported to exceed \$20,000,000.

MR. HARRY S. PARMELEE, president of the Fairhaven & Westville Railroad Co., of New Haven, Conn., and a prominent manufacturer of the latter city, died suddenly of heart's disease, September 27th, on board the yacht "Alert," at the foot of 57th St., Brooklyn. Mr. Parmelee had served through the Rebellion in the First Connecticut Cavalry, and lost an arm before Richmond. He was the inventor of an automatic sprinkler which is now extensively in use, and he was president of the Mathushek Piano Co., a director of the Treat & Shepherd Co. and of the Second National Bank. He was an enthusiastic yachtsman, and was enrolled as a member of the yacht clubs of New York, New Haven and Larchmont.

TUNNEL CONTROVERSY IN CHICAGO.

The question of lowering the tunnels under the Chicago River for the purpose of expediting harbor traffic, was again the subject of discussion in a conference on September 30th, between the representatives of the Chicago city council, the drainage board and the traction companies, whose right of occupancy of the tunnels is the chief obstacle to a solution of the problem. Despite the mayor's contention that initiative action in the matter comes within the province of the sanitary district, the drainage trustees present disclaimed all responsibility until the city shall have formulated a method of procedure. The question then arose whether the traction companies would surrender their rights to the tunnels if allowed to run their lines across the bridges, in reply to which the attorney representing the Union Traction Co. at the conference stated that "if the company were protected and lost none of its rights and sustained the dissolution of none of its privileges, its directors would undoubtedly act in the interests of the people."

A plan was submitted by L. O. Goddard, chairman of the River Improvement Association, which provided for the removal of the bores by first giving the street railways the right to cross the bridges, and then blowing off the tops of the tunnels and scraping six or seven feet from the top of the walls. This plan was heard with attention, and will be discussed at the next conference. An estimate of the cost of lowering the three tunnels as submitted by City Engineer Ericson included the details of the cost of lowering each tunnel, and presented an aggregate sum of \$1,060,000.

RULING OF BOARD ABSOLUTE.

The Massachusetts Board of Street Railroad Commissioners has dismissed the application of selectmen of Stockbridge to require the transfer of the tracks of the Berkshire Street Railway Co. from private land locations to the public highway, at least until new evidence shall be available. The board had recently viewed the premises and decided that private land locations were best in accordance with public interests. The dismissal of the selectmen's petition for a change was in recognition of the new law which gives the board authority to approve locations without being influenced by local considerations.

Mr. George E. Moffat, chief engineer for the Fargo & Morehead Railway Co., of Fargo, N. Dak., advises us that the road is to be built at once and that the company is in the market for all material and supplies for ten miles of track.

An express business over the lines of the Lake Shore Electric Railway Co. between Cleveland and Norwalk has been inaugurated by the Electric Package Co., of Cleveland.

IMPROVED SEMAPHORE BLOCK SIGNAL AND CAR SPACER.

In the "Review" for July, page 423, we illustrated and described at some length the automatic signal for block system and car spacing device which had been brought out by the American Electric Signal Co., of Pittsburg, Pa. That system used red, white and green lights only for the signals, but a later improvement, known as the Berry automatic block signal and car spacing device, has just been put on the market by the Pittsburg Switch & Signal Co., which is the successor to the American Electric Signal Co., and some details concerning the Berry apparatus will be found of particular interest at this time.

The improved semaphore signalling device shown in the illustration is a feature of the new system so that incandescent lamps are not depended upon for the signals, though groups of lamps are arranged so that they can be cut out during the day. The semaphore arm on the right of the illustration has a green blade and green glass, while the arm on the left has a red blade and a red

glass, the glasses providing green or red lights in conjunction with the incandescent lamps. In event of an operating circuit wire breaking or a magnet burning out the semaphore arms come to the danger position by gravity.

For the operation of a single track system with turnouts, the arrangement of magnet and semaphore circuits is in general similar to that of the light and magnet circuits shown in Fig. 1 on page 423 of the "Review" for July, and the same is true of the double track system where one car controls two blocks, the wiring being analogous to that shown in Fig. 2, page 423. The semaphore apparatus has, however, the necessary magnets for actuating the semaphore arms, which was not necessary where only lights were used for the signals. The ingenious mechanism by means of which when several cars may be permitted to enter a block, the block is not cleared until the last car leaves, is retained, this being a valuable feature of the system. The trolley contacts also are arranged as in the installations previously described.

The wiring for an installation on a double track line where it is desirable to have the car signal one block only is shown diagrammatically in one of the illustrations herewith. The method of operation may be thus described:

The diagram shows a car having run into block between stations 5 and 6, throwing up a red or danger signal at block 5 so that the crew of any car following, arriving at station 5 and seeing a red or danger signal, knows that there is a car in that block. The method of operating this signal is as follows: Having reached station 5,

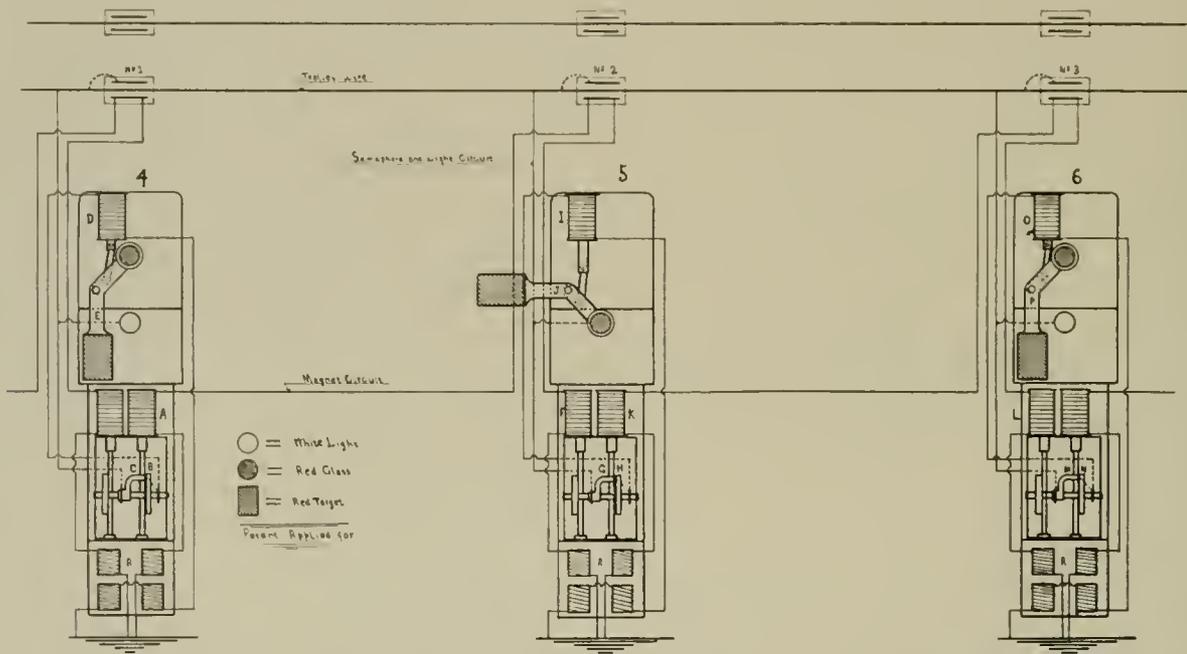


DIAGRAM OF CONNECTIONS OF AUTOMATIC BLOCK SIGNAL AND CAR SPACING DEVICE.

CONVENTION NOTES.

The Q. & C. Co., of Chicago, was represented at Detroit by Mr. Kalas. The company was unable to secure space for an independent exhibit, but the well-known "Stanwood" steel step—the one with a light and airy tread—was shown in the exhibit of the John Stephenson Co.

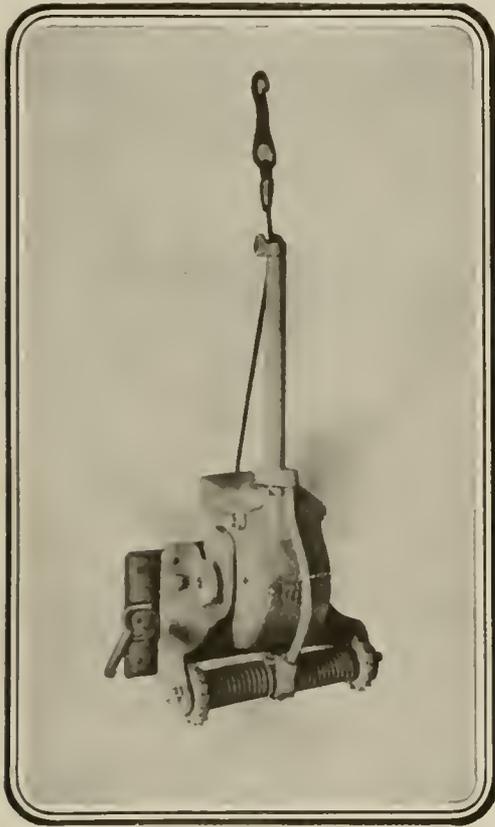
H. H. Hart, who exhibited the Hart Tie Plate at the Detroit convention, secured a large order from the Michigan Central Railroad while in that city. The tie plate is manufactured by George Fuller, Old Colony Bldg., Chicago, Ill.

Porter & Berg, of Chicago, and their representative, C. R. Mason, were very much in evidence although they did not have an exhibit, and report that they took a number of nice orders for supplies. They distributed a very unique souvenir in the shape of a "Frog" match safe which created considerable interest among convention visitors.

The H. P. Heil Co., Milwaukee, Wis., through its eastern representative, C. J. Harrington, of New York, has just closed a contract with the Consolidated Railways of Pittsburg for cast-welding several thousand joints, the style of welding to be the Heil improved cast-weld joint for 9-in. rails. The company has also closed a contract with the Toronto Railway Co. for a welding outfit.

JOHNSON TROLLEY RETRACTOR.

The device shown in the accompanying illustration is designed to furnish absolute protection to the overhead construction, trolley poles and wheels by instantly retracting the trolley about fifteen in. below the wire whenever it gets off the line. In a test over a year it is reported that the retractor has not failed to act in a single instance, and without the slightest damage to wire or poles,



working through severe storms and in extremely cold weather without being out of service at any time.

It is made entirely of steel, is simple in construction, and every adjustment can be made from the outside and on the car.

Fig. 1 shows the retractor in position on the dash of the car, connection being made with the regular trolley rope by means of the clamp *I* (Fig. 2). Fig. 2 shows position when trolley is retracted.



The machine consists of rotatable casing mounted in a suitable frame and containing a tension reel provided with an automatic adjustable locking device; a retractor arm of suitable length receiving

the power of the springs *E* through the medium of the arm *F* and yoke *G*. In Fig. 1 there is a maximum of spring power and minimum of leverage. In Fig. 2 the order is reversed, the minimum of spring power and the maximum of leverage at *H*, which in this machine gives 75 per cent more power in the last position. As the retractor springs can be wound up by the ratchets *D* to agree with trolley-pole tension, the vicious action of unnecessary power in the start is obviated in case the harp should be pressed against the wire.

The spring at *E* being divided, should one of the springs break, it still leaves energy enough in the remaining one to get the trolley out of danger. The breaking of both springs would resolve the machine into a trolley catcher. A broken spring can be replaced in three minutes.

When the car is running, and the trolley on the wire, the tension reel accommodates the variations in height of line, but when the trolley jumps from the wire the sudden upward movement locks the reel and raises the latch *C*. The arm then swings down and carries the trolley with it, the reel remaining securely locked while in that position. But when a small lever, which is raised to an upright

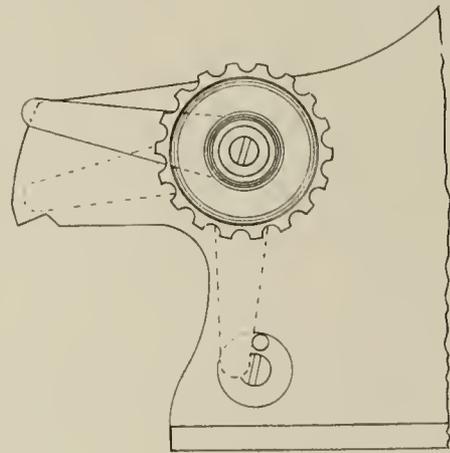


FIG. 3.

position behind the button *B* is moved to the left and a pull given downward on the trolley, the locking device is thrown out of gear and the trolley can be manipulated with freedom. After the trolley is replaced on the wire, the arm is raised to an upright position and the locking device shown in Fig. 3 set in action, the small lever being locked so it cannot be tampered with.

This retractor is fastened in the center of the dash with top of the arm level with top of dash. The arm is let down and connected with the trolley rope, with the trolley free from the wire; then the springs *E* are wound up until the arm draws the trolley down freely.

The trolley rope is connected so that at low points the rope in the machine will have a clearance of six inches above the top of arm, and the rope can be adjusted to pay out fast enough to meet all requirements as to curves, sudden rise of line at railroad crossings, and incidental jolts. This retractor is made by the Federal Manufacturing Co., of Cleveland, O.

WORLD'S FAIR INTRAMURAL RAILWAY.

An intramural railway is to be constructed upon the World's Fair grounds at St. Louis which it is estimated will cost about \$750,000 to build and equip. This system of rapid transit will include about eight miles of main line and branches and will enable visitors to see the exposition with as little fatigue as possible. The chief consideration in planning the intramural road has been to locate it where it would not mar the beauty of the exposition, and it is believed that the plan presented by Mr. Charles V. Weston, of Chicago, comes nearest to a perfect solution of the problem. Owing to the varying altitudes of the exposition grounds the road will be at times an elevated line, a surface road and an open cut.

The Dallas (Tex.) Consolidated Electric Street Railway Co. has ordered 13 new winter cars of the latest improved pattern, which will be shipped from St. Louis for service on the Dallas lines.

TRADE NOTES.

THE KINNEAR MANUFACTURING CO., of Columbus, O., is distributing an ingenious advertising novelty to its street railway friends. The card represents the Kinnear steel rolling door as used for car barns and the doors are made so as to operate on miniature rollers.

GEORGE E. WATTS, who has been connected with the Columbia Incandescent Lamp Co., of St. Louis, for the last five years as sales agent for St. Louis, Kansas City, Omaha, Cincinnati, Indianapolis and Louisville, announces that he has entered the electrical field on his own responsibility as manufacturers' agent. Mr. Watts' headquarters are at 514 Chemical Bldg., St. Louis, where he will be pleased to welcome his old friends.

SARGENT, CONANT & CO., of Boston, will shortly complete the electrical equipment, for power and lighting, of the Hampton Co., Easthampton, Mass. The entire plant will be electrically driven, current being supplied from two multiphase generators, one direct coupled to a Corliss type engine, and the other bolted to a water wheel; either or both may be used for operating motors or arc or incandescent lamps.

THE CRANE CO., of Chicago, has just published a new pocket size catalog of its steam goods, etc., comprising 464 pages and including a complete line of the company's goods such as standard, medium, low pressure, extra heavy, and hydraulic goods in brass and iron, engineers' supplies, tools, pipe, etc. The book contains a great deal of useful information, tables, rules, etc., and will be furnished on application to the home office in Chicago, or to any of the company's branch houses.

THE ANNUAL MEETING of the stockholders of the Sprague Electric Co. was held Tuesday, Oct. 14th, 1902, at the office of the company in Watsessing, N. J. The following directors were elected for the ensuing year: Allan C. Bakewell, D. C. Durland, S. M. Hamill, J. R. Lovejoy, John Markle, J. R. McKee and E. G. Waters. At a meeting of the directors held later in the day officers were elected as follows: President, Allan C. Bakewell; first vice-president, S. M. Hamill; second vice-president, D. C. Durland; secretary and treasurer, Harry R. Swartz.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, maker of the chloride accumulator, distributed a pamphlet at the American Street Railway Convention entitled "A Few Illustrations Selected from 220 Installations of the Chloride Accumulator Batteries in Street Railway Service." The pamphlet contains 11 half tone illustrations of the interior of several battery houses with brief descriptions and a statement is given in the preface of the increase in installations of the chloride accumulators from October, 1901, to October, 1902.

THE MICA INSULATOR CO., of New York and Chicago, is now manufacturing its "Empire" oiled cloths in the form of a tape under the name of "Linotape." It is made in any width from 1/4 in. to 36 in. and has proved itself to be an excellent tape both mechanically and electrically. The foundation of this tape is a closely woven cloth made so as to secure the greatest mechanical strength and the coating consists of the company's Empire oil on both surfaces. It is stated that this coating never cracks or hardens and that it renders the cloth impervious to moisture and acid and alkali proof.

"FOUR TRACK SERIES" No. 35, published by the New York Central & Hudson River R. R., under the head of Historical Pilgrimages About New York, tells in entertaining style the story of the growth of the Empire State and its struggle for supremacy. The events of its civil and literary history are narrated under the names of the towns and cities most familiar to the student as landmarks of the progress of the state and the route and schedule of trains for reaching these interesting places are also given in detail. The publication contains a fine map in colors of New York from the Battery to Newburgh, and is illustrated with half-tone engravings.

THE GENERAL ELECTRIC CO. has recently issued the following publications: Electric Hoists, a handsomely illustrated catalog describing this class of machinery for power and mining work; Bulletin No. 4295, on "oil switches;" Bulletin 4296 on "switch for a system of remote control;" bulletin 4297 on "high voltage type H transformers;" bulletin No. 4298 on "Thompson high torque induction meter." Catalog and price list No. 7560 superseding No. 7524 on "Repair Parts of Type K Series Parallel Controllers;" catalog and price list No. 7561 on "Parts of Standard Carrier Bus Are Panels;" catalog and price list No. 7562 on "Parts of Form 3 Carbon Feed Alternating Current Series Enclosed Arc Lamps;" catalog and price list No. 7563 on "Parts of Form 5 and Form 6 Carbon Feed Direct Constant Current Series Enclosed Arc Lamps." Flier No. 2104 on "G. E. Alternating Current Lightning Arresters" and flier No. 2105 on "Reflectors for Enclosed Carbon Feed Arc Lamps."

THE REYNOLD SILENT CHAIN GEAR is the title of bulletin No. 1001 published by the Link Belt Machinery Co. of Chicago. This chain gear consists of a chain made of stamped links of special form, shouldered studs and countersunk washers. The chain is made in six pitches and in many widths of each pitch. These chains run on cut sprocket wheels with accurate teeth and having straight sides and varying forms. One of the principal advantages claimed for this gear is that it can be run at high speeds with no noise; it is also claimed to be superior to leather or rubber belting for the reason that it cannot slip. It can be run on short centers without an idler, it can be used in hot or damp places and is run slack, and therefore produces no excessive journal friction. The silent chain gear is particularly recommended for motor gearing and in many cases makes the use of a motor possible where belting or spur gearing are found impracticable. While the Reynolds silent chain has been on the market in this country for less than a year its application has already become extensive.

THE WESTERN ELECTRICAL SUPPLY CO. of St. Louis has recently taken the agency for the Hartman Automatic Oil Circuit Breakers. This is one of the most practical circuit breakers for cars that has even been gotten out. It is designed on entirely original lines and embodies in its construction many new and valuable points which will at once commend itself to the engineer. The extreme simplicity in its construction is one of the many good points in its favor. The parts are reduced to a minimum in number, and there is no delicate and complicated mechanism to get out of order.

A particularly valuable and entirely new feature is the operation of the switch mechanism in oil enclosed in a tight metal case. By this method the arcing feature has been almost entirely eliminated by surrounding the contact mechanism with a non-conducting fluid. The contacts are of the laminated type, the advantages of which over the ordinary knife-blade type are well-known. Special attention is also called to the fact that the instrument is a perfect oil-break switch as well as a circuit breaker. Bulletins, descriptive matter, etc., are mailed on application.

The Western Electrical Supply Co., of St. Louis, have recently taken the agency for the celebrated Shelby Seamless Cold Drawn Steel Trolley Poles. We are advised that they are carrying a complete line of these poles in stock, and are prepared to ship promptly.

THE H. W. JOHNS-MANVILLE CO. has issued its catalog No. 5 relating to "Vulcabeston" packing. The increased temperature and pressure in modern steam plants require the most effective kind of steam packing and "Vulcabeston" is claimed to give excellent service under all conditions. This material is tough, pliable and yielding and can be moulded into any shape of gasket. It is made of any desired density, from soft for ordinary purposes, to hard for valve seats, coupling rings, etc. The catalog describes the use of Vulcabeston concave and convex packing rings on the valve rods of locomotives for more than a year without the necessity of even screwing down the follower, and a number of testimonials are included in this catalog from users of this packing in locomotive and air brake equipments. This material is manufactured in flexible rope for packing, in pressed rope rings and gaskets, in moulded gaskets, washers for standard unions, moulded faucet washers and convex and concave packing rings, etc. The company will be glad to send a copy of this catalog to any one interested upon request.



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If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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By reason of the attention which street railway men are now devoting to the subject of discipline the article in this issue by Gen. W. A. Bancroft, president of the Boston Elevated Railway Co., describing the methods used by that company in choosing, training and disciplining its motormen and conductors will be found of exceptional interest at this time. This system which General Bancroft describes in detail is probably more elaborate than is used by other street railway companies, and it will certainly be surprising to the layman—the "average man"—to know that the ideal of discipline for street railway men is considered to be even higher than that of our military force.

From the latest reports it appears evident that if Ohio interurban electric railways desire peace and happiness in their relations with municipalities they will do well to secure private rights of way. Thus in a controversy between the Stark Electric Ry. and the Canton-Akron Ry. over the proposed grant for a terminal of the former road in Canton, the trial court on October 22d decided that an interurban electric line is a railway and that it is not necessary for such a company to follow the ordinary course of applying for a franchise from the city; but that it may appropriate a right of way and pay any damages incurred by owners of the property.

On the other hand, a trial judge has held in the case of the city of Dayton versus the Southern Ohio Traction Co., that as soon as the company's line enters the city it becomes a street railway and not an interurban line, and as such must give reasonable service, stop at street crossings, sell tickets, announce names of streets, run cars at specified speed, and, in the language of the court, "furnish a continuous local street car service."

These two decisions are not as conflicting as might be thought; the first allows an interurban to condemn a right of way for itself and not use the city streets, while the second shows what may happen if a company uses the streets.

Reserves of power generating machinery which would insure against delays to traffic in event of accidents at the power station or provide for extraordinary temporary demands for current, have always been among the prime requisites in electric railway stations. In the main power plant the units are chosen of such a size that one may always be held as a reserve, but with the development of long roads using multiphase apparatus at the main station, and high-tension transmission lines with rotary-converter sub-stations, the installation of duplicate converter units at all sub-stations requires such an investment that other plans received consideration.

Perhaps the most ingenious design to reduce the initial investment in converting apparatus and at the same time provide against delays to traffic is the portable sub-station car. The first proposal to use such a car of which we know, was in connection with the Chicago & Milwaukee Electric Railway, for which Mr. B. J. Arnold was the engineer. In describing this road in the "Review" for August, 1898, we said: "It will be noticed that the electrical equipment of the sub-station is not in duplicate. This has been considered unnecessary as it is intended to mount the machinery needed for a sub-station, static step-down transformers, and one rotary converter upon a track fitted with motors. In case of a break-down at any sub-station the storage battery can be relied on to supply current for several hours, during which time the portable reserve sub-station equipment can be taken to the crippled station and be connected ready to operate until the repairs have been made."

This scheme was never put in practice on the Chicago & Milwaukee line, but in 1901 the Union Traction Co. of Indiana built a portable sub station car, the drawings for which were published in the "Review" for April, 1901, page 212; this was, we believe, the first portable station of this character to be put in service. This car has proved to be very satisfactory and convenient in operation and but one change in that design has been suggested as a betterment—making the roof easily removable in order to facilitate handling apparatus in the car by an overhead crane.

It is rather surprising that this plan of providing for emergencies has not been more widely adopted, since it has proved successful in practice and we know of no serious objections urged against it by engineers. In this issue we illustrate a sub-station car recently built for the Wilkesbarre & Hazelton Railway, a new Pennsylvania interurban, which may be taken as indicating an increasing popularity for the portable sub-station. In considering the merits of this device it should not be overlooked that the car is equally serviceable for temporarily increasing the capacity of a sub-station

when traffic on the portion of the line supplied by it may be heavier, as for a reserve in case of accident.

In several respects the high tension alternating installation of the Berkshire Street Railway Co. at Berkshire, Mass., which is described in this issue (supplementing the description published in the "Review" Feb. 15, 1902), is a somewhat radical departure from usual engineering practice. In the first place, the scheme for generating and distributing current is new, in that step-up transformers are avoided by the use of direct connected alternators of the revolving field 3-phase type, giving current at 13,300 volts and 25 cycles per second, this current passing directly to the transmission line at this voltage. The idea of this is of course plainly to avoid step-up transformer losses. Under usual conditions the design would, however, be questioned, inasmuch as theoretically the step-up transformer is the most efficient part of the usual high tension alternating installation, and when working at full load, it can be assumed to give very nearly 98 per cent efficiency. In this particular installation, however, the consulting engineer in charge decided that, for a long time to come at least, the transformers could not be operated at their full capacity, and in all probability would not average much over 50 or 60 per cent of full load; and he was therefore probably entirely justified in eliminating the step-up devices. The question naturally arises, How are the alternators of this type going to stand up under electric railway load conditions? During four months of continual running, they have given no undue trouble. As far as safety is concerned, these high tension machines are probably attended with no more danger to operators than are the ordinary 600-volt direct current machines. The only high potential parts are the stationary armatures and these are entirely enclosed and protected, and the builders claim it is impossible for an employe to obtain a shock unless he deliberately and intentionally places himself in danger. The machines are protected by static interrupters, by lightning arresters and by barb wire suspended over the high tension transmission lines, the wire being grounded at every fifth pole.

It will be noted that the revolving fields of the station alternators are separately excited by 110-volt independent steam driven units. The service on these exciting units is unquestionably very severe, and they require considerable attention. It is urged, however, that the gains offset the drawbacks, and not the least conspicuous advantage is the convenience of running one or both of the small exciter units for lighting the power house and car barn when the main generating units are shut down. The piping arrangements as described and illustrated in this issue will also be found of interest and worthy of study, the most noticeable feature being the flexibility and diverse connections provided for meeting almost any emergency that can be imagined caused by the disablement of a live or exhaust steam feed water system.

Another interesting feature will be found in the arrangement of the high tension transmission line. The transmission lines are No. 4 and No. 6 bare copper wire arranged in two circuits, one 13 miles long, and one 26 miles long. Three wires of each circuit are placed at the corners of an imaginary equilateral triangle, having sides 18 in. long, but the wires are not transposed at any point of the circuit. The question naturally arises how much loss of current is there due to lag through induction. The engineer states that thus far he has been able to discover no appreciable loss, but adds that this is undoubtedly due to the low amperage and high potential. The maximum current never exceeds 50 amperes, and the average is less than 20 amperes. This, at 13,000 volts, seems to give no trouble in the three-phase circuit with straight away wires. The working of this installation will be watched with unusual interest.

It is not always that the discussions before our technical clubs and associations produce information of so practical a value as was brought out at the September meeting of the New York Railroad Club, when the topic for discussion was "The Construction of Perfect Track." Mr. J. C. Brackenridge, chief engineer of the Brooklyn Rapid Transit, who was appointed to open the discussion, in the first place admirably defined a perfect track as one "that will always keep its alignment and service, and never wear out," and then in the next sentence with commendable frankness summed up the situation in the words "unfortunately I cannot tell you how to build a perfect track or tell you where you can find out." However, Mr. Brackenridge goes on to give some valuable data on the subject of track building. His remarks are

quoted at length in another column of this issue. The New York Railroad Club includes in its membership over a thousand of the leading steam railroad and street railway men of the country, especially of the East, and this subject of track laying was thoroughly discussed from the standpoints, both of the steam railroad engineer and the electric railway engineer. In view of the fact that it is frequently said in electric railway circles that we must come to steam railroad standards in track laying, it is of interest to read the views of some of the members on this point. Mr. R. Trimble, a steam railroad engineer, pointed out that some steam locomotives now in use concentrate on a wheel base of 16 ft., about 225,000 lb. Considering that this load is distributed over an area of about 200 sq. ft., we have an average load on the supporting roadbed of 1,100 lb. per square foot, and Mr. Trimble is of the opinion that 6 or 8 in. of ballast under the bottom of the ties is not sufficient to make a perfect distribution for steam railroad work, and he advocates that 14 in. of ballast under the ties is not too much. Mr. Reed of the Metropolitan Street Ry., of New York, also pointed out that, where the power applied to the locomotive drivers is conveyed by reciprocating parts, no matter how much care is used in balancing, there is always a hammer-blow struck with each revolution of each driving wheel. With a solid foundation, therefore, for steam railroads, there would not only be excessive wear on the track structure, but upon the locomotives as well, so that a flexible track is desirable. The discussion at once turned upon this question: Is a flexible track desirable or undesirable for electric railway work in city streets? On this point Mr. Brackenridge, speaking from his experience with electric railway work in Brooklyn, and Mr. Reed referring to the experience on the Metropolitan in New York, take diametrically opposite positions. Mr. Brackenridge said: "I am a believer in wooden tie construction, having used a longitudinal concrete beam with steel tie rods, and found that the rigid foundation shortened the life of the rail more than 25 per cent." Mr. Reed said: "I must differ from Mr. Brackenridge as to the best track construction for electric railways, especially for paved streets. As the power applied to the wheels emanates from a revolving armature there is, or should be, an even application at all points of the circumference, and there is nothing to cause a pound or hammer-blow, therefore, I believe there is no necessity for a flexible roadbed; I consider a perfectly rigid roadbed by far the best."

This difference of opinion between two experts of so high a standing as Mr. Brackenridge and Mr. Reed is certainly confusing, especially when both speak from actual experience with rigid roadbed construction under similar conditions. The situation is just this; in Brooklyn it has been found that with heavy traffic on track supported on concrete beam, the head of the rail itself is ironed down or worn out prematurely, while in New York under practically the same traffic this trouble has not been experienced. The testimony from other cities on this point is of value.

In the September issue of the "Review," Mr. Stanley, general superintendent of the Detroit United Ry., said: "We are satisfied with a 9-in. girder grooved rail with concrete foundation, but our experience in Detroit has shown that 6 in. of concrete is not sufficient foundation for heavy rails." In other words, Detroit wants a still more rigid roadbed than 6 in. of concrete gives. At Buffalo, concrete work with electrically welded joints has been used, and is being retained in new work. Kansas City—which claimed to be the home of the concrete beam under electric railway track,—has several miles of track with 6 in. or more of concrete under each rail, and in 1900, Mr. E. Butts, the company's engineer, authorized the statement in the "Review" that the Metropolitan company of Kansas City was so well pleased with the results of this tieless concrete construction, that it had decided to follow this practice wherever possible in new work and in rebuilding. We do not recall an instance where concrete construction has been abandoned after trial. On top of this testimony, and to add still more confusion to the unsophisticated, is the decision of the Rapid Transit Commission in New York to use a ballasted track with an exceedingly thin quantity of ballast beneath the ties, this decision having been reached after an experimental stretch of track had been built and used with ties and rails embedded solid in a concrete bed. It looks as though the question of the relative advantages of concrete construction as compared with wooden ties and ballast is still a debatable question in every individual case, as the testimony at hand is certainly conflicting.

The Employing, Training and Disciplining of Car-Service Employes of the Boston Elevated Ry.—1.

BY MAJ. GEN. WILLIAM A. BANCROFT, PRESIDENT OF THE BOSTON ELEVATED RAILWAY CO.

If that nebulous and oracular personage, "the average man," were asked to name the most highly organized and perfectly disciplined body of men in this country, it is probable that the Army or Navy of the United States would be promptly mentioned. Such an answer would be conclusive evidence that the "average man" has never undertaken the management of an important street railway system conducted in accordance with modern principles, and attempted to operate it under the conditions that prevail in our large American cities.

The "average man" knows that a vast army of men is employed in the running of the street cars that carry him with considerable speed and almost absolute certainty to nearly any street or corner he may desire to reach in the city, suburb or country town; he knows that these men are units in the organization of a great corporation that

undertakes to supply transportation to the public in a more or less systematic and convenient manner; he knows, in a general way, that the conduct of the men is governed by numerous rules promulgated by what is known as "the management;" and he may, perhaps, know that before a man is entrusted with the running of a car he is instructed in his duties and in the manner and means of performing them.

More than this the "average man" may not be expected to know. The care that is exercised in the selection of new men; the infinite pains taken in the in-

struction of recruits; the constant inspection of the daily work of all employes, and the unceasing efforts that are continually being exerted to increase the individual and collective efficiency of the car service force are matters beyond his ken or imagination.

There is no branch of street railway activity that causes a manager more concern than the production and maintenance of a corps of capable and dependable men to man the platforms of the cars—men who can and will do the right thing at the right time when no superior officer is at hand to watch or aid them. Every railway company is striving with greater or less success for the realization of this ideal, and the purpose of this writing is to describe the methods adopted by a company that has met with some success in its efforts to reach this Utopian condition.

The Boston Elevated Railway Co. operates somewhat more than 410 miles of surface, underground and overhead track and employs about 5,000 motormen, conductors, guards and brakemen. The men who constitute its car service force are generally conceded to be as well trained a body of operatives as exists in the country. This opinion has been expressed not only by railway specialists but by persons who travel extensively and view the matter from the standpoint of the public and the passenger.

As a logical and natural starting point for a recital of the means by which this company trains its men, it may be well to begin with an account of the methods adopted for securing good raw material, so to speak, out of which the capable railway man is produced. No department of the service has its work more completely systematized than the employment department, and no pains are spared to eliminate every possibility of giving employment to unpromising applicants. The company is very exacting in its requirements and no person is allowed to fill out an application blank who falls in the slightest particular below the standard.

Every applicant who is seriously considered comes before the Superintendent of Employment personally. Those whose general

appearance is slovenly or unprepossessing are dismissed summarily. Those whose neatness, address and apparent intelligence commend them are subjected to a preliminary examination, and those who pass the various tests made at this time are allowed to file formal applications.

The requirements are, in brief, that the applicant must be not less than 21 years nor more than 35 years of age for elevated service, nor more than 45 years of age for surface car service. The eyesight must be perfect. This is tested by the usual methods employed by oculists in fitting glasses, and the slightest defect in either eye is an absolute bar to further consideration. The hearing must likewise be perfect, and the applicant is required to nod his head in response to the clicks of a device that is sounded at varying distances and from different directions as a test for the quickness and accuracy of each ear.

Since the elevated lines were placed in operation, a year and a half ago, a test for color blindness has been added. The candidate is required to select from many skeins of worsted of various hues and shades, those which he thinks match in general color certain samples that are handed to him. He is further required to name correctly the colored disks of light displayed by a lantern in a dark room, and a failure to select and name correctly is sufficient cause for rejection.

No man is employed as a conductor who is less than 5 ft. 4 in. in height, nor as a motorman or brakeman if he falls below 5 ft. 6 in., and no man can enter the car service unless he possesses four fingers and a thumb on each hand in good working order. Conductors must possess a common school education and motormen must be able to read and write the English language.

If this preliminary examination discloses no defect, the applicant is required to state the names of every person or concern by whom he has been employed during the preceding five years and to state the cause of his leaving each position he has held. If he has had no employer during the whole, or any considerable part, of that time he is required to name as references a sufficient number of reliable persons who have known him during that period and are in a position to express an intelligent and authoritative opinion of his habits and character. A brief description of the man is then entered upon the examination blank, and the following form of application is filled out and sworn to.

BOSTON ELEVATED RAILWAY CO.

Application for Employment.

Boston,190

Superintendent and Employment Department.

Dear Sir:—I hereby make application for a position as..... in the service of the Company, with the full understanding that in the event of my securing employment I am to abide by such rules and regulations governing its employes as the management may from time to time establish.

If employed I promise to loyally and faithfully serve the Company, and to do all in my power to further its interests. To conduct myself honestly, soberly, and with proper obedience and respect to its officials, and courtesy to passengers and the public.

Age..... Where born?.....
Married or Single?..... General condition of health.....
Employed the past five years as follows: Reasons for leaving:

.....
.....
.....
.....
.....

Have you ever been employed by a Railroad or Railway Company, other than stated above?

.....
Have you ever made any assignment of wages that has not been discharged?
.....

Have you ever been convicted of a Misdemeanor or Felony?.....
 Section of Road preferred.....
 Do you use intoxicating liquors?.....
 (Full name of applicant).....
 (Residence).....
 (P. O. Address).....

Commonwealth of Massachusetts,
 County of Suffolk,
 Boston,190

Then personally appeared the above named.....
 and made oath that the foregoing is true to the best
 of his knowledge and belief.

.....Justice of the Peace.

To each of the former employers or persons whose name has been
 given as references a circular letter of inquiry is promptly sent,
 and a failure to receive a satisfactory reply from each of these is
 prima facie evidence of unworthiness. The letter is as follows:

BOSTON ELEVATED RAILWAY COMPANY,
 82 Water Street,

EMPLOYMENT DEPARTMENT,
 A. W. Senter, Supt.
 Boston, Mass.,190

M.....
 Dear Sir:

In applying to this Company for a position as
 Mr. Age, Height,
ft., in., Eyes, Hair,Com-
 plexion, Born in.....refers us
 to you. Will you favor us with your opinion of his honesty, charac-
 ter, habits and ability, etc. Please state definitely as to honesty and
 habits. Has he ever to your knowledge been employed by any Rail-
 road or Railway Company? It is very essential to applicant that
 this letter be answered promptly; also if ever in your employ that
 the dates of entering and leaving your service be given. The in-
 formation that you give us will be thankfully received, and con-
 sidered confidential.

Very truly yours,

N. B. Employed asfrom.....
 to.....

If this investigation establishes positively that the candidate is of
 good habits he is summoned to the employment office and turned
 over to the company's physician for final physical examination.
 This examination is intended to disclose any constitutional or or-
 ganic defects that might interfere with the discharge of his duties
 in a long term of employment. About one out of every eight is re-
 jected by the physician. The kidneys, heart, lungs, and feet have
 been found to be particularly vulnerable points in men employed
 upon the cars, and the company feels that it is not justified in the
 expenditure of the time and money necessary to break in new men
 who are not absolutely sound in these respects. The scope and
 nature of the physician's investigation is shown in the following
 form used for the final physical examination:

BOSTON ELEVATED RAILWAY CO.

EXAMINATION OFFOR THE POSITION
 OF

Date of Examination,Place of Examination,.....
 Analysis of Urinereaction,
 Sp. G..... albumin,sugar
 Cause of rejection,
 Weight,Hearing,Temperature
 Pulse (rate and character),
 Have you ever been vaccinated or had Small Pox?.....
 Have you ever received an injury or wound upon the head?.....
 Have you ever had any difficulty in urinating?.....
 When were you last attended by a physician?.....
 For what complaint?.....Name of Physician?.....
 Are you subject to fits?
 Chest measurements,
 Forced inspiration,
 Forced expiration,
 Measure of abdomen
 Examination of abdomen,
 Lung examination,

Percussion,
 Auscultation,
 Heart,
 Feet,
 Applicant isin my judgment, physically qualified for
 the position of conductor or motorman.

Remarks:—

(Signed)

Dated thisday of190 .

The number of men who succeed in running the gauntlet of all
 of these examinations amounts to only about 25 per cent of the
 total who apply for positions. It is doubtful if any other corpora-
 tion or concern, public or private, exercises so great care in the selec-
 tion of men for service. As a further precaution the company re-
 quires every conductor to furnish a bond with two real estate owners
 as sureties, each in the sum of \$300. The bonds of surety companies
 are not accepted for the reason that it is believed that the stipula-
 tion of private bondsmen is certain to result in securing greater
 fidelity among the employes. An individual will not assume the
 risk of losing \$300 by the misconduct of another unless he has very
 excellent grounds for believing in the honesty of the person for
 whose possible wrong doing he is to be held liable. The bond is as
 follows:

KNOW ALL MEN BY THESE PRESENTS,

That we,ofin
 the county ofas principal
ofand
ofas sureties, are
 held and firmly bound unto the Boston Elevated Railway Company,
 in the sum of three hundred dollars, lawful money of the United
 States of America, to be paid to the said Boston Elevated Railway
 Company, its successors and assigns, for which payment, well and
 truly to be made, we bind ourselves, our heirs, executors and ad-
 ministrators firmly by these presents.

Dated thisday of one
 thousand nine hundred

The condition of the above obligation is such, that if the said
shall be appointed
 Conductor by said Company, and shall faithfully discharge all the
 duties assigned to him as such Conductor, and shall pay over all
 money received by him as such Conductor, and shall fully indemnify
 and save harmless the said Company from any expenses, which said
 Company may incur, or sustain by reason of any misconduct of said
while in the employ
 of, or acting as a Conductor for said Company, and upon leaving
 the service of said Company, shall return all property entrusted to
 him, and pay all debts owing by him to said Company, then the above
 obligation to be void, otherwise to remain in full force and virtue.
 Sealed and delivered
 in the presence of

When the medical examiner has made his report the investigating
 stage is completed and instruction begins. The applicant is given
 a badge and is assigned to one of the several divisions. He is
 now termed a "learner." The general principles of instructing
 learners are substantially the same in both the elevated and surface
 car service, but the methods and details of the training process
 are necessarily so dissimilar that they must be described separately.

A man assigned to a surface line division reports to the Division
 Superintendent, bearing a certificate of assignment from the Super-
 intendent of the Employment Department. He is at once turned
 over to the Chief Inspector of the division for instruction, is
 given a running time book and a book of rules and regulations
 which he is required to learn and understand in the minutest
 detail, signs the weekly assignment sheet, and is entered upon the
 division rating list.

This rating list is a valuable check list of the progress made by
 every individual from the time his name is entered upon the books
 to the time when he becomes a full fledged conductor or motor-
 man and is equipped with the full uniform of the company, for
 until he is fully instructed and has passed successfully the proba-
 tion period he is required to wear no more of the uniform than
 the regulation cap upon which is displayed his badge of occupa-
 tion and his number. The form of rating list, which is here

reproduced, has been found to be extremely useful and convenient as a matter of record and reference.

The Chief Inspector assigns the learner to the person in charge of one of the stations, and he, in turn, assigns the new man to

watch for persons who have not paid their fares. As in the case of motormen, conductors are taught their lessons gradually, the aim being not to confuse and overburden the mind with too many new things at once. Time tables, list notices, rules and the Ander-

BOSTON ELEVATED RY.

BUREAU OF SURFACE LINES.

DIV. NO.

RATING AND CHECK LIST FOR CONDUCTORS AND DRIVERS.

- A. Check when name is entered on ledger.
- B. " when notice to Inspectors, etc., is made out.
- C. " at end of Probation when recommendation for permanent appointment is made.
- D. " at end of Probation when recommendation for discharge is made.
- E. " when equipped with full uniform.

CONDUCTORS.	DRIVERS.	Badge No.	Date Appointed.	Date Turned In.	Probation Expires.	A	B	C	D	E

RATE SHEET. (SIZE OF ORIGINAL 11½ x 17 INCHES.)

some regular motorman or conductor who is not only a thoroughly competent man to handle a car but also possesses the ability and has been specially trained to instruct others.

Instructors are required to give their entire attention to the learner from the time the car is moved out of the car-house until, in the case of a conductor, the day's receipts are made up and deposited in the safe, or, in the case of a motorman, until the car is left in its proper place in the car-house at the completion of the day's work.

A new man is taught one thing at a time and only as rapidly as he is able to understand and appreciate the full meaning of what is being said or shown to him. Every instructor is made to feel that the competency of each individual he instructs forms a part of his own record and contributes to or detracts from his own standing and possible chance of promotion.

If the learner is to be trained for a motorman he at first takes no active part in the running of the car. He is a mere observer of what is done, but he is expected to observe to some purpose. He is shown how to handle the brakes and controlling mechanism and is told the meaning of the bell signals. As soon as he has become familiar with the purpose of these things he is permitted to handle the car under the watchful eye of the instructor who stands by his side ready to correct and explain or, if need be, to take the handles himself in a difficult situation.

Gradually he is given further instruction in the rules, and as progress is made he is taught the other things that a motorman needs must know, but no new instruction is attempted before every previous item has been mastered. As advancement goes on the learner is shown how to cut out motors both on rheostat and controller cars, put in fuses, replace a lamp in a headlight or in an illuminated sign, inspect his brake, controller, rheostat and reverse, operate the main motor switches, insert brushes, and discover defects in case the car is on the street disabled with fuse blown out or trolley off the wire. The effect of abuse of power and mechanism, the use of daily lists and time tables are explained to him and, in a word, he is shown and taught every detail of his occupation.

The first thing that a prospective conductor is taught is to give the bell signals properly. This apparently simple matter is regarded by the company as second only to honesty among the requisites of a good conductor. The mere act of pulling the bell cord the proper number of times to give a signal is, of course, an easy matter but the failure to give signals in a proper manner, and at proper times, is the cause of a greater number of accidents than is pleasant to contemplate. When a heavy freight is being carried and stops are so frequent that it is not easy to make the running time, there is a temptation to take chances and give the starting bell without being absolutely sure that it is perfectly safe to go ahead. Therefore the company considers the understanding and appreciation of the proper giving of signal the most important single item in the education of a conductor.

After the learner has become proficient in the use of the signals he is allowed to collect fares. He is instructed to make his collections with great promptness after a passenger has boarded the car, is taught the proper way to register fares as they are collected, to be sharp and lively in calling "fares please" and to

son trolley base are explained. Then the learner is taught how to "turn in his work" on the day card, how and when to issue and honor transfer and other checks, how to replace burned out lamps and operate the various electric switches in the car. He learns

Boston Elevated Railway Co.

Bureau of Surface Lines. Division No. _____

INSTRUCTOR'S BLANK.

To _____ Insp. Starter _____ 190 _____ Sta. _____

Place _____ Driver No. _____

with the regular instructors at your Station.

Chief Inspector.
The Driver above named has been under our instructions as noted below.

SIGNATURE OF INSTRUCTOR	BADGE NO.	ROUTE NO.	NO OF TRIPS	CHECK HERE IF O. K.	DATE FROM	TO

- Send all new Drivers to Pit Foreman for further instructions. Special attention is called to the following:
- Motor. How to Cut Out both on Rheostat and Controller Car.
- Fuse Box. How to Replace Fuse.
- Lamps in Headlight or Illuminated Signs. How to Replace Them.
- Box on Car for Carrying Cage.
- How to Inspect { Brake Controller Rheostat Reverse } Effect on Motors or other Mechanism of Car by Improper use of.
- Main Motor Switches. How to Operate.
- Brushes. How to Insert.
- Snow Scrapers. Use of Same.
- Car on Street Disabled. How to Discover Defect.
- Car going down Hill with both Brakes disabled and Fuse blown out or Trolley off the Wire. How to stop Car if equipped with Double Motors.

Instructor and approved,

Pit Foreman.
Having carefully examined the above driver, I believe him to be fully conversant with the rules, and in my judgment competent to take charge of the operation of a car.

Chief Inspector.
NOTE. This slip, when properly filled out, is to be returned in sealed envelope to the Chief Inspector.

INSTRUCTOR'S BLANK. (SIZE OF ORIGINAL 9¼ x 10½ INCHES.)

about the trolley catcher, box for carrying the cage, illuminated signs and all the other items that enter into the duties of a conductor.

After the learner has been in charge of several instructors and has been pronounced competent by each he is sent to the pit foreman in the car-house to which he is assigned for a finishing course in the mechanism of electric cars. Here he obtains a fuller and more technical knowledge of the mechanical and electrical equipment of the car and is instructed, so far as need be, in the making of minor repairs. When the pit foreman has added his certificate of approval to the record of the embryo street railway man, his course of instruction is completed, and then comes an examination at the hands of the Chief Inspector of the division. If the Chief Inspector is satisfied that the man is competent to take charge of a car he is sent back to the Superintendent of Employment for a final examination. The various certificates of competency are filled in on an instructor's blank similar to the one reproduced herewith.

The instructor's blank for a conductor differs from that of a motorman only in the points covered by the instruction of the pit foreman, which are as follows:

Anderson Trolley.—Turning of Base.

How to Replace a Short Circuited or Burned Out Lamp.

Trolley Catcher.

Box on Car for Carrying Cage.

Illuminated Signs.—Handling Same.

Light Switch.—Throwing On and Off of Same.

Heater Switches.—Throwing On and Off of Same.

The examination by the Superintendent of the Employment Department is thorough and searching. It consists of written and oral questions and demonstrations upon a dummy car platform that has been built in the office. The written examination for conductors contains the following questions:

What were your instructions regarding the following?

1. Who has charge of car?
2. Who is responsible for time of car?
3. If driver runs car recklessly?
4. If driver runs car over switches and curves faster than a horse walks?
5. Position when crossing special work, curves, overhead switches, etc.?
6. Civility to passengers?
7. Where should conductors solicit business?
8. What duties devolve upon conductors in connection with stopping-places?
9. What should be reported as an accident?
10. Doors (closing same)?
11. Accidents on or near car?
12. When passengers are disorderly or obnoxious?
13. Passengers refusing to pay fare?
14. Passengers tendering check incorrectly cancelled?
15. Who are allowed to ride free?
16. What part of car are free riders allowed on?
17. Articles found in car?
18. Dogs on car?
19. Smoking on car?
20. Receiving or giving foreign or mutilated money?
21. Passengers blocking platforms or standing on steps?
22. When receiving three bells from driver?
23. When receiving four bells from driver?
24. Number of bells required as signal to driver to stop car instantly?
25. What announcement to make on beginning general collection of fares?
26. When to collect fares?
27. Collection of fares on front platform?
28. Number of fares to be collected before registering?
29. When and where to register?
30. When should the register be turned back to O?
31. When and where to deposit receipts of the day?
32. Free transfers? (Where are passengers required to board car?)
33. Where is badge number to be placed when selling 8-cent check?
34. Crossing steam railroad tracks?
35. Seating passengers?
36. Transferring passengers from disabled car?
37. Parcels, bundles, etc., carried on car?
38. Shifting gates and fenders?
39. Leaving service of company?
40. If your car stopped between stations in the subway?
41. Passengers riding in prohibited places?
42. Lights during a thunderstorm?
43. Signs?
44. Use of tobacco or liquor?
45. Use of heaters?
46. Trolley wire down?
47. Number of bells required as signal to driver to stop car?
48. To start car.
49. To back car?

Motormen are examined orally and are required to illustrate their ideas and knowledge by use of the brake, rheostat and other equipment on the dummy car. The prescribed questions for motormen to answer are as follows:

1. What does one bell from the conductor mean?
2. What is the rule in regard to stopping in front of churches?
3. What does two bells from the conductor mean?
4. What does three bells from the conductor mean?
5. If the emergency signal is repeated what do you do?
6. On receiving the emergency signal would you stop on a street crossing or on a curve?
7. What does four bells from the conductor mean?
8. What is the signal to the conductor to let off the rear brakes?
9. What is the signal to the conductor to set the rear brakes?
10. What is the signal to the conductor when you wish to back the car?

11. When outside the eighth division should you back car without shifting ends?
12. What is the signal for front end passengers?
13. If your car is disabled and being pushed, how do you signal the motorman pushing you?
14. If being pushed or towed, how would you have reverse handle set?
15. What do you do with the brakes when reversing for an emergency stop?
16. Do you have the slack of your brake chain taken up while running?
17. How do you test your car when first taking it?
18. If the brakes or other mechanism of your car are out of order on your return to the car house what would you do?
19. How do you apply the power on a rheostat car?
20. How do you apply the power on a controller car?
21. How do you start the car on a bad rail?
22. How do you use the power when using sand in starting?
23. What part of the rheostat should you use when running?
24. What notches of the controller do you use when running?
25. What damage will result from running on short notches of controller or any part of rheostat except end or loop?
26. What do you do when passing under insulating joints?
27. Should you run with power between series and parallel?
28. How do you use sand for an ordinary stop?
29. How must your brakes be set when using sand?
30. What would be the result if brakes were set so tight as to skid the wheels?
31. If your car is going down hill and the brake chain breaks, what should you do?
32. If the rear brake falls, and you blow a fuse or the trolley leaves the wire, how can you stop your car if equipped with two motors?
33. What precaution should be observed when the rail is slippery?
34. How do you proceed to cross a steam railroad?
35. How do you shut off the power with a rheostat?
36. How do you shut off the power with a controller?
37. Can you get your power off any quicker by throwing the power handle suddenly to "off" position either with a controller or rheostat?
38. During thunderstorms when at the end of the route, should the overhead switch be on or off? Also light switch?
39. When waiting at a steam railroad crossing or draw bridge, what is the rule regarding the overhead switch?
40. When there is water on the track what precaution should be observed?
41. When leaving the car in the house what do you do with the handles?
42. When leaving the car on the street what do you do with the handles?
43. What distance between cars is required by the Board of Aldermen?
44. What space between cars is proper when running?
45. In regard to spacing of cars on the street, what is expected of you?
46. What speeds are allowed on different portions of the road by the ordinances?
47. What is the rule regarding making up time?
48. How fast should you run when passing standing cars or cars just starting?
49. What is the proper speed at special work?
50. What precaution should be observed when you have passengers on your running board?
51. What when passing cars which have running board passengers?
52. Who is in charge of the car?
53. If it becomes necessary to leave the car on the street and there is no inspector at hand what should you do?
54. Should conductor's orders always be obeyed?
55. If he gives you orders contrary to the rules what should you do?
56. What rights have people on the street?
57. What vehicles have the right of way over a car?
58. If a teamster persists in blocking the track after he has been warned what should you do?
59. Would you help eject a person if called on by the conductor?
60. In case of accident, however slight, what is your duty?
61. What should be reported as an accident?
62. Should you ever leave a stopping place without giving all those who wish to ride an opportunity to board your car except disorderly or intoxicated persons?
63. In approaching a stopping place or street what is your duty?
64. What should you do in order to save power?
65. Should you solicit business at all stopping places by calling clearly the destination of your car?
66. Where should the rear platform be when the car is stopped to take on or let off passengers?
67. Are you allowed to talk with any one while running your car?
68. What are the rules regarding the use of liquor?
69. What use of liquor do you make if any?
70. What is the rule regarding the use of tobacco?
71. What do you do with the brakes just before the car comes to a full stop?
72. On approaching a switch which is to be turned what should you do?
73. If the trolley leaves the wire what should you do?
74. If the power handle sticks so that you cannot throw it to "off" position, what do you do?
75. If your car is on the street disabled and you cannot start it what should you do?
76. If you blow a fuse what do you do?
77. If the cable on the rheostat should break what should you do?
78. If there is dirt or sand on the rail so as to prevent a good contact what should you do?
79. If the power leaves the wire what should you do?
80. If obliged to start the car in the absence of the conductor what should you do?
81. What constitutes "absence of the conductor" from the car?
82. When shifting ends are you allowed to pass through the car?
83. Would you pass another car with a person standing between cars?
84. When inward bound at public garden entrance to subway, what do you wait for before starting from the top of grade?
85. At the Pleasant St. entrance what do you wait for?
86. In the subway, except at stations, what is the nearest you are allowed to approach the car ahead?
87. What is the rule in regard to the use of sand in the subway?

[The blank on which these questions are printed has two columns headed, respectively, "Right" and "Wrong" for the convenience of the examiner in checking the answers.—Ed.]

If the Superintendent of Employment is satisfied with the showing of the candidate he is given a provisional appointment upon probation and is tested in actual service for sixty days.

Power House of the Berkshire Street Railway Co., Pittsfield, Mass.

On August 21st last the Lenox and Lee division of the Berkshire Street Ry. was placed in operation on regular schedule. This adds another link to the Berkshire Street Railway system which it is intended will ultimately form a continuous line from Cheshire and Berkshire, south through Pittsfield, Lenox, Lee, Stockbridge, Housatonic, Great Barrington, and Sheffield, to the Connecticut state line. The line is now running from Cheshire to Lee. At Cheshire connection is made with the Hoosac Valley Street Ry. running north through Adams, North Adams and Williamstown, Mass.

The plans of the Berkshire Street Ry. were fully described in the "Review" for Feb. 15, 1902, page 65, and at that time complete descriptions were given of the roadbed, overhead construction including high tension distributing line, car house, rolling stock and method of generating and distributing power. The power-house itself, however, had not been completed and the following description

The power house is a brick structure with engine room 67x107 ft. and boiler room 42x95 ft. The two rooms are separated by a heavy brick wall. The engine room floor is 8 ft. 8 in. above the level of the boiler room floor and below the engine room is a basement, the floor of which is 12 ft. below that of the engine room. Adjoining the boiler room this basement floor is depressed 5 ft. 4 in. below the level of the boiler room floor, forming a condenser pit wherein are located the condensers and steam and water piping, also the primary heaters, thereby leaving the engine room unobstructed in this respect.

All parts of the building below the floor level, including the engine foundations, are formed of concrete, made of best Portland cement, mixed by machinery on the grounds, in the proportion of 1-3-6. The concrete was laid during the winter months, and has been found to give more satisfactory results than brick.



ENGINES AND GENERATORS, BERKSHIRE STREET RAILWAY POWER HOUSE.

of the generating apparatus and power plant will be read with interest.

As outlined in the article in the "Review" referred to, the power scheme includes a central generating station at Pittsfield with a sub-station in Lee, and one in Housatonic, distant respectively 13 miles and 23 miles from the main station. Three-phase alternating current is generated at the main station at 13,300 volts and transmitted at this voltage directly to the transmission line without the use of step up transformers. From the line the current passes to the sub-stations and is there transformed to 380-volt alternating current, and converted to 600-volt direct current, passing from the converter to the trolley wire. For feeding the district adjacent to the main power house there are two 300-kw. rotary converters located at this station with the necessary step down transformers. At each of the two sub-stations there are two 250-kw. rotary converters with their transformers. One of the two generating units, one converter at the main power house and one converter at each of the sub-stations are sufficient to take care of the average load leaving the other set of apparatus at reserve for emergencies.

The station is on the main line of the Boston & Albany R. R. about two miles from the postoffice in Pittsfield. A nearby stream furnishes feed and condensing water.

Generating Units.

The generating units comprise two 750-kw. triphase revolving field Westinghouse alternators, each driven by a 1,200-h. p. horizontal cross compound condensing direct connected Rice & Sargent engine, built by the Providence Engineering Works, of Providence, R. I.

The generators, rated at 750 kw., are designed to run at 94 r. p. m., giving 32.6 amperes per phase at 13,300 volts and 25 cycles per second. The stationary armature is thoroughly protected and the design of the machine is such that an employe working around the unit could by no possible mishap come in contact with any of the high potential parts and would have to deliberately place himself in jeopardy to obtain a shock. Each alternator is separately excited by its own exciter set, consisting of a 20-kw. Westinghouse machine (e. m. f. 125, amperes 160) driven by a small Westinghouse steam

engine. At night when the main engines are shut down these small exciter units are used for lighting the station and car house.

The engines follow in the main the general design of the Rice & Sargent standards. The general dimensions are as follows: Diameter of cylinders, 22 and 44 in.; stroke of piston, 48 in.; r. p. m. 64; diameter of middle portion of shaft, 21 in.; main shaft

easy; the valves can be moved without universal joints; and examination and repair can be readily effected.

The valve gear is the Rice & Sargent patented rotary four-valve type, with independent eccentrics for the steam and exhaust valves. The point of cut-off is controlled by the governor from 0 to $\frac{3}{4}$ stroke.

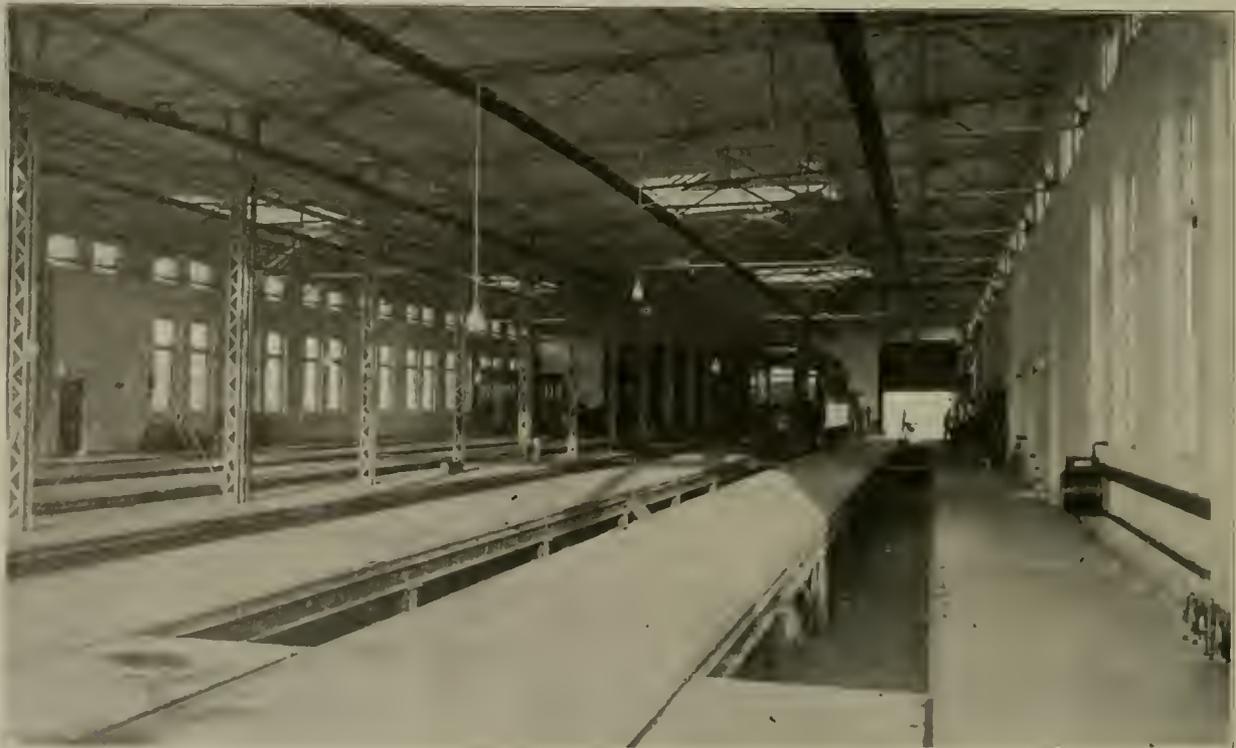


CAR HOUSE—BERKSHIRE STREET RAILWAY.

journals, 18x32 in. The rating at 150 lb. steam and $\frac{1}{4}$ cut-off is 1,120 h. p.; at $\frac{6}{10}$ cut-off is 2,150 i. h. p. The total shipping weight of each engine is 225,000 lb.

As is usual in the Rice & Sargent design the cylinders are made of close grained cast iron, as hard as can be worked, with faced heads and pistons, and water relief valves at each end. They are made to safely withstand a working pressure of 150 lb. after having

The governor is the builder's improved patented inertia governor, guaranteed to so regulate that the speed will not vary more than 1 per cent from no load to full load, and that the instantaneous variation under any condition of loading will not exceed 2 per cent. The governor is free from vibration and is in perfect balance at all speeds. A special stop motion is provided to immediately stop admission of steam to the cylinder, if the governor becomes disabled.



INTERIOR OF CAR HOUSE—BERKSHIRE STREET RAILWAY.

two ordinary reborings. The exhaust valves are located and shaped according to this company's patented design, the steam passages being formed in the valves themselves instead of in the cylinder. For this arrangement the builders claim these advantages: The clearance space is reduced to minimum; the valves wear and remain tight, even after long use; the movements are short and

Each governor has the same characteristic and there is no pumping or hunting the load. A variable check valve arrangement is located in the dash pot whereby the governor action may be dampened to any desired point for successful operation of alternating dynamos in parallel on railway loads. The governor has control of both cylinders, and low pressure gear is under control of hand adjust-

ment while engine is in operation, so that the relation of cut-off in one cylinder to the other may be changed to suit the load.

The balance fly wheel is 18 ft. in diameter and weighs 50,000 lb. The wheel is made in halves with oval arms. The rim is



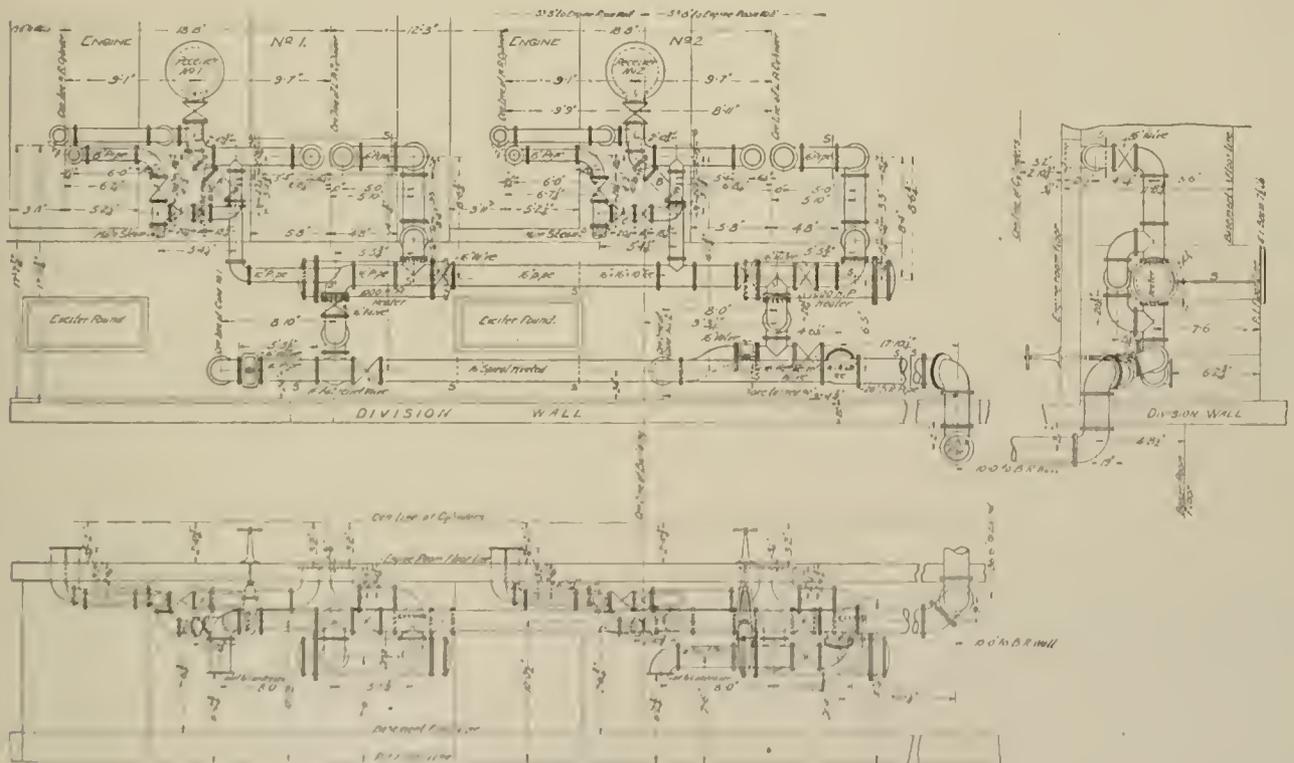
POWER HOUSE—BERKSHIRE STREET RAILWAY.



THE BOILER ROOM.

turned as far as the arms will allow and the rim joints are made by steel arrow head keepers shrunk in flush with the rim. The hub bolts are of Norway iron turned and driven into reamed holes. The builders guarantee that with the 50,000-lb. wheel, the engine

The receiver is of the reheating type with a capacity at least four times that of the high pressure cylinder. The reheating coils are sufficient to superheat the incoming steam, so there is no appreciable drop to the low pressure cylinder. There is a 3-in. pop



MAIN EXHAUST PIPING, PLAN AND ELEVATION.

will, under a load not greater than 1,400 h. p. give a maximum variation in angular position in one revolution not exceeding .185 of a degree, figured from the point of minimum deviation on the other; the e being the requirements of the electric company.

safety valve on the receiver, set for 40 lb. The receiver is tapped for drips from both shell and reheating pipes.

Each cylinder is furnished with mechanical cylinder lubricators with hand oil pump. A centrifugal crank pin oiler is furnished

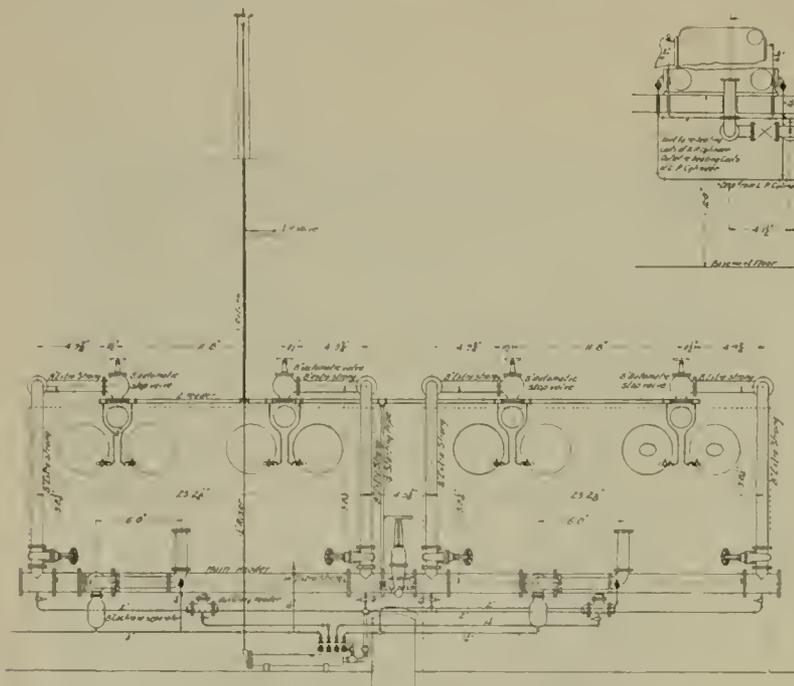
for each crank pin; a wiper oiler for cross head pin and oil boats for the eccentrics; also a full set of nickel-plated, glass, sight-feed flushing oil cups of approved make, for all parts requiring them. The main pillow block is fitted with chain continuous oiling arrangements in addition to a pressure oil system.

Steam Equipment and Piping.

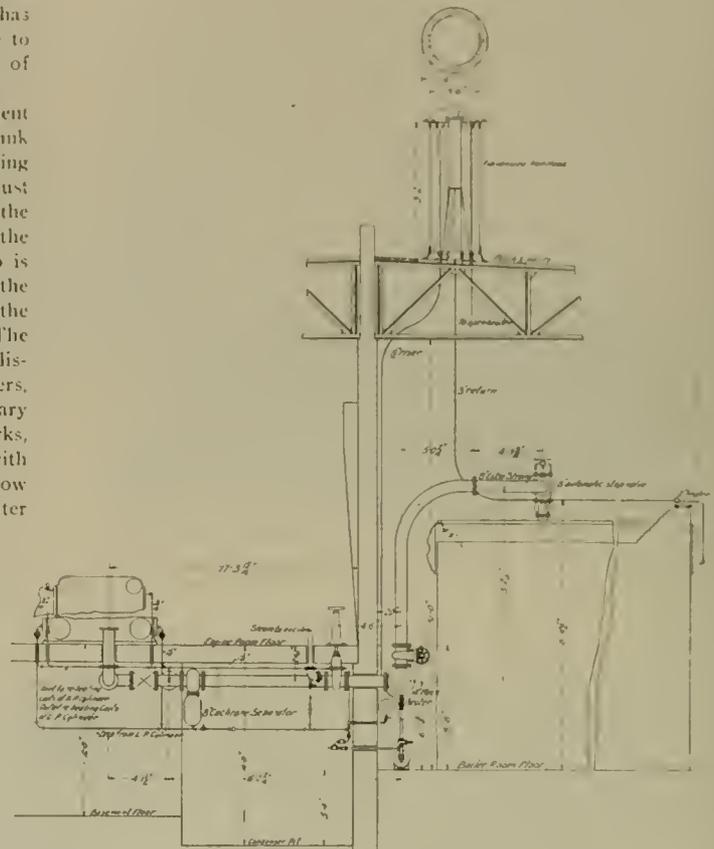
The boiler room contains four 380 h. p. water tube boilers built by the Aultman-Taylor Machinery Co., of Mansfield, O., set in two batteries. Each boiler has 3,930 sq. ft. of heating surface arranged in 4-in. tubes, in 16 sections, each 12 tubes high, and has 68 sq. ft. of grate surface. Steam is carried at 150 lb. pressure to the square inch. Each boiler is rated to evaporate 11,800 lb. of water per hour.

For supplying water each condenser has a 10-in. independent cast iron suction pipe leading from a cold well 10 ft. deep, sunk in the bed of a nearby stream. There is a 6 in. suction pipe leading to the boiler feed pumps in the boiler room. The hot well is just outside the building, the discharge pipes to the well from the condensers being 16-in. in diameter, or 2½ times the area of the injection pipe. The connection from the well to the feed pump is 6 in. in diameter. The intake pipes also have connection with the city water mains thus giving three sources of water supply, the cold well in the stream, the hot well and the city supply. The water is drawn by a Warren duplex pump, 6x6x6 in., which discharges it through a 4-in. wrought iron line to the primary heaters, and from them in a brass pipe, to the 2,000-h. p. Cochrane auxiliary feed water heater furnished by the Harrison Safety Boiler Works, of Philadelphia. The feed water pumps are Warren make, with cylinders 10x6x12 in. The design is such that the small or low pressure pump can also discharge directly into the Cochrane heater

The steam piping system includes two steam headers, one 14 in. in diameter for the main engines and one for the auxiliary apparatus. From the cross connection between the two 42 in. drums on each Euler leads an 8 in. connection starting from an automatic stop and check valve, and bending horizontally, and then vertically downward to the header where there is a gate valve about 8 ft. above the floor level, controlling the boiler supply pipe. The header is about 6 ft. above the floor. Steam is conveyed to each engine



END ELEVATION, MAIN STEAM PIPING.



SIDE ELEVATION, MAIN STEAM PIPING.

through an 8-in. connection leading horizontally from the header to a point beneath the engine room floor directly under the engine cylinder. The connection then turns upward through the floor to the cylinder, first leading into and through a Cochrane separator. The arrangement is such that steam can be fed to both engine cylinders or to either of them. In the branch leading to the low pressure cylinder is a Kieley reducing valve by means of which the mean effective pressure in the low pressure cylinder can be regulated throughout a considerable range.

The arrangement of drip lines is novel. The drip is led to a header located in the condenser pit referred to and low enough to receive the water by gravity. The water is drawn from the Holly header by a forcing tee which has direct connection with the main steam header. A 1½-in. riser carries the steam and entrained water to the condenser of the system, which is located on the roof of the boiler house, 37 ft. above the boiler room floor. In addition to the condensation of steam taking place in this condenser by reason of its exposed position, a pipe fitted with a relief valve leads from the top of it to the auxiliary feed-water heater. A 3-in. return pipe carries the water to a 2-in. header extending across the front of the boilers for the return to the boilers of the water of condensation from the high-pressure steam lines.

This adaptation of the Holly system was installed by Westinghouse, Church, Kerr & Co.

In the layout as designed for the exhaust piping the high pressure cylinder exhausts into a receiver, or when the low pressure cylinder is out of commission, into the main exhaust header. This header is 16 in. in diameter and toward each end feeds through a primary

and the boiler-feed pumps can also receive the water from the hot and cold wells and pump either directly into the boilers or through the primary heaters, and thence into the boilers. The open heater receives the steam from the exciter units and the steam pumps, and also the condensation from the heating system for the building and the drips from the engine receivers, each of the receivers being provided with a trap for the purpose. The auxiliary exhaust is cross-connected with the main exhaust in the boiler room, with a valve in the cross-connection so that when desired the main exhaust riser can be used to carry off the exhaust from the auxiliary plant or the exhaust from the main engines may be utilized in part in the auxiliary or secondary heater. The boiler feed-pumps can be controlled by means of an automatic valve inserted in a live-steam supply to them, the valve being actuated by the level of water in the heater.

feed water heater. It is arranged with valves so that if necessary the exhaust into one end can pass through the exhaust outlets corresponding to the other unit. The feed water heaters are 1,000-b. p. Goubert horizontal type. Just beyond the heaters are the vertical twin jet condensers, which were built by the Warren Steam Pump Co., of Warren, Mass. At this point is the relief valve for service when running non-condensing.

The auxiliary feed water heater together with the feed and circulating pump are located in the boiler room. The auxiliary header is just below the main header near the fire wall separating the boiler and engine rooms. The connection from each boiler is fitted with an automatic valve at the boiler and each battery is controlled by a gate valve immediately above the header. The connections to the exciter units, steam pumps and other auxiliaries are taken from the top.

All the steam piping is extra strong, with Chapman valves and Crane fittings.

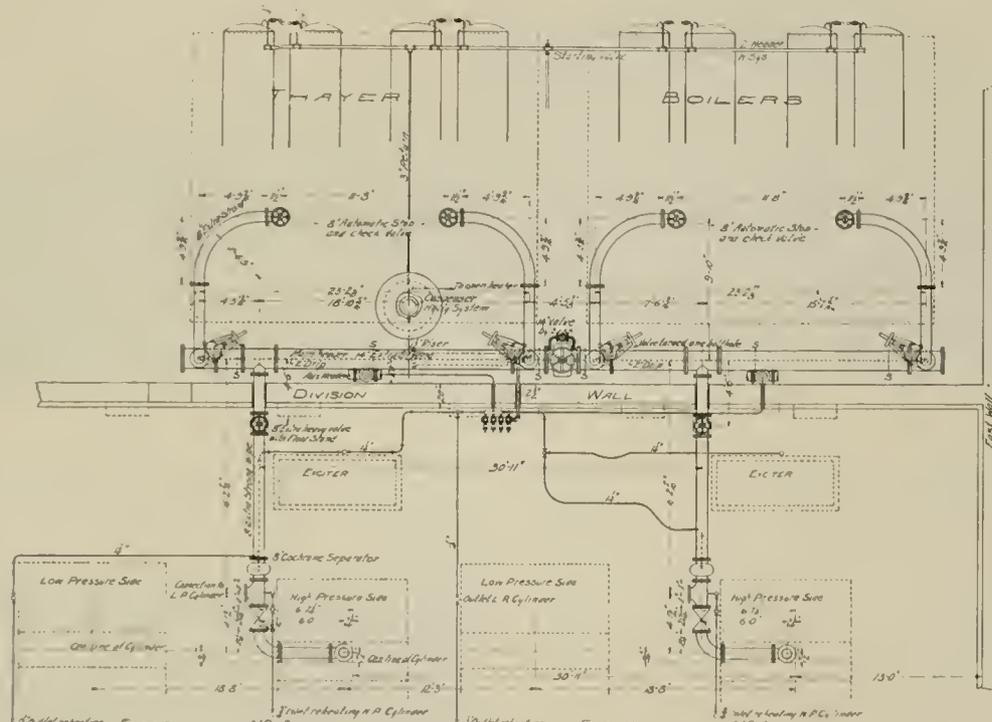
The entire plant is heated by steam and connections are provided for feeding live steam into all the conductors in the event of pipes becoming frozen in winter.

A Westinghouse air-compressor furnishes compressed air for

ALLEGED ACCIDENT ON LONDON UNITED TRAMWAYS.

October 12th, a young woman who was crossing the Uxbridge road at Shepherd's Bush, through which the lines of the London United Tramways run, was seen to fall in the road, where she shortly expired. The newspapers published the rumor that the young woman had been practically electrocuted by the breaking of one of the guard wires of the electric tramways. In the coroner's inquest the fact was brought out that her death resulted purely from heart disease and that the breaking of the wire of the tramways had nothing to do with the case, the break occurring some hundred yards from the position occupied by the woman. The post-mortem examination disclosed that the young woman had suffered very much from heart disease and there was no sign of her having been struck or burned by an electric wire.

Mr. James Clifton Robinson, managing director and engineer of the company, also testified that a guard wire which had fallen and crossed the trolley wire had short circuited the system and this had blown out the fuse, so that the current was entirely cut off from this



PLAN OF MAIN STEAM PIPING.

cleaning purposes and also for operating the oiling system, the oil storage tanks having been located in the basement.

Coal is brought to the rear wall of the power house on elevated tracks and is dumped in front of a door leading to the boiler room. For carrying it to the furnace doors, specially constructed side-dumping hand cars are provided, these cars running on a system of narrow gage tracks or guides let into the boiler room floor. Each car has a capacity for 2,000 lb. of coal. Cars are also provided for removing ashes. Just before entering the boiler room the cars filled with coal pass over a platform scale and are weighed and recorded. This coal handling tramway was installed complete by the Hoher Platt Co., of New York City.

The stack adjoins the power house and was erected by the Alphon Crotodis Chimney Construction Co., of New York City. The stack is 175 ft. 8 in. high and 8 ft. in diameter at the top. The foundation upon which it rests is entirely of concrete, the foundation bed going down about 10 ft. The weight is distributed is about 1 1/4 ton per sq. ft. The settling of the foundation has been carefully watched, but it is now determined that it has been absolutely uniform amounting to 1 1/2 in. No settlement has occurred in the last 6 months.

The station was designed and erected under the supervision of Charles K. Stearns, of Boston.

section and all of the wires were perfectly harmless. After hearing a large number of witnesses the jury returned the verdict of "death from natural causes."

ALLENTOWN (PA.) & READING TRACTION CO.

The new electric line connecting Allentown and Reading was formally opened October 16th by an inspection trip between Reading and Kutztown. About one hundred invited guests participated in the trip. At Blandon the storage battery plant was inspected and a short stop was made at Kutztown. The party returned to Reading and enjoyed a banquet presided over by President G. H. Gerber of the Traction company.

One of the cars of the Lake Shore Electric Railway Co. has a record of 69 miles an hour. This car is equipped with four G. E. 60 motors and is in regular service between Toledo and Cleveland.

The first through car on the electric line between Mansfield, O., and Crestline was run October 20th. An hourly service has been established.

Moving Small Fruits by Electric Railway.

The International Railway Co., of Buffalo, was one of the first companies in the United States to recognize and demonstrate the practicality of utilizing electric railway routes for marketing perishable farm products. The Niagara region, served by the company's international lines, is widely famous for its agricultural and horti-

about route, and at least one transfer of shipments from car to car. The electric express fruit service was instituted about August 20th, when the earlier varieties of peaches were ready for the market, and the service at once received the favorable indorsement of the fruit growers and commission merchants. Not only did the



TRANSFERRING FREIGHT BY ELECTRIC LOCOMOTIVE AT BUFFALO.

cultural wealth, and by careful planning and management, the larger portion of the output of the farms in this section intended for the Buffalo and nearby markets, is now handled in the express cars of the International Railway. This past season, Mr. T. E. Mitten, general manager of the International company, has caused particular attention to be given to the matter of handling small fruits, especially peaches, and it is a conservative statement to say that practically the entire peach yield of the Niagara district that has been marketed in Buffalo this fall, has been carried over the

electric railway company demonstrate its ability to place the fruit in Buffalo at an earlier hour in the day than formerly, but it also became evident that fruits carried in the electric cars were re-



FRUIT TRAIN DRAWN BY MOTOR CAR.

Lockport branch of the International Railway. This output has amounted to between 150,000 and 200,000 baskets of peaches.

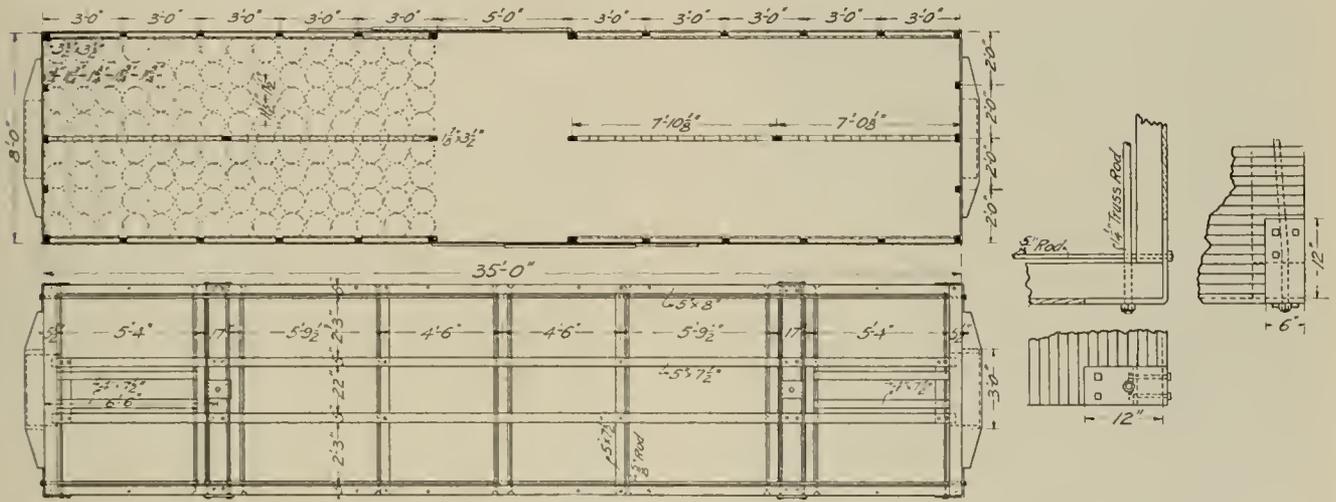
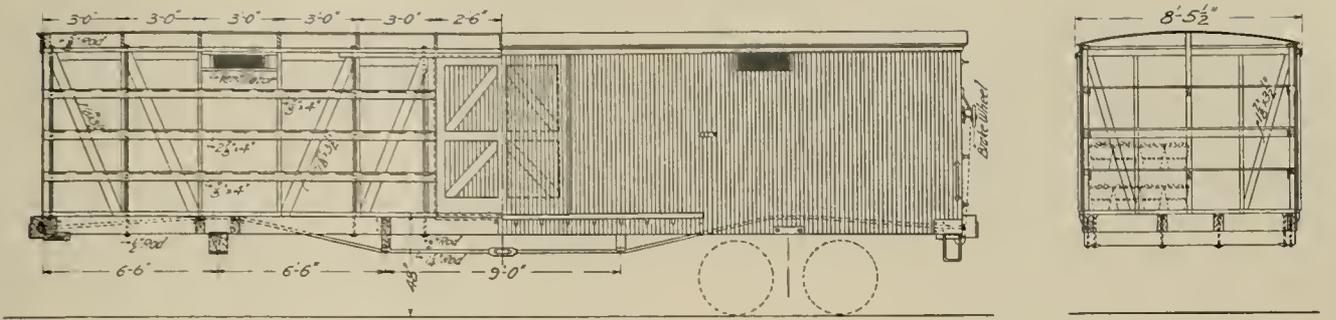
Previous to the inauguration of the fruit car traffic by this company, the fruit growers shipping to Buffalo were dependent on the old-line express companies' service, necessitating a round-



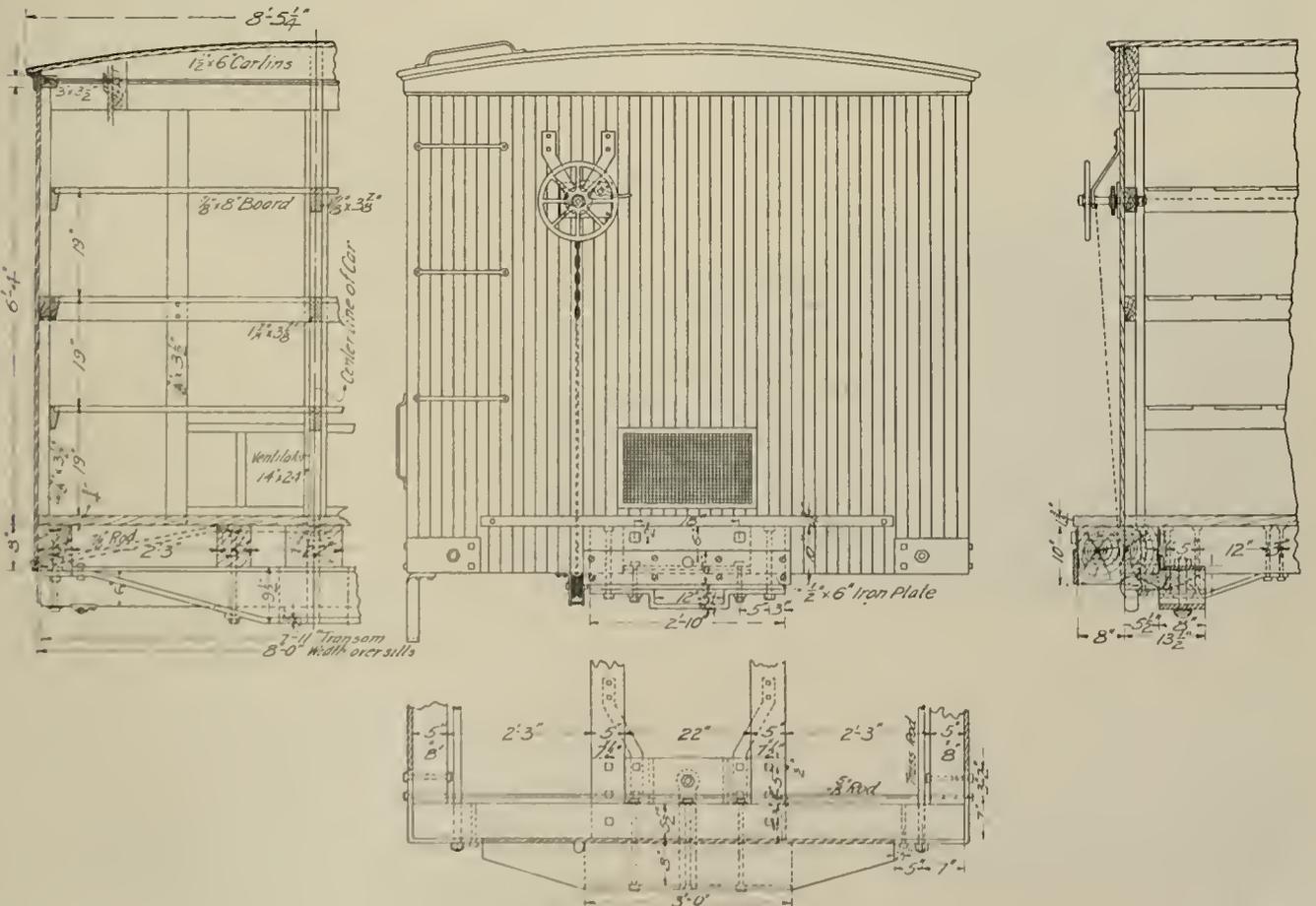
INTERIOR OF CAR SHOWING PEACH BASKETS AND MOVABLE SHELVING.

ceived at the markets in such excellent condition as to bring better prices than if shipped by other means where rough handling caused much damage and injury.

In preparing for the fruit traffic of the present season, the company constructed six freight cars of the pattern and dimen-

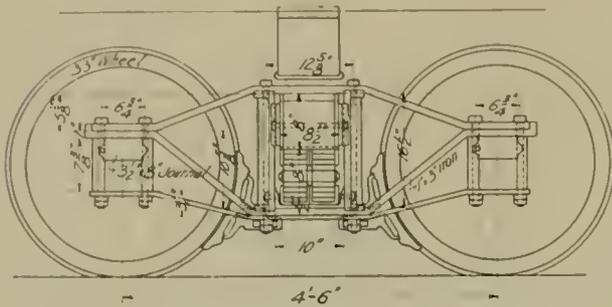


PLAN, ELEVATION AND SECTION OF FRUIT CAR FRAMING.



END ELEVATION OF FRUIT CAR.

sions indicated by accompanying engravings. The fruit car as here shown follows standard steam railroad box car construction with ample provisions for ventilation. The distinctive feature in the design is the interior arrangement of adjustable shelving, suitable for the storage of baskets filled with peaches. The details of the shelf will be understood by reference to the working drawings and reproductions from photographs shown herewith. After the peach season has closed the interior racks can be removed and the cars used for the transportation of regular freight and express matter. A fruit car 35 ft. long with this arrangement of shelving



TRUCK FOR FRUIT CAR.

will accommodate 1,000 baskets of fruit with absolutely no danger of injury to the contents, without unnecessary waste of space, and in a manner to insure perfect ventilation. It will be understood that in loading a car with peach baskets the shelving is built up as the loading progresses, thus facilitating to the utmost the work of handling the fruit. The fruit cars are designed to be handled in trains as trailers, are equipped with Christensen automatic air brakes, and are mounted on a special home-made truck. All fruit cars in addition to having the regular draw bars are equipped with Gould couplers so they can be made up into trains with either steam freight cars or electric cars. One of the engravings shows a train of five fruit cars attached to a motor car equipped with four G. E. 57 motors.

During the fruit handling season empty fruit cars are distributed every afternoon along the road between Olcott Beach and Buffalo. The fruit growers deliver their shipments into these



FRUIT CAR USED ON BUFFALO LINES.

cars, and obtain shipping receipt, the consignment being way-billed by a billing clerk who accompanies the cars until all shipments are properly way-billed. Late in the evening the motor car starts from Olcott, the northern terminus on Lake Ontario, and picks up the fruit cars at the various stations along the line. When complete the train at once starts for Buffalo, where the cars are unloaded in the city market, in close proximity to the commission houses, being delivered to the consignees before 4 o'clock in the morning, and in plenty of time for the opening of the business day.

The company charges for this service regular express tariff rates of 40 cents per hundred pounds. The ordinary peach basket filled with peaches weighs approximately 22 lb., and five baskets are allowed to the hundred pounds, making the charge 8 cents a basket for transporting the fruit from any point on the Lockport line to the Buffalo market. The haul varies from 30 to 40 miles. The fruit service of the International Railway Co. has required the constant use throughout the fruit season of from five to eight fruit cars daily, and the business for the season is stated by the management to have been entirely profitable and satisfactory.

As is well known, the International Railway Co. is doing a large car transfer business with the aid of electric locomotives, which have been fully described in previous issues of the "Review." One of the views herewith shows the proportions to which this branch of the business has grown.

CAR WASHING VERSUS CAR PAINTING.

It is natural in most cases for men who seek to gain the highest eminence in their chosen occupations, after accomplishing their work in a most commendable manner, to suddenly lose this laudable interest, which they have endeavored to maintain regardless of the many discouraging circumstances which arise in the course of the every-day routine of their work, when it becomes evident that with all their efforts to attain the highest degree of perfection they must see their work reduced to untimely ruin under circumstances over which they have absolutely no control.

Would any just man condemn the mural artist who, anticipating the destruction of his paintings by the gross carelessness of some people whose duties were to clean the walls, should lose that keen interest which is so essential to his success and relapse into indifference which would be reflected in his work?

It is quite safe to say that this indifference is somewhat prevalent among master painters of today, who, after exerting every effort for the satisfactory completion of their work, to the end that a car may be painted and varnished in a workmanlike manner, so that it should last with proper treatment eight or ten years, must feel discouraged when they reflect that in one-quarter of the allotted time of the life of this paint and varnish it will be destroyed by the ruthless hands of car washers, while the painter stands helplessly by, being powerless to act.

Would it not be profitable for those in authority, who advocate the proper maintenance of their cars, to occasionally inspect the methods employed for washing and cleaning them? It is more than likely that in the course of their inspection they would discover many reasons why varnish and paint sometimes give such poor satisfaction. Such inspections might possibly lead to instructions being given whereby certain damaging methods would be abolished. These methods, from the master-painter's point of view, are absolutely unnecessary and are only tolerated through lack of proper care by those in authority, and who, in a certain sense, are responsible for some almost maliciously ignorant practices which are in use.

And yet the fault is not always with the car-washers or the station foremen, whose duties include the supervision of the car washing. The washers might be exceptionally well trained in their work, but the trouble may lie with the management, who from a commendable desire to reduce expenses may refuse to allow the employment of an adequate force to properly accomplish the work. It should not require a barrelful of wisdom to see the fallacy of these arrangements, when the truth is that one man the fallacy of these arrangements, when the truth is that one man added to the car-washing ranks might possibly be the means of reducing the force in the painting department by two or three men, who are paid much higher wages. So it is evident that a manager has an erroneous conception of economy when he fails to take into consideration all of the injurious results that possibly may follow an overzealous desire to consider first costs exclusively.

The same logic may be applied to the reduction of the cleaning force, made possible by the use of washing fluids and all like concoctions, whose combination of ingredients forms, to a degree, a solvent,

which after repeated applications must eventually destroy the varnish which is depended upon to protect the paint, and subsequently the inevitable result must be an increase in the number of men on the repair shop pay roll. The unattractive appearance of the cars when in service should be a reminder that even if it cost a trifle more by reason of the employment of a sufficient number of men to do the work properly, it matters not if the final results justify this expense.

From the fact that the varnish on a car, after being finished, begins to slowly oxidize, it is obvious that all the dirt that is deposited on the car during the first weeks that it is in service, if not removed in a reasonable time, must in this hardening process become firmly attached to the varnish and cannot be removed with the use of water alone. This often tempts the washer to use some preparation that will easily release it, which, in other words, means removing the varnish that is retaining it. After repeated doses of this description, the ultimate durability of the varnish can be determined by the number of times the car is washed.

The washing of cars with a brush attached to a hose, where a continual supply of water is being used in the operation, can be done without injury to the varnish, provided care is exercised by the washer and he uses the brush lightly. If it is used too forcibly the bristles of the brush would have the same effect on the varnish as curled hair, which is often used in the paint shop for removing the gloss of varnish preparatory to applying another coat. This continual supply of water gives the brush an advantage over the sponge which is generally used for car washing, and which is liable to retain some of the grit which is being washed off, thereby causing the grit to act in a similar manner to pumice, when used for "rubbing down" varnish. Taking into consideration the type of workman that is usually employed for car washing, the brush attached to the hose is far preferable to the sponge and bucket method.

There are some very destructive methods employed by car washers. For instance, where white paint is used for window posts and lower panels it becomes very dirty when neglected, and a trick of adding kerosene oil to the water used for washing is sometimes secretly employed. Doubtless this method originated from that of wash-women who use oil in the water to bleach clothes. While it may not have any bad effect on cloth, it is certainly very destructive to varnish. However, this trick can be easily detected on inspecting the sponges in the washroom by the odor of the oil, which fortunately never leaves them.

The practice of hastily rubbing the dust from the body of a car with cotton waste, which is often done, is very damaging to the varnish, and more especially to a newly varnished car. The waste soon becomes filled with grit which transforms it into a most formidable weapon, capable of the complete destruction of the gloss of the varnish.

All the burden of improper cleaning must subsequently fall upon the painting department, and possibly extend to others; for after the paint and varnish is destroyed the wood and iron must be exposed to the elements, which have no respect for either.

If the whole car-washing force could be placed in one department, under the supervision of an inspector whose duties would be to thoroughly inspect the details of the work, much benefit no doubt, would be derived from the care that would be insured by his being continuously in touch with the men. The proposition of placing the washing of cars under the master painter's supervision might possibly be questioned. Yet, admitting that this innovation might be productive of some conflict between the heads of the painting department and the station where the cars are cleaned, still if it could be managed satisfactorily to all interested much benefit could be derived from this venture. Owing to the master painter's entire familiarity with paint and varnish, he would be capable of instructing men in regard to the proper methods to be employed, and the suitability of articles to be used in this important operation.

While it has always been regarded as a matter of inferior importance, the car washing question is one that might open up new avenues of economy if time were devoted to its serious consideration.

Plans of the Brooklyn Rapid Transit Co. for providing through tram between Manhattan and Bay Ridge and Fort Hamilton have been completed and it is announced that work on the extension will be begun during the present month.

HENRY J. DAVIES.

Mr. Henry J. Davies, who was at the Detroit meeting elected president of the Street Railway Accountants' Association, is well deserving of this honor by reason of his part in organizing the association and the active interest taken in it up to the date of his withdrawal from active railway work in 1899, at which time it will be remembered the association paid Mr. Davies the compliment of electing him an honorary member.

Mr. Davies was born near Toronto, Can., July 26, 1850. When he was three years of age his parents removed to Cleveland, O., where he received a grammar-school education, after which he spent



H. J. DAVIES
President Street Railway Accountants' Association.

three years in the study of stenography and law. At the age of 19 he became a court and convention reporter and soon acquired a very large practice. In the fall of 1880 he acted as private secretary for Hon. Tom L. Johnson, and on Jan. 1, 1880, was elected secretary and treasurer of the Brooklyn and the South Side street railroad companies of Cleveland, which Mr. Johnson controlled. When these companies were united with others in 1893 to form the present Cleveland Electric Railway Co., Mr. Davies was appointed assistant secretary and claim adjuster, and later assistant treasurer. He voluntarily left the company in 1899 when Mr. Horace E. Andrews, president, and Mr. John J. Stanley, general manager, retired from the management, and was immediately elected secretary of the National Carbon Co., a position which he still holds. On the retirement of Mr. H. A. Everett and his associates and the re-election of Messrs. Andrews and Stanley, Mr. Davies was elected secretary of the Cleveland Electric Railway Co. He also holds the position of secretary of the Iroquois Portland Cement Co., and is a director of that company, of the Factory Mutual Insurance Co., of Ohio, the Lakewood Savings & Banking Co., and several other corporations. Oct. 27, 1896, Mr. Davies married Miss Helen A. Williams, and they now occupy a home in Lakewood, a beautiful suburb of Cleveland.

The Easton (Pa.) & Nazareth Street Railway Co. and the Easton, Tatamy & Bangor Street Railway Co. have been consolidated and will hereafter be operated as the Northampton Traction Co. They connect the slate and cement districts in the northern part of the county with Easton.

HUDSON VALLEY STRIKE ENDED.

The strike on the line of the Hudson Valley Railway Co., noted in the October 'Review,' terminated November 3d, when the men returned to work. On October 17th representatives of the International Street Car Men's Association and the National Amalgamated Association of Street Railway Employes arrived for the purpose of directing the strike and encouraging the strikers to remain firm. After a conference held on the same date between a committee of strikers and Mr. Colvin, president of the company, the latter stated that the ground had been gone over thoroughly and no formal proposition for adjustment had been made by either side. He further stated that the company was willing to reinstate those employes who had not been implicated in any riotous demonstration and who would apply at once for their former positions, he considering that there were only 20 of that class. He also stated that the company would not discriminate against a man because he might or might not belong to a union. The representatives of the strikers insisted upon an increase in wages and recognition of the union. It was also announced that the control of the road had passed into the hands of Hon. J. W. Herbert, of Helmetta, N. J.; George H. Helme, of New York, and George B. Wilson, of Philadelphia, who, with Mr. Colvin, now own the entire stock of the company. John H. Powers, first vice-president and director, severed his connection with the company and was succeeded by Mr. Herbert.

Under the new management it was thought that a settlement would be reached without recognition of the union. The president was authorized to effect a settlement if possible, but was restricted in two particulars. No contract was to be signed with the union, and the men who left the union during the strike and re-entered the employ were not to be dismissed. It was stated that if the union would incorporate, making it a responsible body, the company would not object to making a contract with it, as under the present conditions a contract with the union could not be enforced. The company was willing to make contracts with the men as individuals.

October 20th a joint committee representing the company and the strikers met and a proposition was made on behalf of the company to submit all difficulties to arbitration. The representatives of the strikers demanded recognition of the union and expressed a willingness to arbitrate all other difficulties. It was finally agreed to submit the matter to arbitration, the arbitrators selected being B. S. Josselyn, general manager, for the company, and James M. Sheehan of the Amalgamated Association, for the union, who were to call in a third person, if necessary, to constitute the board, which was to hear all questions of dispute and present its report at noon of the 22d. Before the report was presented the strikers ignored the agreement to arbitrate and demanded recognition of the union, increased pay, and reinstatement of all striking employes. J. M. Sheehan withdrew from the board and declared that further dealings between the union and the company would have to be done through Mr. Fitzgerald, president of the Amalgamated Association, with whom the company strongly opposed having any relations whatever.

After a meeting of the representatives of the company in New York, October 24th, it was reported that no more cars would be run in Washington, Saratoga, and Warren counties than absolutely demanded by the franchises of the road. As order among the strikers had been well preserved, on the same date six companies of troops were withdrawn, leaving only four companies along the line. On the following day twenty of the non-union employes, whose term of contract had expired, returned to their homes, their places soon being filled by others, and the company operating its schedule at longer intervals.

October 31st a committee of former employes called on Mr. Colvin for an interview, at which he expressed a willingness to consider any proposition submitted by them for settlement. The strike was satisfactorily settled November 2d, by a proposition presented by the strikers. Under the terms of the settlement motormen and conductors in the employ of the company less than two years will receive an increase of one cent, or 17 cents per hour, all others will receive an increase of $\frac{1}{2}$ cent, or 10 cents per hour. The employes agree to withdraw their affiliation with all other labor organizations and form a local union. All former employes, with the exception of those under indictment for inciting riot are to be restored to their former position as far as possible, and in future the company is to employ either union or non-union men as it deems advisable. The work of inspecting cars, as formerly done by the motormen, who re-

ceived extra compensation for this work, will be performed by regular inspectors. The reinstatement of the motorman, whose dismissal on account of an accident at Fort Edward in August, was the primary cause of the strike, was left to Mr. Josselyn, general manager, for settlement.

CONSOLIDATION OF THE INTERURBAN RAILWAYS OF CINCINNATI.

At a meeting of the stockholders of the Rapid Railway Co., the Suburban Traction Co., the Cincinnati & Eastern Electric Railway Co., and the Interurban Terminal Co., whose depot is in course of construction on Sycamore St., a consolidation of these interests was effected. The new company will be known as the Interurban & Terminal Co., with a capitalization of \$2,500,000. Each share held by the stockholders in the various companies merged will be exchanged for a share of the consolidated stock. The capitalization of the old companies was: Rapid Railway Co., \$700,000; Suburban Traction Co., \$600,000; Cincinnati & Eastern Railway Co., \$500,000; Interurban Terminal Co., \$150,000, making a total of \$1,950,000. There had been expended on the new Sycamore St. depot \$55,000, which was taken up by the stockholders. The new company holds in reserve a stock of \$700,000 to be taken up as the money is needed for the completion of extensions and the new depot. Each share of stock issued thus far represents its face value expended in building the properties. The Cincinnati & Eastern Ry. will cost \$150,000 more than was at first anticipated on account of increased length of double track and an increase in rolling stock from 6 to 18 cars.

The combined mileage of the lines of the company is 96 miles, as follows: The Cincinnati & Eastern, which will be in operation early in November between Cincinnati and New Richmond, 28 miles; Suburban, which will be ready next February, to Bethel and Batavia, 32 miles; Rapid Transit, about completed to Mason, a distance of 22 miles, and will be completed to Lebanon by next March, 18 miles. The terminal depot is expected to be finished by January 1st.

It is anticipated that when the roads are all in operation over 300,000 passengers will be carried monthly besides a large amount of express and freight.

The consolidation is made possible by the Chamberlain law recently enacted in Ohio, which provides that when electric railways are not competing and can be operated from one power house a consolidation is permissible.

The officers of the new company are: G. R. Scrugham, president and general manager; Lee H. Brooks, first vice-president; Ellis G. Kinkead, second vice-president and general counsel; John M. Kennedy, treasurer; William E. Hutton, secretary; the officers together with Charles H. Davis, Guy W. Mallon and George H. Worthington, compose the board of directors.

LOUISVILLE STEAM ROAD CONVERTED TO ELECTRICITY.

The Louisville (Ky.) & Nashville Railroad Co. has leased to the River Road Co., which was incorporated September 27th, with a capital of \$350,000, a line of track extending from a central point in the city of Louisville to the village of Prospect, the road lying on the southern banks of the Ohio River and having a length of 12 miles. The line will be converted from a steam road to an interurban electric line with first class equipment in every respect. A half-hour schedule is to be established during the busy parts of the morning and evening and an hourly schedule during the middle of the day. It is expected that extensions will ultimately be made, their extent depending on the success of the present line. The officers of the new company are: Lafon Allen, president; Owen Tyler, first vice-president; Bethel B. Veech, second vice-president; W. N. Cox, secretary and treasurer; Henry A. Bell, William F. Booker and Edmund T. Halsey, directors.

October 16th a runaway coal car on the Jackson St. line of the Seattle (Wash.) Electric Co., struck and instantly killed a pedestrian. The car had broken loose from its train and ran eighteen blocks down grade before leaving the track where it dashed into the sidewalk cutting a telegraph pole in two.

NOTES ON MOTOR AND BOND TESTING.

BY R. W. CONANT.

It has been demonstrated by five or six years of severe service on the modern types of street railway motors, that the final test of their capacity lies in their ability to withstand heavy currents during long periods of time.

Cotton, which is the basis of the insulation of their windings, has but a limited life, when subjected to the long continued baking by the heat generated in the windings, under the ordinary operating conditions of the motors. This heat is produced in every part of the wire carrying the current and is greater the higher its resistance and the more current that is received. The heating is also increased by poor ventilation, conduction and radiation. Once this action starts it is cumulative to a surprising degree. The main facts tending to make this destroying heat action augment itself may be explained as follows: First, any increase in the temperature of the windings increases their resistance and as the current is forced to overcome the greater resistance, heat is generated at a still more rapid rate. The ultimate temperature attained impresses itself on the cotton insulation, scorching it to a brown color, as will a hot flat-iron when held on a piece of cotton cloth. During the next severe period of service of this motor the cotton receives a little more baking and scorching until it is reduced to a brownish or even black powder that crumbles away and allows the wires to come together.

On account of some of the coils in the motor receiving more heat than the others these bake out first and many times all the coils are taken out when one only is defective. As soon as one coil short circuits it weakens and distorts the field causing the motor to take more current and spark badly, thereby increasing the heat and hastening the deterioration of the rest of the winding. When a general short circuiting has taken place, and in some motors before they have reached this point, flashing and bucking occurs which burns the armature and controlling mechanism besides causing great loss of time and waste of power.

If this trouble can be detected at the start by locating, removing and inspecting the defective coil, much time and money may be saved by attending to the betterment of the conditions causing the defect.

Some of the most common causes of these troubles are as follows: Brakes set too tightly causing motors to take greatly increased current; poor judgment of the motorman in handling his controlling mechanism causing overheating by increased current; other coils short circuited in the motor by baking out, defective workmanship in constructing or repairing the coils; leads chafing together inside of motor abrading the insulation allowing the copper wires to come in contact, cutting out a coil, throwing more load onto the others; a sandy rail in which the groove has been allowed to fill up with dirt that binds the wheel flange, causing an enormous increase of power consumption; low voltage on the line caused either by poor bonding or too little feed wire or both.

The effect of low voltage in overheating the motors is not due, as has been supposed by some, to any increase in the strength of the current or a higher amperage necessary to do the work, but on account of the lower speed during the application of the power, the current must be kept on for a much greater portion of the time, allowing less time for coasting, stops and cooling of the motor. This low voltage and consequent overloading of the motors is a very important factor in hastening the baking out of their windings especially where the grades and loads carried are heavy.

One of the common causes of low voltage being poor bonding of the rail joints it will be interesting to discuss methods for obviating this.

Bonds and Rail Joints.

The chief reason for testing rail bonds is to enable the loss in returning the current to be reduced to a minimum, in order that needless waste of fuel may be saved, the corrosion of pipes checked and the voltage and service improved. This is best done by systematic tests made when the bonds are first installed and again six months later or after the frost has been in the ground and thawed out again. The necessity for such testing is very great as it may be noted that there is as much damage done by a good bond poorly installed as by the worst type of bond ever used.

The standard of good bonding is with the joint resistance equal

to about 4 ft. to 6 ft. of the rail itself. A greater resistance should not be allowed as it will rapidly become worse until it is so high that most of the return current is obliged to take some other path with the resulting damage and consequent loss of power. It is apparent what one bad joint will do when it is remembered that it cuts out all the rail between it and the power station, excepting in so far as there is leakage through the earth or it is bridged by cross-bonds. It is also to be noted in this connection that cross-bonds are not any more likely to be properly installed than is the joint bonding.

On a road recently tested by the writer, out of 400 joints 100 had a resistance greater than 90 ft. of rail and 50 were above 270 ft. of rail. In this instance the bonds had been installed only a year and were thought to be in good condition when put in, although they had not been tested. The expense of testing is not great and would be amply repaid by the results obtained.

It is a source of surprise to many to learn of such conditions existing as those mentioned above, but they may be explained as follows: In order for a joint to be properly bonded, there must be a clean metallic contact between the bond terminal and the iron of the rail. Unless the plug is put in tightly moisture will creep in between it and the inside surface of the hole in the rail and the iron rusts causing a high resistance at this point that in many instances is almost equal to a break in the rail. It is in the making of this contact that most bonds fail. It has been held by some that with the class of men usually employed on this work it is impracticable to obtain good bonding of joints and recourse must be had to the use of a supplementary wire.

Judging from measurements taken of the resistance of over 40,000 rail joints the writer believes that by proper testing and care in bonding the use of a copper return wire in parallel with the rail or a supplementary wire may be dispensed with in any ordinary case and that bonding the joints is all that is necessary to make the return as near perfect as is commercially possible.

TENNESSEE INTERURBAN ELECTRIC RY.

The Nashville & Columbia and Nashville & Gallatin Electric Railways have been consolidated under the name of the Tennessee Interurban Electric Ry., and the capital stock increased to \$3,000,000. The line has been surveyed to extend through Nashville as a center, from Gallatin to Mt. Pleasant, Tenn., touching Brentwood, Franklin, Spring Hill and Columbia southward, and Goodlettsville, Edgefield Junction, Hygeia Springs, Ridgetop and Edwards Springs northward. The line will be 119 miles in length and passes through a densely populated country and a magnificent agricultural and stock raising section. The traffic will be passenger, express and freight. An extensive power plant and an elaborate equipment will be required, making it one of the leading lines of the South. A number of manufacturing companies are preparing to locate along the line. The offices of the company are located at Nashville. The incorporators are: C. W. Ruth and Frank Haskell, Pittsburg; J. H. Connor, J. P. Fulcher and John H. McMillin, Nashville; Van Leer Polk, Paris, France; D. D. Spillers, Gallatin, Tenn.; J. M. Dedman and Major W. J. Whitthorne, Columbia, Tenn. The officers are: Frank Haskell, president; C. W. Ruth, vice-president and treasurer; Frank P. Bond, secretary; J. H. Connor, general manager.

ALLEGED FRAUDULENT SCHOOL.

According to press dispatches of recent date four officials of the Correspondence Institute of America, with headquarters at Scranton, Pa., have been arrested on a charge of using the United States mails for fraudulent purposes. This institution, which was organized some two years ago to give instruction in "caricature, newspaper illustrating, advertisement writing, proofreading, book-keeping and stenography," should not be confounded with the International Correspondence Schools, also of Scranton, Pa. There is, of course, no danger of anyone familiar with the work done by the International Correspondence Schools, making such a mistake.

The Peoples Traction Co., of Galesburg, Ill., hauled its first load of express on Saturday, October 18th.

From the Lake Region to the Atlantic Sea Board by Trolley.—II.

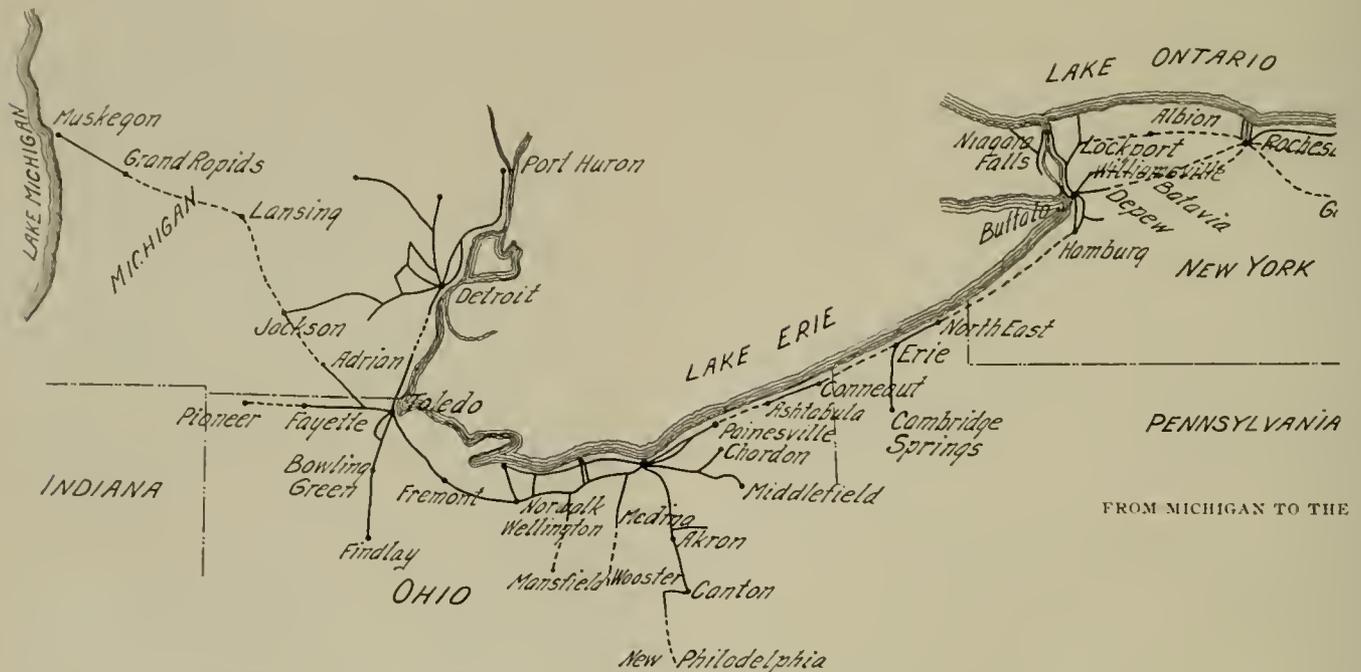
BY R. H. DERRAIL.

At Albany a union ticket office is located for the convenience of the patrons of the different roads. Tickets are also sold to any point along the lines.

The Albany & Hudson Railway & Power Co. will within a short time extend its system to the Massachusetts state line there to connect with the proposed extension of the Berkshire road which is to be built west from Pittsfield. The Troy, Rensselaer & Pittsfield Street Railway Co., which controls the Troy & New England, now operating as far east as Averill, has the right from the Board of Railroad Commissioners to build to the state line, and I am informed by Mr. George F. Murray, of Troy, N. Y., that the line will be constructed next year.

At Pittsfield I find a line running through the heart of the Berkshire and Greylock Hills, from Lee through Pittsfield, Cheshire, Adams, North Adams to Williamstown, and by the first of November it will be extended south from Lee to the Connecticut state line. This system running as it will north and south through the entire state is owned by two companies, the Berkshire, and the Hoosac Valley Street Railways. The Pittsfield Electric Co. operates a local line in the city with an extension to Dalton and another one running north to Cheshire in competition to that of the Berkshire company.

range of mountains. The diversity of scenery along this line can be appreciated by those who have travelled through this section by the Boston & Albany road. This line will start from the line of the Berkshire road at Lee and connect with the Springfield lines at Westfield. Mr. R. D. Gillette is interested in this projected road, and it is his intention to have it constructed in the same thorough manner as the Berkshire road. At Westfield I touch the western end of my journey to Boston by the "Broomstick" train. It is the western end of one of the greatest trolley systems in the world, as far as mileage is concerned. It might be well to state here that the writer is fully satisfied, judging from what he has observed on his trip, that if the street railway managers of the middle states had control of some of the eastern roads, longer runs would be made than are now to be found in eastern territory. There is no reason but that Springfield, with a population of 63,000, and Boston with over a million, only 110 miles apart, should not have through car service similar to that in force between Toledo and Cleveland, a distance of 118 miles. It is now necessary to make eleven changes by the most direct route, or a change of cars every 10 miles. Of course the eastern section of the trip a distance of 50 miles will be well taken care of when the Boston & Worcester air line is put into operation in the near



Who would have imagined a few years ago that to-day a model up-to-date electric road would be penetrating this famous mountainous country full of wild, picturesque scenery and summer homes of many wealthy people? The rails average from 70 to 75 lb. and the cars are of the most modern type, 45 ft. long with a seating capacity for 48 people. Of the 12 cars three have smoking compartments and are geared for a very high speed although their average running schedule is 25 miles an hour including stops. The company has the right to carry freight south of Pittsfield but no attempt has been made to cater to this class of traffic. About a quarter of the 41 miles is over private right of way. At Cheshire connections are made with the cars of the Hoosac Valley for Adams, North Adams and Williamstown, all of which places are well worth visiting.

I was obliged to take the train for Westfield, but the trolley will be available for pleasure travel in two years' time if the plans formulated by the Western Massachusetts Street Railway Co. are carried out. The road will follow the route now traversed by the Boston & Albany Railroad, through many glens hedged in by a

future by James F. Shaw, who has built more long distance inter-urban lines in New England than any other promoter. There is no question but that this road will be a grand success from the start.

Returning to Springfield we find one of the best equipped city and suburban roads in the country, and it is looked upon by all the street railway men in this section as the model road in New England. Cities of every size have cars in operation that have seen better days, but this cannot be said about the Springfield system for its cars are of the very best. The city is noted not only for its fine electric system, but as a trolley center, for one can ride north along the valley of the Connecticut through Holyoke, Northampton, and the quaint old towns of Deerfield and Greenfield, a distance of 43 miles, a most delightful ride through a charming country, while southward, with the exception of two breaks of a few miles each, there is a continuous trolley line to New York City, a distance of over 170 miles. The route from Springfield to Boston has been described so often that I shall not make any attempt to go into detail. It might, however, be of in-

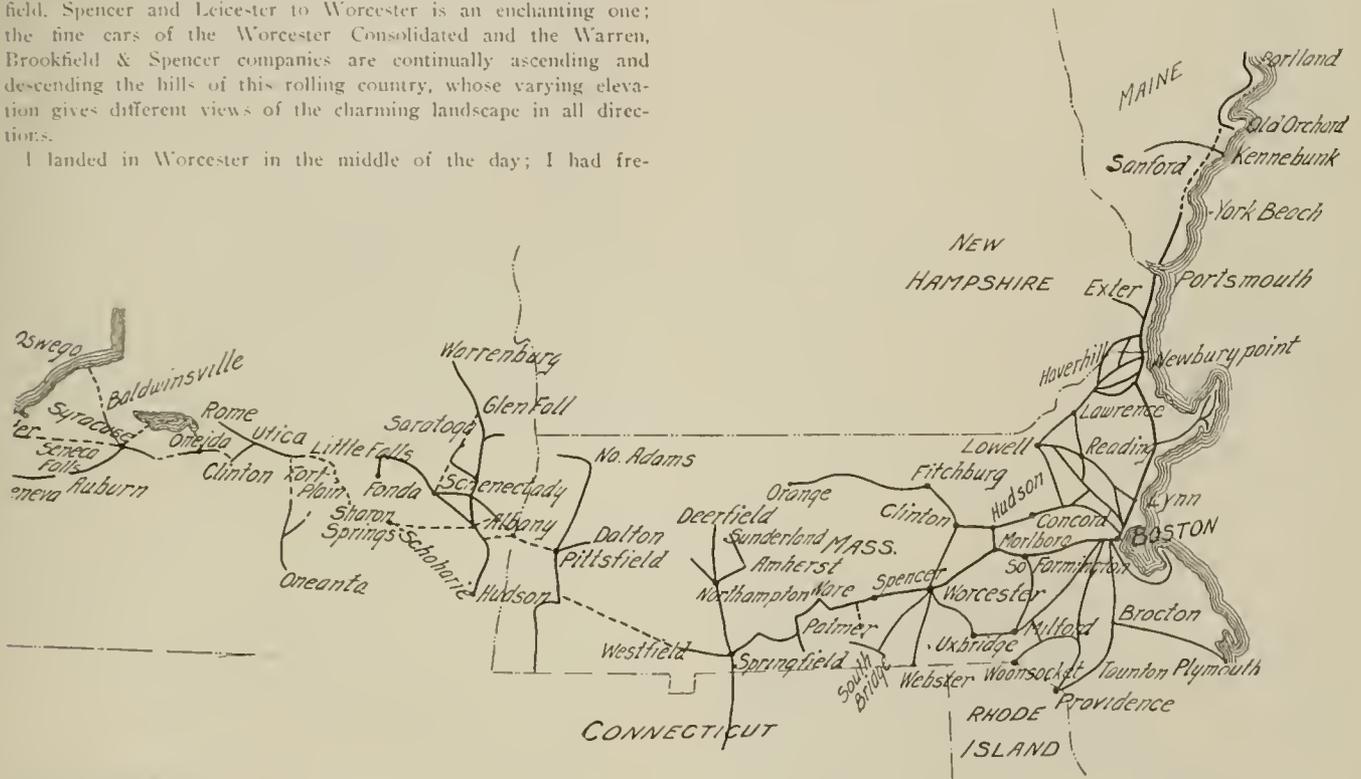
terest to know that with the exception of one break which exists between Athol and Turner's Falls, one can start from Springfield and ride seven hours per day for twenty-four days at an average rate of speed of 14 miles an hour through suburban country and arrive back in the city without going over the same ground twice.

To continue my journey eastward, I took a car of the Springfield & Eastern Street Railway Co., running over the tracks of the Springfield company as far as Ludlow and thence over its own tracks, paralleling the Boston & Albany most of the way. The ride is through a very pretty farming country. The business of the road consists chiefly of through traffic. At Palmer another change is necessary to continue the journey eastward, passing Forest Lake Park, a popular pleasure resort located midway between Palmer and Ware. Between Palmer and West Warren the Boston & Albany Railroad is obliged to make a southerly detour to avoid the hills while the electric line wends towards the north through Ware to Brookfield. The ride from Ware through Brookfield, Spencer and Leicester to Worcester is an enchanting one; the fine cars of the Worcester Consolidated and the Warren, Brookfield & Spencer companies are continually ascending and descending the hills of this rolling country, whose varying elevation gives different views of the charming landscape in all directions.

I landed in Worcester in the middle of the day; I had fre-

comprising some 3,000 miles, and connecting five of the six New England states with the city of Boston. He finds no union ticket office in the city representing this great system, similar to those in vogue in the middle states, nor is it possible for him to obtain any definite information concerning the numerous scenic routes available by trolley from the great city except through a street railway guide which is published independent of the different roads.

I have finished my trip by trolley as far east as Boston by travelling 483 miles over the grand trunk line by trolley and 451 by steam. The actual time consumed in making this trip was 28 hours by electric railways and 17 hours by steam, and the fare by electric railways \$6.70, by steam \$9.71. In addition to this I travelled over the branch lines out of the cities of Detroit, Toledo and other centers, the mileage, rates of fare and running time being enumerated below.



ATLANTIC COAST BY TROLLEY.

quently visited Worcester and ridden over its many city and suburban lines during the past few years, but there seemed to be a change. The rolling stock was much improved, the roadbed had been rebuilt and the cars ran with more smoothness and on seemingly perfect schedule time. Up to this time I had not realized (on account of my year's absence from the city) that this change which was brought about by Mr. R. T. Laffin, general manager of this company since its reorganization two years ago. Mr. Laffin has proved himself one of the most far sighted and practical street railway men in this section of the country.

From Worcester electric lines radiate in all directions, one line running through Clinton to Leominster and Fitchburg, thence westward to Athol and Orange. To the south a line runs through Webster to the Nutmeg state, while connections are made with Providence, Southbridge and other places. There are several desirable lines to Boston, two of which are worthy of mention here, one through Marlboro and South Frammingham passes many historic places and the great water basin of the Metropolitan Water Works. The route is through a picturesque farming country. The other line was taken by the writer from Worcester to Clinton, thence to Hudson, Maynard and Concord and thence over the "Paul Revere Route" through historic Cambridge to the Park St. station of the Boston subway. A flight of stairs brings one to the extreme of the great hole in the ground located on the Common, Boston's breathing place. Imagine the feeling of a western trolley tourist located in the center of a perfect network of electric lines,

	Mileage.	Rate of Fare.	Running Time.
Detroit	306	\$4.25	16 hr. 50 min.
Toledo	279	4.55	14 " 15 "
Cleveland	441	8.20	25 "
Eric (Pa.), Buffalo, Utica and Albany (N. Y.)	432	7.50	22 " 40 "

I found that the rates of fare varied; in some places where the electric lines operate through a territory not served by steam the rates average over 2 cents per mile, but on the whole the general average was about 1 1/2 cents per mile.

In conclusion I predict that this trunk line connecting the Atlantic with the great lake region will be completed and in actual operation in less than five years, at which time one will be able to travel over this line, some 965 miles in length, in less than six days at the average speed the interurban cars are run to day, namely 18 miles an hour.

To connect this trunk line it will be necessary to construct some 43 miles of track in Ohio, 35 miles in Pennsylvania, 325 miles in New York and 74 miles in Massachusetts.

Freight.

While my trip over the various lines was solely for the purpose of studying the country traversed by the trolley from a tourist's standpoint the freight and express business on the interurban lines out of Detroit is carried on to such an extent that I am satisfied that it contributes no small portion of the revenue of the different

suburban lines through the states of Michigan, Ohio, Pennsylvania and New York that I travelled over. This business is developing wonderfully, in fact to such an extent that the steam roads are throwing every obstacle in its way. It was only two years ago that the right of the electric cars to carry freight in the state of Ohio was questioned, but it was decided by the Supreme Court that all interurban lines had the power to transport freight as well as passengers.

While practically all the suburban lines in the states mentioned have the right and do carry light freight and baggage, only a few have gone into the business on so extensive a scale as to have a very complete equipment of standard freight cars. The popularity of this service is due to the fact that the merchant in the outlying town can telephone to the city for his goods and be assured of prompt delivery, or the farmer can have his products landed at the markets of a city without any trouble or inconvenience and at a less cost than by steam.

All the lines out of the city of Detroit do a light freight and express business. The line to Mt. Clements and Port Huron being through a rich agricultural country with many large intervening summer resorts, the carrying of fruit, vegetables, groceries and general merchandise forms a great portion of its business.

On the Jackson line, although two round trips per day are made to Ann Arbor and one to Jackson, the cars are taxed to their utmost. On the Flint division one round trip is made to the terminus of the line and one to Romeo, thus giving Rochester, which is at the junction point of the two lines, the benefit of two round trips per day. On the Pontiac line one round trip is made per day taking in all the intermediate towns and villages. Freight and express is also carried on the line from Detroit to Trenton. Two round trips are made on this line.

Many of the companies through the entire section which I have travelled use their power sub-stations as receiving and distributing stations for freight and express and in addition to this platforms are erected at convenient points for the collection of milk cans. On the line from Monroe to Toledo (Toledo & Monroe Ry.), two round trips are made each day. In Toledo there is a Union Freight Station located in the business section of the city. It is maintained by the different suburban lines and some 20 loaded cars are sent out each day to the outlying towns.

While many of the electric roads have entered into the light freight and express business only four have come under my personal observation which are thoroughly equipped with standard freight cars—the Toledo & Western, the Cleveland & Eastern, The Hudson Valley and the Albany & Hudson.

The former company has some 50 cars comprising flats, boxes and hopper bottom gondolas. Although the road is young it is doing considerable business in the handling of coal, lumber, brick, grain, hay, etc., which is handled entirely at night. These cars are hauled by electric locomotives to and from the freight house located at West Toledo, where connections are made with the Lake Shore and the Michigan Central Railroads. An electric locomotive is practically completed which will be capable of hauling from 12 to 15 loaded cars.

The company intends in the near future to erect elevators at several points along the line for the convenience of the farmers, which will be an innovation in the carrying of freight by electric roads.

The lines of the Toledo & Maumee Valley and the Toledo, Bowling Green & Southern do considerable in the way of carrying light freight and express. The Lake Shore running from Toledo to Cleveland is equal to the other lines in the carrying of light freight and express matter as well as running combination cars. Three round trips are made as far as Fremont two of which run through to Norwalk and in the near future, if they have not already done so, through cars will be run to Cleveland, the same as the passenger cars now are.

Cleveland is the center of what is probably the most extensive light freight and parcel service in the United States. Its location and the network of interurban trolley lines entering the city furnish the very best conditions for the development of traffic of this kind. The Electric Package Co. handles this business on the lines of the Cleveland, Elyria & Wellington, the Cleveland, Painesville and Eastern, the Northern Ohio Traction Co., and the Lake Shore Electric. The Cleveland & Eastern has its own depot and freight agent, but a new union depot will be erected

as the joint property of all companies entering Cleveland. This company does a larger business than any other single company running out of the city. The section served by its lines has no steam railroad facilities and this part of the business has been a success from the start. The company has several flat cars on which it hauls a large quantity of stone outside the city limits.

The cars of the Cleveland, Elyria & Wellington are in some cases combination baggage and passenger and the company does a very large business in the handling of milk. This is also true of the Northern Ohio. The Canton-Akron line expects to do quite a large business in the handling of farm products.

In fact all along the line east the street railways do a general light freight and express business. The Pennsylvania & Ohio Traction Co. operates on its line between Ashtabula and Conneaut several combination baggage and passenger cars.

In the state of New York the lines have the right to carry freight and express and considerable is done on the Lockport division of the International Railway Co. In Rochester the line running out to Sodus Bay (Rochester & Sodus Bay Ry.) makes two round trips per day with freight cars, and every second car operated on this line is a combination car. The lines of the Rochester Railway Co., running north to the beaches do only an express and passenger business.

As you follow further through the state of New York you will find that the Syracuse & Suburban, the Geneva, Waterloo & Seneca Falls, the Fonda, Johnstown & Gloversville, the Schenectady, and the United Traction Co., all do a general light freight and express business. At Albany a Union Express office is maintained by the two latter companies and the Albany & Hudson.

The Hudson Valley Railway Co., with a system of some 100 miles, handles much of the outgoing freight along the upper Hudson in car load lots, consisting chiefly of paper, wood pulp, lumber, machinery, etc. Some of the largest paper mills in the country are located along the Hudson River all of which have spur tracks from the main line of the electric road to their yards.

The Albany & Hudson does a very large business in the handling of heavy freight which is transferred to and from the different steam railroads. This line runs through a section where there are no steam railroads therefore its relations with the steam roads with which it connects are of a friendly nature.

Reaching Massachusetts one loses sight of all this branch of the transportation business on electric roads, although several of the companies have received by special act of the legislature the right to carry, express, baggage and United States mail.

TWIN CITY LINES TO FORT SNELLING.

An agreement has been effected between the Twin City Rapid Transit Co. and the prominent retail merchants of Minneapolis for the extension of the company's electric lines to Fort Snelling. The company has long considered the advisability of such an extension, but was deterred from proceeding in the matter by the indisposition of the War Department to grant a right of way across the government reservation. The Commercial Club of Minneapolis has now taken the initiative and after a canvass of the merchants of the city, a delegation has been appointed to visit Washington and secure authority for a line to the military post, an errand which there is reason to believe will result successfully. If the right of way be granted the merchants will bear a proportion of the expense of constructing the line, and for this purpose stock to the amount of \$8,000 has been subscribed. The construction will be undertaken by the Twin City company and the cars to Fort Snelling will be operated as a part of the latter's extensive system.

FUMIGATING STREET CARS.

In the interest of good health, the Cleveland City Railway Co., of Cleveland, O., is fumigating its cars every night with a composition recommended by the city health officer. The disinfectant used is a powder which is burned in the cars after the doors and windows are closed and is warranted to kill all germs.

The Lexington (Ky.) Railway Co. has agreed to furnish three cars free to school children participating in Arbor Day exercises.

ELECTRICALLY WELDED RAIL JOINTS AND BONDS.

The advent of heavy cars on street railways has brought with it increasing destructiveness to the joints in the track, and the demand for a better bond around the joints to properly care for the greater volume of current necessary for the propulsion of these cars. When the first electric roads were operated little attention



SAND BLAST CAR.

was paid to either of these subjects, but motors partly suspended from the axles of the cars without intervening springs played havoc with the joints. Heavier rails were rolled and splice bars with twelve bolts were provided, but even these in time work loose and long before the full wear of the rail has been realized, the rail ends at the joints are worn out by the continual pounding of the wheels as they pass from one rail to the next. The bonding at the joints also deteriorates and it becomes frequently necessary to rip up the pavement to get at the joints and replace the bonds, or else the power is found to elb lower and lower and the difficulty is sought to be overcome by putting in more generators at the power station or increasing the capacity of the overhead feed wires.

Considerable progress has been made in the last five years in doing away entirely with joints and bonds in all track that is laid in surrounding pavement. In several cities rails have been laid that were unprovided with the usual holes at the ends for the bolted splice bars, and bars electrically welded to the rails at the joints are used. The bars and the rails are thus made integral and the necessity of a copper bond at the joints is done away with.

In the manufacture of a continuous rail it is important that the ends of the abutting rails be in intimate contact, for if there is the slightest opening at the joint the metal in the head of the rail will be forced into it, and this will in time produce a low spot no matter how rigidly the rail ends are held. Another important point is to have the bars used in making the joint of a nearly the same quality of metal as the rail itself as possible, in order to introduce no extra resistance to the passage of the electric current. It is also desirable not to have the joint go below the bottom of the rail, especially in old rails where ties have previously been used under the joints, as it becomes necessary to remove the latter where the welded joint extends below the bottom of the rail. Joints which include these features are made by the track welding department of the Lorain Steel Co., which controls the use of the Thomson electric welding patents for purposes of railway construction in addition to patents on its improved process of electric welding and also on its welded joints and bonds.

In welding joints by the Lorain company's process two rolled steel splice bars are used. These have at the ends on one side projections, or raised portions, which originally form the contact points between the bars and the rail web and confine the welded area to these sections. Welds are made at each end and at the middle of the bar. The middle weld is made first, the bars being thereby heated and elongated before the ends are welded. After the ends have been welded, the shrinkage of the bars in cooling exerts a powerful pull to bring the abutting rails together thus closing the slightest opening, leaving practically no joint at all.

The apparatus for welding is carried on trolley cars illustrated herewith. These cars are provided with special axles enabling the wheels to be set to any gage. A sand blast is used for cleaning the rails and bars at the points where the welds are to be made. Following the sand blast car comes the welding train. This consists of two cars coupled together, the first of which carries the welder hung from a crane at the front of the car. The welder itself consists of an alternating current transformer, for stepping down a current of 300 volts and 650 amperes to one of 7 volts and about 28,000 amperes with which the actual welding is done. Pressure is obtained from an hydraulic pump and communicated to the welds by means of two large forged steel levers. By this means a pressure of 37 tons is developed at the weld. The car behind the welder contains a rotary converter and suitable regulating apparatus for transforming the current taken from the trolley wire to an alternating current of 300 volts. This apparatus has recently been installed and does away with a rotary converter and a booster in two separate cars, which was previously used. By means of this apparatus the primary current to the welding transformer is kept practically constant at 300 volts with a line voltage of from 325 to 600. With a line voltage of 500 about 250 amperes are taken and it requires about 125 kw. to make a weld; as the current is on about two minutes at each weld the power consumed is about 12½ kw. h. per joint. As a continuous process it takes from twelve to fifteen minutes to complete a joint.

Following the welding train comes a surface grinder, by means of which the head of the rail is reduced to a true surface. This tool is not needed on new rail. In welding old rail the receiving



ELECTRIC WELDER.

rail is purposely welded a little higher than the other and the grinder then removes the inequalities leaving the head of the rail a true surface again. This machine was devised especially for the purpose of joint grinding and differs entirely from the common method usually employed. No flexible shaft is used and it is impossible for the operator to allow the emery wheel to drop down into the low places.

To derive the proper benefit from continuous rail in the saving of power, by providing a ground return for the current of least resistance in the rails themselves, it becomes necessary to make special provision where switches and crossings are located in the tracks, and also where the ground cables from the generators at the power house connect with the rails.

The same apparatus for welding joints is also made use of in electrically fastening copper cables to the rails. This is done with



WELDING TRAIN.

copper blocks having on one side a groove to receive the cable; the block and cable are then electrically brazed to the rail web. By this means cable of any diameter is attached to the rails so that the area of contact between the copper and the steel is ample to allow for the difference in conductivity of the two metals. Where welded track abutts special work copper cables are passed underneath from welded rail to welded rail and the ends electrically brazed to the rails. An unbroken metallic return is thus secured having no joints whatever. Worn pieces in special work can thus be renewed without breaking the continuity of the return circuit. The trouble from electrolysis is avoided as the rails are made the path of least resistance and there is but little tendency for the current to seek other paths of return.

The application of electricity to the manufacture of a continuous rail was first introduced by The Johnson Co. in 1893, when little was known regarding the handling of so large a current as was required for welding rails, and experience soon demonstrated the advisability of experimenting before continuing on a commercial scale, and operations were therefore suspended. Continuously during the years of 1895-6-7 experiments were prosecuted until the present form of welded joint was perfected. In the early experiments an erroneous impression was obtained that the electric current affected the structure of the steel, but subsequent experiments



SURFACE GRINDER.

demonstrated that far from affecting the steel detrimentally, no other method of heating leaves the steel so little affected as does the electric current properly applied. Welds of extraordinary toughness are now made which are unexcelled in strength or ductility by any other form of welding. The improved process was first introduced in 1897, and work on a commercial scale has been going on ever since with very gratifying results and giving entire satisfaction. In the last three years the Lorain Steel Co. has

welded in Buffalo, N. Y., alone, over 100 miles of track. During this season contracts have been completed at Rochester, N. Y., and Worcester, Mass., and welding is now being done at Columbus, Ohio, and on the lines of the Boston & Northern Street Railway Co. at Lowell, Mass.

FOND DU LAC & OSHKOSH ELECTRIC RY.

With a view to operating the Fond du Lac & Oshkosh Electric Ry. this fall the construction work has been pushed forward with all possible dispatch. The grading of the entire line was completed last month and 8 miles of the 11 miles necessary to connect the lines of the Fond du Lac street railway and the Winnebago Traction Co. at Oshkosh have been laid.

The Columbia Construction Co., which is building this line, has also completed setting 9 miles of new poles and the work of erecting the span wires and overhead material was commenced early this month. The feeder system has been erected through the city of Fond du Lac from the power house to the end of the Fond du Lac line. The feeders consist of three 500-c. m. and one No. 0000 cables. The current is furnished chiefly from the Fond du Lac power house and for this purpose a 500-kw. Westinghouse direct current generator has been installed. A booster will be used to keep up the pressure on the longest feeders, and power for the north end of the road will be furnished by the Oshkosh power house. The cars for the new line are about ready for shipment. These will be furnished by the St. Louis Car Co.

An arrangement has been made with the Chicago & Northwestern Railway Co. and the Wisconsin Central Railway Co. whereby a subway will be built at North Fond du Lac, through which the electric line will pass under these railroads. The subway will be 32 ft. wide and will be laid with a double track to avoid any possibility of collision between cars. The work on this subway has progressed considerably and the temporary support for the steam railway track are now in place. The excavations for the roadbed and the masonry retaining walls are now under way.

The new line is built over a private right of way 50 ft. in width, of which the company has the fee and the electric railway track parallels the Chicago & Northwestern Ry. for 9 miles north from the subway; the grade is practically the same as that of the steam railroad. The roadbed is laid with 70-lb. rails in 62-ft. lengths. All of the rails and other material are now on the ground and if the weather permits the subway to be completed before winter sets in the road will be put in operation this fall.

The Columbia Construction Co. is also just completing the graveling of the Oshkosh & Omro Electric Ry., which is a branch of the Winnebago Traction Co. running from Oshkosh 10½ miles west to Omro. The line has been in operation for two months and is proving a valuable feeder to the Winnebago company's system.

NEW FRANCHISE AT PORTLAND, ORE.

Ordinances have been introduced in the common council of Portland, Ore., prohibiting the transportation of freight in open cars through certain streets during the hours between 7 a. m. and 7 p. m., except it be for construction purposes, and providing for the payment of an annual license of \$100 for each freight car with motor-power attachment, of \$80 for each car without such attachment and \$20 for each car used for construction purposes.

Another ordinance provides for franchises for the City and Suburban Railway Co. on certain streets. The lines may be single or double track and are to be completed within one year from the date of approval of the ordinance, and during construction no street shall be obstructed for more than two blocks at a time. The company shall establish a 10-minute service between the hours of 6 a. m. and 8 p. m., and a 20-minute service between 8 and 11 p. m., and shall pay a license of \$50 per year for each car.

The New Orleans Railway Co. was among the first to discover that the "Jim Crow" law recently enacted in Louisiana which was supposed to go into effect October 13th, was not really effective in New Orleans until November 3d, at which time the company arranged to have its cars equipped with screens or partitions in compliance with the law.

THE PRIVATE RIGHT OF WAY.

ALTON D. ADAMS.

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Electric motive power was certain to cause the extension of street railways into interurban and interstate lines. This extension is likewise certain to carry electric railways off from country roads and onto the private right of way in at least a large number of cases. Reasons for this change are many and weighty. In cities the value of real estate is relatively great and the damages that must follow the construction of an elevated railway an unknown quantity. Furthermore, passengers prefer to alight directly on city streets. In spite of these facts, the disadvantages of operation in the streets have driven a part of the electric railways to underground and elevated structures in some of the great cities. On most interurban lines conditions are far different. Land is cheap and the cost of a private right of way along the surface moderate. Most of the travel is between cities or town centers, and it is not necessary to deposit passengers at frequent intervals along country roads. The right of way offered by these roads to electric lines is not particularly inviting. Such roads are usually narrow, seldom graded, often crooked, sometimes roundabout, and generally afford a poor foundation for heavy tracks and high-speed cars. Town and county roads have political as well as physical disadvantages when used as the right of way for electric car lines. As long as railways occupy the public highway restrictions are sure to be put on the speed of cars, often rightfully. Such locations make it also possible to lay heavy burdens on electric railways in the form of road building and the removal of snow, whether rightfully or wrongfully. Legislative authority in the regulation of fares is apt to be carried much further over railways that occupy the public streets than over those on private rights of way, as the experiences of steam and electric roads plainly show. In the matter of taxation, also, a line that operates in the streets offers a more shining mark than one which owns its own roadbed. Perhaps the strongest single reason tending to the location of interurban electric railways on private lands is the desire to meet the public demand for rapid transit. Owing to the difficulties outlined, both physical and legal, this demand cannot be satisfactorily met in some cases by railways that follow the highway. Much the most important traffic of interurban electric lines is that between centers of population, even though these centers are only towns and villages. In order to secure a large through business from one town center to another, for which high speed is necessary, electric cars can well afford to miss an occasional lone traveler on the highway. Where electric lines compete with steam roads for through passengers, which is the case between most large towns and cities along their routes, the amount of traffic over each depends to a very large extent on their relative running time.

The general use of highways by interurban lines of electric railway is no doubt based on the idea that the public road offers a cheaper location than a private right of way. This idea is no doubt well founded in many cases, but in many others it is incorrect. Though many electric railways have some portions of their tracks on private right of way, the costs of these portions are usually mixed with the costs of the parts that are on public roads. In some cases, however, the length of track laid on private right of way forms a large part of the total, so that its influence on the average cost per mile may be noted. Several electric railways of Massachusetts have been selected for comparison as to the cost of roadbed and tracks alone. It is obviously unnecessary to consider the cost of electric line construction in this comparison because this cost may be expected to be the same on public roads as on a private right of way. The electric railways here considered are either located entirely on town and county roads, or else have by far the greater part of their length on such roads, though they terminate in cities. This plan is followed to avoid the question of comparative cost between tracks on dirt or gravel roads and those on the paved streets of cities. In each case the length of track given include both main and side tracks. The Shelburn Falls & Colman electric railway has a total of 7.01 miles of track, of which 2.55 miles or 36 per cent, is on private right of way. For the entire length of track the average cost was \$7,324 per mile. Of the 30.27 miles of track owned by the Springfield & Eastern Electric Railway, 6.1 miles or 20 per cent, are on its own right of way. The average cost of the entire track and roadbed was \$11,594 per mile. With a

total of 28.26 miles of track, the Haverhill & Amesbury Electric Railway has 4.5 miles, or 16 per cent, on a private way, and the average cost of the entire line was \$8,410 per mile. The Nantasket Beach Electric Railway, owned by a steam railroad, is located entirely on private right of way and has 18.33 miles of track. Along nearly its entire length this road is equipped with a third rail to conduct the current. The track is well ballasted, in part with broken stone, and the construction is very substantial to support cars that are similar to railway coaches in weight. Owing to the way in which reports of steam railways are made out, the figures for the cost of this Nantasket line include the electrical construction as well as the roadway and tracks. This cost amounted to \$13,638 permile. For comparison with the foregoing costs the following are given for electric railways that have all or nearly all of their tracks located on highways.

Name.	Length of track.	
	Miles.	Cost per mile.
Brockton & Plymouth.....	23.68	\$10,266
South Shore & Boston.....	66.03	10,616
Fitchburg & Leominster.....	28.68	12,079
Worcester & Suburban.....	24.07	15,245
Worcester & Webster.....	15.73	10,077

This list, which covers the costs of merely roadbed and tracks, might be greatly extended with figures not far different from those given. A comparison with the costs of roads which have a large portion of their tracks on private land tends to show that such roads cost no more than those on the public highway. The figure of \$13,638 per mile for the Nantasket road complete with electrical construction would be hard to duplicate with equal depth of ballast, weight of rails, alignment and easy grades, on most highways.

Costs of track and right of way for steam railways offer some interesting data as to the probable costs of electric roads when built on private land. It should be held in mind in connection with steam railways, however, that heavy locomotives and high speeds have made it necessary to give them much more substantial roadbeds than have thus far, with a few exceptions, been constructed for electric railways. Another factor in the figures for steam roads that makes the cost of a private right of way seem larger than it really is, exists in the item of buildings and depots. Available figures for the costs of steam railways include all buildings owned and used in connection with the roads. Evidently freight and passenger depots may form a very material item in the cost of steam railways.

STEAM RAILWAYS.

Name of road.	Miles of Track.	Cost per mile.
Stockbridge & Pittsfield.....	35.97	\$12,794
Chatham	7.84	12,555
Boston & Providence.....	225.56	22,371
Ware River	56.64	19,688
Nashua & Lowell.....	41.81	16,365
Plymouth & Middleboro.....	16.05	19,003
Pittsfield & North Adams.....	25.03	16,026
Holyoke & Westfield.....	24.56	18,822
Milford & Woonsocket.....	18.77	9,237

In each case the miles of track given cover the entire length of main and side tracks. Variations in the cost per mile are to be accounted for largely by the unequal requirements for grading in different sections of the state and by the character of buildings and terminal facilities. The entry of the Boston & Providence Railway into Boston and Providence and the depots there erected must have added a very material item to the average cost per mile of track. It will be noted that in spite of the substantial construction of roadbeds and the erection of depots the average cost of steam railways per mile of track is not much greater than that of electric railways laid on public roads, in a number of instances. The figures presented make it appear probable that in many cases with given conditions as to alignment, grades and ballast, the cost of an electric railway will be less over a private than over a public right of way. As is well known, the T rail, which cannot be used on the highway, is stiffer and wears longer than girder rails of equal weight, such as are generally employed on electric roads.

Appreciation of the advantages of a private right of way is rapidly growing with the managers of electric railways. On Sept. 30, 1897, eighteen electric railways in Massachusetts had small parts of their tracks on private right of way, and the total length of tracks

so located was 32.64 miles. On Sept. 30, 1901, the number of electric railways with parts of their tracks on private rights of way in this state was not less than 51, and the total length of tracks so located was 117.58 miles for this number of roads. These figures do not include any systems that were under construction at the date just named. Of the 51 railways seven had more than five miles of track each on private right of way, as follows:

	Miles.
Boston & Northern	10.52
Worcester Consolidated	9.88
Lowell, Lawrence & Haverhill	8.38
Springfield & Eastern	6.10
Old Colony	5.78
Milford, Attleboro & Woonsocket	5.72
Holyoke	5.14

Besides these electric railways in operation, one of those under construction was building about twenty miles of track on its own right of way.

Other states present a movement of electric tracks to private land similar to that in Massachusetts. Two long electric railways in New Hampshire, for which exact figures are not yet available, are laying large portions of their tracks on their own rights of way. In the state of New York 15 electric railways are located in part on private land, and the combined length of their tracks thus located is 112.43 miles. The greatest length there of track owned by one company on private right of way is that of the Albany & Hudson, 35.1 miles. Electric railway history is being made rapidly, but perhaps in no direction faster than in that of location. In document No. 475 of the Massachusetts House, for 1898, a committee of three eminent gentlemen, appointed by a special act for the purpose, made a report on the relations of street railways to cities and towns. In that report it was said: "This is all the street railway was fifty years ago, when first laid; it is all that it is now—an improved line of omnibuses, running over a special pavement. * * * The analogy throughout is with the omnibus line, and not with the railroad train; with the public thoroughfare, and not with the private right of way." In spite of this report one may travel today across Massachusetts over several routes from north to south, and nearly from east to west, by electric railways laid for long stretches on private rights of way.

A LETTER FROM AUSTRALIA.

Editor "Street Railway Review":

At the present time, while so much is being published favorable to the theory of municipal ownership of street railways, a little news from Australia, where the scheme of public ownership is being tested, may be of more than passing interest.

In May last the Brisbane Tramways Co., Ltd., a private company owning the street railway system in Brisbane, the capital of Queensland, a city of 125,000 population, tendered its employes a banquet as a token of the company's appreciation of their care and faithfulness in handling the immense crowds during the occasions of the visit of the imperial troops and of His Royal Highness, the present Prince of Wales.

Two nights were given up to the festivities and nearly every employe, from the resident officers to the humblest "points-boy," was present. Among the invited guests were the Minister for Railways of the State and the Attorney-General. Each addressed the company, expressing the highest appreciation of the work of the Tramway company in taking over a bankrupt horse-car line and equipping it electrically and of the service rendered the public. Coming from such a source, anything in commendation of private ownership should have considerable weight, particularly as the railways of Queensland are owned by the state, and as there is a great clamor that the state should take over the tramway system as soon as permitted by their franchise.

In the course of his remarks, the Attorney-General said: "There have been persons who have cried out at giving privileges to what they had termed a foreign company; but there could be no two opinions as to the value given in return, and as he had said to a representative of the South Australian government, who recently inquired into the workings of the trams, if they had been under the control of the government they could not have been the success they had been."

Among other things, the Minister for Railways said: "No government could do as well as a good single man. The government did not run the railways of Queensland. The railways were to a large extent run by parliament, which, of course, was composed of representatives of the people. Members of parliament would pass a resolution that a certain thing should be done, and whether that thing was right or wrong, their influence was occasionally strong enough to cause it to be done. Neither the commissioner nor government ran the railways. They were controlled by parliament, and yet people wondered why the railways were not better managed."

The leading newspaper of Brisbane, commenting editorially on the function and the speeches, mentioned the remarks made by the ministers and said: "But were not the ministers right? Consider the position. Start with the consideration that in the nature of the case the government has not before its eyes the imperious necessity of a service paying its way, as a private company has. The first result is that routes are not selected on a business basis; they are selected more or less from party and private influence. We have abundant illustration of that evil in our railways. For the same reason, the service itself would not be aimed at the public requirements; and a thousand reasons other than personal fitness would operate in the choice of servants. The attitude of a private company is: 'We must induce the public to travel; the attitude of the government is, 'There is the provision, the public can use it or not, as it pleases.' Yet another result of the absence, or the ignoring, of the natural economic conditions, is that the government is pressed into paying higher wages than the business warrants. * * * It is certain that had this been a public enterprise, the labor party would have put forward wage demands which took no account of the economic limits of the enterprise itself."

The paper alludes in this connection to the plight of the government of New South Wales, which publicly announces an expected deficit of \$150,000 for the current year on the Sydney street railway, caused by having to reduce the hours of employes from nine to eight—the political pressure being so great that the demand had to be granted even with the knowledge that it might cause such a large deficit.

These are facts presented by men who have seen efforts at public ownership given a fair trial, and they themselves have assisted in the effort, with what degree of satisfaction to themselves their views as here quoted give no uncertain sound.

Will American cities attempt an experiment which is discredited where it has had every opportunity to succeed? C. E. BADGER.

INTERURBAN LINE BECOMES STREET RAILWAY IN CITY.

A decision has been rendered by a trial court in the case of the city of Dayton against the Southern Ohio Traction Co., in which the city claimed that the company was not fulfilling its contract. The court holds that as soon as the railway company's line enters the city it becomes a street railway company and not an interurban line and must, therefore, exercise the functions of a street railway, such as providing reasonable service, stopping at street crossings, selling tickets, announcing names of streets. The company is also required to furnish a continuous local street car service. The effect of the decision, if sustained by the higher courts, will be to require the Southern Ohio Traction Co. to give local service all the year around in the city of Dayton. The company has heretofore operated one local car during the summer months, but discontinued it in the winter because of the small patronage.

MOTORMAN RESPONSIBLE FOR ACCIDENT AT PITTSFIELD.

In a report upon the accident in which President Roosevelt's body guard, William Craig, was killed and the President and Secretary Cortelyou were injured at Pittsfield, Mass., last September, the board of railroad commissioners finds that the responsibility for the accident rests with the motorman of the car which ran into the president's carriage.

The Blue Grass Traction Co. expects to have its line running between Lexington and Paris, Ky., next March.

The Proper Type of Steam Motor for Large Generators.

Two English Opinions Relative to Steam Turbines and Reciprocating Engines.

At the meeting of the Incorporated Municipal Electrical Association at London, England, in July, 1902, the subject of steam turbines was presented in a paper by Mr. S. E. Fedden, city electrical engineer, of Sheffield, and Mr. A. A. Day, borough electrical engineer, of Bolton, contributed a paper dealing with the relative merits of horizontal and vertical reciprocating engines. Both topics were considered from the view point of generating-station service, and were of much interest, as shown by the generous and spirited discussion which they called forth. The papers are of timely value and are here reproduced practically in full.

STEAM TURBINES.

BY S. E. FEDDEN.

The technical details of the steam turbine have been so very prominently placed before engineers lately in numerous able papers, that the author does not consider it necessary to go over this ground again. Suffice it to say that the construction of the steam turbine is simplicity itself, as it consists only of a hollow drum revolving in a stationary drum or cylinder, each with teeth or vanes attached, and so arranged that they clear each other. The two cylinders are steam packed, and, of course, the thrust guides require careful adjustment so that the vanes do not clash. Of late years this turbine engine has been meeting with signal success, and many engineers are now considering whether it is not destined to revolutionize the means of obtaining power from steam, both by land and by sea. The author suggests, however that engineers and inventors should turn their attention toward bringing to perfection gas turbines, now that cheap gas is available, and the ideal engine, combined with the most economical way of obtaining electrical energy from coal, may then result.

The fundamental principle attending all methods of electrical working is implied by the word "velocity," a requirement eminently possessed by the dynamo, motor, and rotary convertor, owing to the entire absence from these machines of reciprocating parts. This requirement, however, is not possessed by the prime mover, the modern reciprocating engine. Velocity was first obtained on the dynamo by means of belts, or ropes, but this method of driving was soon discarded; it took up too much available floor space, and was an unsatisfactory and inefficient arrangement at the best. The attention, therefore, of the most prominent engineers in the world was directed toward increasing the speed of the engine, so as to adapt it for direct coupling to the high-speed dynamo or alternator. The efforts of these engineers were attended with very great success in Britain, and they were able not only to couple their new high speed engines to the dynamos, but they also obtained those qualities of economy and reliability of working claimed for the slow-speed engine with its belt drive; and the market now supplies high-speed engines of moderate sizes and of British manufacture, which are second to none in the world.

The demand for electrical energy for all purposes has, however, increased by leaps and bounds, and has thus called for larger generator and larger engines with heavy reciprocating parts, and, therefore, more strain and wear, bringing increased engine troubles. High speed engines are now being built with pistons weighing considerably over two tons. Such a piston will have to start and stop from 400 to 500 times per minute. When this enormous weight, making 50 many reversals per minute, is considered, it will not be difficult to imagine the steam hammer effect obtained if the least thing goes wrong with the valve setting or the compression. On account of the increased engine troubles with high speed engines, manufacturers are now falling back to moderate speeds, and many to low speed, although this is attendant with an increased cost of plant. Taking into consideration the large demands for electrical energy which must be made in the near future, it seems probable that the size of the generator and slow speed engine will become unmanageable also great difficulties will be experienced in shipping and erecting them. The aim of all engineers should be simplicity, and the modern reciprocating engine, with its numerous complications, cannot by any means be considered the embodiment of this

principle of simplicity. The great number of its moving parts, which require watching and adjustment, increases the cost of maintenance and attendance.

Engineers who have had charge of power stations of from 6,000 h. p. to 10,000 h. p. are fully aware of the laborious and never-ending work and watchfulness required to maintain their reciprocating engines in fair running order; the station calls, incident to the taking up of brasses, repairs and adjustments to valves, gland packing, cylinder lubrication, automatic governors, trip valve gears, and many other things, are items that go to build up the daily and nightly experience of the present-day station engineer. Engineers laying down new plants have to consider the increased cost of building, the larger floor space required, the longer lengths of steam and exhaust piping, valve-opening gears, and heavy cranes for lifting, which are required in the case of large reciprocating engines, as against the requirements of a station laid out with steam turbines. The massive nature of foundations, the time required for delivery and erection of large plants, are items which often seriously delay the speedy completion of contracts.

It was owing to these and similar reasons that the author's attention became directed towards the steam turbine as offering a possible solution of the difficulty, and a short experience with machines of this type has since formulated his belief that progress in the generation of electrical energy lies in this direction. The failure of the steam turbine to secure earlier appreciation was probably due in great measure to that inherent conservatism to which British engineers are only too liable. Two years ago the author had the opportunity of going through the country to inspect all the larger turbine installations, and the conclusions then arrived at were: (1) It was inadvisable to put down a steam turbine to exhaust to atmosphere. (2) It was inadvisable to put down a steam turbine of a small size. (3) It would be policy to install steam turbines from 200 kw. to 300 kw. and upwards either for alternating or continuous current generation for lighting or power, provided there is a plentiful supply of cold water available for condensing purposes, and also provided the surface condensers were used, all the water being returned to the boilers.

From the year 1885 until 1890 nearly all the turbines manufactured were non-condensing and of comparatively small size. They were not economical; in fact, many engineers called them steam-eaters, but great improvement, both in construction and design, has since been made in them, and has led to a very much smaller steam consumption, so that there is now on the market a steam turbine which, in the larger sizes, and in the matter of steam consumption, is capable of holding its own against any triple-expansion engine yet produced. Even in the early days, when they were considered steam-eaters, their smooth running and general adaptability to the driving of electrical machinery was the subject of much comment. The author, however, wishes to call the attention of the members to a few of the advantages which the adoption of the steam turbine, when running under ordinary conditions in a power station, has impressed upon his mind.

As many members are no doubt aware, a steam turbine of 500-kw. capacity 100 cycles, single phase, was brought from the Paris exhibition into the Sheffield station about 18 months ago, and was running on the town load within three days of the time of its arrival at the station doors, and within about three weeks of the date of the order by telegram. It was simply dropped down on the station floor, without any preparation in the way of foundations, and has since, over the period stated above, run more or less continuously and during longer hours than any other unit in the station. It runs in parallel with alternators both of the iron and copper type, with engines of the triple and compound type, and can be brought up to speed to meet the demand of a sudden load much more quickly than any other of the neighboring units. Boiler priming or wet steam simply causes momentary slackening of speed until the turbine clears itself of water. Other advantages are as follows: (1) Absolutely steady nature of turning moment. (2) Entire absence of cylinder lubrication, which, therefore, allows of all the condensed steam being returned to the boilers. The saving in this one item alone materially assists in the reduction of station costs. (3) The time occupied in

cleaning down is brought to a minimum, and is about one-sixth of that required with a reciprocating engine of similar capacity. (4) The entire absence of rubbing surfaces and packed glands within the steam chamber will permit of the use of superheated steam without fear or injury. The turbine specially lends itself to the use of superheat of a high temperature, and in this respect possesses a considerable advantage over a reciprocating engine. (5) Exceedingly small costs for attention and repairs, and great reliability of working. These last items bring home to the engineer more forcibly than anything else the advantages of a purely rotary as opposed to a reciprocating motion.

When considering laying down a steam turbine plant, the main factors to be considered are:

1. Good vacuum in the condenser. This is even more necessary than with an ordinary engine, as the makers claim that the turbo expands the steam right down to the vacuum of the condenser. The following table of actual tests taken on a 500-kw. turbo-alternator set, running at 2,500 r. p. m. with 130-lb. steam pressure and no superheat, illustrates how important it is to obtain a high vacuum:

Vacuum, Inches of mercury.	Steam consumption per kilowatt-hour.		
	Full load.	Half load.	Quarter load.
28	22.2	25.6	32.4
27	23.1	26.9	34.5
26	24.0	28.2	36.6
25	25.1	29.7	39.0
24	26.2	31.2	41.2
23	27.5	32.9	44.8
22	28.9	34.7	46.3

2. Arrangements for high superheat, as tests show that with 50° F. of superheat, there is 8 per cent, and with 100° F., 12 per cent economy in steam consumption. From the tests taken on the 1,250-kw. steam-turbine sets, which are now working satisfactorily at Ellerfeld, in parallel with Sultzer engines, where the speed ratio is something like 16 to 1, it was shown that there was a gain of 12 per cent with 55° C. superheat, and that every inch of vacuum improves the steam consumption by 4 per cent. It was also shown that the steam consumption in the turbines, other things being equal, decreased constantly with increasing loads, whereas the Sultzer engines showed a less economy over three-quarter load.

The steam consumption in a turbine closely follows the right line law, or is proportional to the load added to a constant quantity which represents the consumption of steam at no load. The new 1,500-kw. turbo-alternators which the author is installing at Sheffield power station will, with their own condensers, only occupy the space of 730 sq. ft. The foundations will be of the simplest description, and the general compactness of the sets and the ease of erection are expected to effect a considerable saving of time and money. The appearance of the station will be improved by the absence of ugly lengths of steam piping, or cylinders poised up in mid-air to obstruct the lighting of the building, and altogether the author hopes that there will be a general absence of that complexity of moving parts which to the trained eye of a station engineer offers so many possibilities of failure. The author has been severely criticised for starting a large power house with steam turbines, but time may show whether this criticism is deserved. At present, however, he feels quite confident, after considering the problem from all points, that the steam turbine stands in a most favorable position when compared with reciprocating engines of large powers for the supply of electrical energy.

THE CORRECT TYPE OF ENGINE FOR LARGE GENERATING STATIONS.

BY A. A. DAY.

In bringing the subject of the correct type of engines to be used in future electric power stations before this association, I would point out that many stations have now arrived at that state of congestion which will necessitate before long a larger electric supply station being put down. Under these circumstances, it seems to the author very desirable that the type of engine which should be employed in such a station should be discussed by this association. Further than this, it is quite apparent, if the various types of plant employed in central stations throughout the country are considered, that it is not an easy question to settle which is the correct one. I think it may be taken generally that the engines used in the United

Kingdom are mostly high speed with a sprinkling of the low-speed type, both horizontal and vertical. In America the low speed type, both horizontal and vertical, is almost exclusively employed. On the Continent low speed is also almost universal. It must, therefore, be taken as a matter of fact that all three types can be used and are used successfully in electric lighting and power works. It may, perhaps, also be further noted here that in the case of the power schemes which have recently sprung up in England, the engines proposed for these are of the low-speed type, and also that the larger generating sets in the large stations of this country have also been put in at low speed. On the whole, therefore, I think it may be taken at the present time, having regard to the fact that larger generating sets are being used, that there is a tendency towards the low-speed type. One great factor in the matter is that the space occupied by large generating sets does not appear so unfavorable to the low-speed type when the set is large, say 2,000 h. p. or upwards.

The whole question of high versus low speed I do not purpose to enter into in this paper, as I am quite sure the members of this association are familiar with the advantages and disadvantages of both types, it having been discussed repeatedly before various societies and in the public press. If, however, one goes outside electrical engineering and compares the results from the engine point of view only, one finds the low-speed engine still holds the record for low steam consumption. The conditions under which engines in existing electric power stations run are such that very little can be gained from their records which will help towards the solution of this question, as not only is the load factor bad in most cases, but the plant factor also, and the very large amount of steam piping which is necessarily kept alive (but not to the full extent of its usefulness) all combine to produce the very poor results which most central stations at the present time show in pounds of coal per unit generated. The effect of these factors together is so marked that it is almost impossible to gain any figures from central-station statistics bearing upon the relative figures of merit of different types of plant, for it might even be argued from such statistics that condensing was the reverse of an economy.

The author's opinion on this question of high versus low speed is that if one adopts the principle of high speed it should be high speed, and not, as is very frequently the case, and especially with engines developing large power, only a moderately high speed, and the larger the set generally the less the speed, so that when one comes to a set of about 2,000 h. p. the space which is necessary for a high-speed set or a low-speed set is approximately the same. If one adopts the high-speed principle, he must of necessity abandon the idea of personal human supervision of the working parts. If this is admissible, the higher the speed the better the results, both as regards economy of steam, space, and material. The question of space occupied is not, however, of vital importance where a station is being built on large lines for the supply of a considerable amount of power, say on the three-phase alternating system, giving a high-pressure supply, and therefore rendering the position of the power house a question of much less moment than it was in the case of the first electric light stations put up, when the public was timid as to the utility of an electric supply, and had very small notions of what that electric supply would develop into in the course of a few years. The author also thinks it may be generally taken that the question of space occupied per horse power has been very considerably overdone in the past. Many stations now are very cramped, and when repairs are necessary, a good deal of inconvenience is caused by the cramped way in which the engines are arranged, and when, as appears to be the tendency, the generating sets are of much larger dimensions than they have been hitherto, the necessity for space round the engine is much greater, and a larger amount can be allowed without making the horse power per square yard of the engine room as a whole too small. It should also be borne in mind that in a station employing large units, if the engines are placed close together, it is impossible to put the boiler power into so compact a space. The consequence is that if one generating set requires half a dozen of any type of boilers to supply it with steam, there is no reason why that set, from a space point of view, should occupy less than the length of the engine room covered by the boilers. If this rule be carried out (and it will be found a point of considerable importance in the designing of large stations), it will be found that it is unnecessary to cramp an engine for the sake of saving its floor space, especially in putting down a station such as is here being considered where the power units are large, while at the same time paying due

regard to the importance of having as small an amount of steam piping as possible. It therefore seems to justify the employment of low-speed engines in a station such as we are discussing.

It may be objected that the large unit is not a necessity in the case of an ordinary town supply. If, however, a little consideration is given to the probable demand for electric energy during the next 20 years, the author feels sure that the putting in of small sets, such as one repeatedly sees even now, will cease. There is no reason why large towns such as Manchester, Glasgow, Liverpool, and so on, should not be employing at the end of the period above stated 100,000 h. p. for all purposes. On the Continent, Berlin has already reached half that amount, and the output is seven times that of Liverpool. In England we have just as good an opportunity, and probably the demand for electric energy will be quite as great once the principle is grasped that electric motive power is undoubtedly the coming means of power distribution. This cannot, however, come about in England until the price of current is reduced below the figure at which it now generally stands for motive power, because in England we have a very good supply of cheap coal in the manufacturing districts, where a motor demand is likely to be of the most importance. Nevertheless, the author thinks the figure above stated for such towns is a reasonable one, and if one takes 50,000 h. p. in the same period for towns next in point of size, and 20,000 h. p. for comparatively small towns in the manufacturing districts, it will be at once evident that if these figures are reasonable, large generating sets must be the order of the day; if not, the power stations connected with such towns will become unwieldy in size, and the advantages of large engines will be lost, and the loss in steam pipes will become enormous.

After very carefully considering this subject from all points of view, the author considers the low-speed type of engine should be the one adopted in the future for large power stations; that it will be condensing goes without saying. The type which the author suggests as most suitable in the long run (and it should be borne in mind that the power stations must be put down to last as a business concern and without anything about them of an experimental nature) is a horizontal low-speed compound or triple-expansion engine with direct-coupled generator between cranks. This type does not appear to have been very largely tried in England. It has, however, succeeded well on the Continent, and in the author's opinion may generally claim to have the following advantages, if the question of the space occupied is left out.

1. The most economical engines have been built of this type, and certainly it can hold its own, if properly built, with any results obtained in electric light stations. These results, as far as they have gone, do not require any very economical engine to obtain them, although one is fully aware that the reason why the pounds of coal used per unit in electric light stations generally is very large, is due to the poor load factor which these stations have. The author recently had occasion to inquire very closely into the question of the cost of producing power in large cotton factories such as there are in Bolton, and the figures obtained were equally a good advertisement for the horizontal type of engine, which is almost universally employed, and also very useful as a guide to the price at which it is necessary for power to be supplied in order to make its use become general. Such engines are found to give an indicated horse power hour for less than 1 d with coal about 7s per ton, and this on a load having a variation of 10 per cent.

2. The horizontal engine does away with the necessity for steam pipes in the engine room, or rather, above the engine room floor, and enables the steam pipes to be reduced to a minimum. This is a question of vital importance in a large station, and one of the points which requires very careful consideration. By adopting the horizontal type of engine the difficulty of steam pipes can be satisfactorily overcome as far as the engine room is concerned, and at the same time keep the engine room neat, doing away with all obstruction to the free use of a traveler from one end of the engine room to the other.

3. The engine can be kept clean at a minimum of expense and trouble.

4. The repairs to such an engine will be found to be reduced to a minimum if the valve gear be of the Corliss type, which appears to frighten some engineers by its complication. The complication seems to the author to be far more apparent than real. It is no more necessary that the gear should be more complicated than in the case of an enclosed high-speed engine, but it is seen in one case

and not in the other, and a good deal of complication can be done away with if the motion work were not made so that it could be adjusted while the engine was running, which the author considers to be too great an advantage to be thrown away for the sake of appearances.

5. The engine is easily accessible for repairs, and the same applies to the dynamo. It seems to the author that the weak point of a similar type of engine to that under discussion, but vertical instead of horizontal, is that to remove the top half of the field-magnet ring, or to get at anything of importance on the dynamo, necessitates the dismantling of the engine to such an extent that it practically means rebuilding, and if this dismantling has to be done in a cramped space it is a very costly and lengthy business.

6. The dynamo being placed between the two cranks, the shaft is not in any way cut up. We all know the difficulty that has been found to exist in making a crankshaft with built cranks strong and able to withstand the throwing off and on of the full load repeatedly, as must necessarily be the case with electrical generators for power purposes and traction. The author does not mean by this that there is anything extraordinary in the strains set up in a generator on traction supply as it has been attempted to prove. It is obvious that such strains cannot exist. Nevertheless, practice bears one out that a three-crank shaft is not so easily made strong enough to stand the shocks which do occur, as one with two cranks at the end of a plain, simple shaft.

7. The bearings of such a horizontal engine can be adjusted both vertically and horizontally, enabling the armature to be adjusted inside the field, which it is very advisable should be possible. A point about which there has been considerable discussion, and which seems to have been at one time considered insurmountable in connection with low-speed engines, is the difficulty of getting a very even turning moment without an abnormal fly-wheel. It is, of course, of the utmost importance that the turning moment should be very even in the case of three-phase or polyphase transmission, but a good deal more has been made of this point than is necessary, as there are three-phases running on the Continent, and running satisfactorily, with engines that have only a single crank, the percentage of variation being 0.3 per cent of the angular velocity; and it is not at all difficult to make a two-crank engine such as has been described, with a far more even turning moment than is possible with a single-crank engine, however well designed. The weight of the magnet wheel in the above-mentioned instance is 43 tons.

This proves conclusively that an even turning moment can be obtained from low-speed engines, enabling such a type to be used in connection with alternating-current machinery; and, therefore, the arguments which have been adduced as to the advantages which high speed gives in this matter are, to a certain extent, done away with, because there can be no need for the fly-wheel of a low-speed generating set being made abnormally heavy to obtain a sufficiently even turning moment, especially if the engine is not a single-crank one. One knows that the usual way of looking at this question of high versus low speed is that a high-speed engine with a short stroke gives a higher mean effective pressure in cylinders and that, in combination with the quick stroke, reduces the condensation in the cylinders to a minimum, and, in so far as this takes place, the high-speed engine has the advantage over the low-speed one; and it is not practical to make a high-speed horizontal engine of large size, it has that advantage over that type, but the horizontal type of engine if fitted with Corliss valves is much better drained than the vertical, either high or low speed; and if the condensed steam can be easily disposed of, the advantage if the high-speed vertical type due to lessened condensation is minimized. It is also true that the wear and tear of pistons on a horizontal type is greater than in the vertical, but this can be minimized by having tail rods without side bearings, etc., and the amount of wear which actually takes place is, to a certain extent, due to the material of which the cylinder and piston, respectively, are composed, and in a well-designed engine of good proportions the wear is not excessive. When we see engines that have run for 20 years without new cylinders or reboring, and still show good economy, it may be argued that this wear is a matter of small importance.

A very great point is gained when, in trying to arrive at the correct solution of this question, one can get the various points down to their relative importance. For instance, taking the question of condensation in cylinders, this is a point on which great stress is laid by some engineers. At the same time the condensation in the

steam pipes, and which is more easily avoided than that in the cylinder of the engines, amounts to many times the latter. The same thing with regard to the friction of the piston and cylinder liner. The difference in this item between a horizontal and a vertical engine does not equal that which may be caused by a slightly inferior grade of cylinder oil, and although one does not say for one moment that all these points are not of great academic interest, and that we should all strive to obtain as perfect a result in all parts of central stations as is possible, still it is not worth while nor likely to increase the efficiency of the station as a whole, if such small points of economy are to be considered without the question of convenience and the relative importance of such points being taken into consideration, since indirectly they may very materially add to the running costs of the station. In the matter of convenience, for instance, the time occupied in making the bottom cylinder cover joints on a vertical and horizontal engine respectively would probably be somewhere in the ratio of 3 to 1, or if through any cause the work had to be done quickly, the probable time the joint would stand would show a still greater difference in favor of the horizontal type. This matter of convenience in getting at parts for repair work is very much greater in the case of horizontal engines than in vertical engines, and this point very largely outweighs the economy due to the reduction of condensation losses, especially seeing the relation the comparatively insignificant proportion of these losses bear to the total, and if the engine of the slow-speed type can produce an indicated horse power hour for .05d or .06d for coal, and the question of the space occupied is not of vital importance, as it should not be in the case of a power station put down on the high-tension alternating-current system, on the whole there can be no question that the horizontal low-speed type is the one which should be employed in the future.

The author has previously stated that with regard to the question of high and low speed, if it is to be high speed it should be a very high speed, and as it is not likely that engines of the reciprocating type would be obtained giving a higher speed than that now usually employed for that type of engine, where space is important, the steam-turbine type would be the correct one to adopt. The author has not had any recent experience with the steam turbine from which he is able to draw conclusions, and after the paper we have had from Mr. Fedden he does not propose to enter upon that question, but some years ago, in the early days of the steam turbine, he ran one which was very satisfactory except in one point, and that was the question of governing. He has since seen engines of this type running, and in their case the governing seemed to be excellent. There is a great future for this type of engine, and where space is of importance it seems likely to come to the front. However, he would give preference to the low-speed type for power-station work of the size which is being considered in this paper, because, as in the case of both alternators and dynamos, it is an advantage to build them of such a size that it is not necessary to employ a high speed of rotation in order to get the necessary e. m. f., and at the speed at which a turbine runs the rotating part of the dynamo or alternator will become too cramped to make a thoroughly sound engineering job of it, which is very necessary at such a high speed of rotation. There is one point in connection with low-speed engines of large power which some members may be inclined to bring forward, and that is, on large sets, especially on the Continent, it seems necessary to employ a large number of men. In the engines recently erected in the power station at Pinkston a very large number of men were employed, but this is not necessary, and was mainly due to the contractors wishing to have no mishaps on a brand new engine. At any rate the number of men required is not excessive in the case of horizontal low-speed engines, and there is no reason whatever why two men, one to drive and one to grease, should not run a 5,000-h. p. set of the horizontal type, and not lead a very hard life at that.

It has always appeared to the author that an electric supply station is somewhat analogous to a pumping station, and the contrast between the quiet, cool and clean engine room of a pumping station which runs night and day, and the easy and very free-from-anxiety sort of life that the drivers of such engines seem to have, when compared with the unrest which exists in the electric power house, is very great. This notwithstanding that the high-speed engineer would probably say that the valve gear of such pumping engines was the most complicated box of tricks that he ever saw in his life. There is no reason why the future power house should not be as

clean, tidy and free from noise and heat as the ordinary pumping station, and this will be most easily obtained, without the sacrifice of any economy, by the employment of low-speed engines of the horizontal type, coupled to steam pipes carried underneath the floor direct to the boiler house. We should, then, in our future power houses probably be able to show results such as some members of the Institution saw during their trip to the Continent, where the cleanliness of the engine room and machinery was remarked by everybody, and where, notwithstanding complications and the alleged disadvantages attached to low speed, the results obtained were sufficient to advance the business at a much more rapid rate than any English stations can show, and sufficiently low to bring electricity into far more general use than it has yet attained in England.

The author does not wish to be misunderstood in this matter. The claims of the high-speed engine to economy of space and steam, at any rate in small sizes, he admits, also the advantages of all engines of the vertical type as regards floor space; but the horizontal type has advantages as above stated, and these outweigh those of the other types except in the matter of space. If an electric light station were not so largely affected by its load factors, the relative values of the different types would be apparent, and we, as station engineers, should be able to lay ourselves out to get the very utmost economy of coal, as in the long and steady runs of marine engines; but as in the very nature of the case we cannot hope to establish records for coal consumption per indicated horse power in electric supply stations, the refinements which lead to the utmost economy in steam may be dearly purchased, and it is for this reason that the convenience, economy of oil and labor, easy access for repairs, with the other points already mentioned, the horizontal engine of low-speed type appears to the author to be the most suitable for large sizes where space is not of supreme importance.

The author has not gone into the question of the arrangement of cylinders, or the question as to whether compound or triple-expansion engines should be used. Personally, he would divide the plant up, some triple-expansion and others compound. This is a matter which has to be settled for each individual station, but generally triple-expansion is not warranted except in the case of very large sets when they can be kept fully loaded. In any case, the horizontal engine can be made triple-expansion or compound, and the cylinders can be so arranged that the turning moment for either will without doubt enable alternators to run perfectly in parallel. The question of price the author has not gone into in this paper (although this is not against the type proposed), because in the question of electrical machinery price is of secondary importance, the more so as the importance of the electric supply increases. It is also rather difficult to discuss the question of engines without taking into consideration the kindred question of boilers, or, indeed, the question of the whole of the station plant, every part of which is so much dependent upon every other. If, however, sufficient has been said to bring about a discussion on this important point, it may be of use to us in the future.

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BROOKLYN EMPLOYEES' BENEFIT ASSOCIATION.

Over 800 members of the Brooklyn (N. Y.) Rapid Transit Employees' Benefit Association met Friday, October 17th, at Association Hall, Brooklyn, to discuss means for extending the membership and increasing the efficiency of the association. The secretary presented his financial and statistical report showing a membership of 2,600; gross receipts to Oct. 1, 1902, \$9,062; gross expenditures, \$5,900.72; balance on hand, \$3,161.28. To date 173 members had received \$2,587 in sick benefits and five death benefits had been paid. Preliminary plans were presented for a new clubhouse to be erected as permanent headquarters for the association at East New York. Provision was made for the enlargement of the Sick and Claims committee by the appointment of a local committee at each depot. On behalf of the board of trustees the chairman made formal presentation of the bowling trophy won at the Rockaway outings by the Ridgewood team. A visit was made to the Y. M. C. A. gymnasium where the evolutions of several classes at athletic drill were witnessed.

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The Milwaukee Light, Heat & Traction Co. has been granted a franchise for a line from the city limits to St. Francis.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

EXTENT OF DUTY WITH REGARD TO KEEPING RAILS FROM PROJECTING ABOVE SURFACE OF STREET.

Citizens' Railway Co. v. Gossett (Tex. Civ. App.), 68 S. W. Rep. 766. May 7, 1902.

The court of civil appeals of Texas holds erroneous an instruction in which the jury was charged that the company would be liable if it permitted the surface of the street to become lower than the rails of the railway track, and which grouped facts that would authorize a recovery if this was the case. It says that if the company had exercised ordinary care to keep the street and the tracks in a reasonably safe condition, so as to permit the crossing of vehicles, it would not be liable, although the rails may have been projected above the surface of the street.

INJURY TO PASSENGER FROM CATCHING FOOT IN RING IN FLOOR OF CAR—EVIDENCE OF RING RISING AFTER ACCIDENT EVIDENCE OF NEGLIGENCE—REPUTABLENESS OF BUILDER OF CAR NO DEFENSE.

Kingman v. Lynn & Boston Railroad Co. (Mass.), 64 N. E. Rep. 79. May 21, 1902.

The party suing and two other passengers present at the accident testified that the ring in which the former testified that she caught her foot was standing erect immediately after the accident, and was then pushed down by another passenger with an umbrella, and that repeatedly thereafter the same ring whenever the car started after a stop, rose and remained upright until pushed down by some passenger or by the conductor. The supreme judicial court of Massachusetts holds that the evidence was competent. It says that there was no reason to infer that anything about the car was different at the time to which the testimony referred from what it had been when the car left the barn after its morning inspection. If during the time testified to the ring rose frequently as the car started, and remained up until pushed down, this tended to show that it had been doing the like since its use on that day began. Knowingly to use a car in that condition was negligence on the part of the carrier, and the evidence was competent to show that the car had been in fact in that condition for so long a time before the party suing became a passenger that the company should be charged with knowledge of the dangerous condition, or with negligence on the part of the conductor in not ascertaining the danger. In the testimony of the three witnesses as to the action of the ring at the time of and immediately after the accident there was evidence which would warrant the jury in finding that the company and its servants were negligent. However reputable the builder from whom the car was bought, and however usual the particular device of the ring, if the device was allowed to get into and remain in a condition which usually raised it when the car started, it was negligence not to discover and remedy that condition.

FRIGHTENING OF HORSE BY NOISE AND SMOKE FROM BRUSH HOLDER GROUNDING—PRESUMPTION FROM NOISE AND SMOKE NOT INCIDENT TO ORDINARY OPERATION OF CARS.

Richmond Railway and Electric Co. v. Hudgin (Va.), 41 S. E. Rep. 736. June 12, 1902.

Here it appeared that when the latter named party, by whom the action was brought, was shown a horse and wagon's length distant from a car, which had one of the older styles of motors and was used in emergencies to take the place of other cars undergoing repair, he heard the car make a loud, unusual noise, to which neither he nor the horse paid any special attention; but just as the horse got even with the car the car stopped, and an unusual volume of smoke came from under the front of the car, right in the horse's

face, which caused the horse to take fright and start to run away. The party pulled the horse up, and, in order to keep it off the curbstone, pulled the left rein harder than he did the right, whereupon the horse darted across the street to the left; and the sudden turn of the wagon threw the party, who was sitting on the right side, out of the wagon, the wheel of which passed over his leg, breaking and crushing it severely. What happened to the car on the occasion of this accident was described as the "brush holder grounding." The supreme court of appeals of Virginia affirms a judgment in favor of the party for \$2,000 damages, holding, among other things, that there was no error prejudicial to the company in the giving of the following instruction: "If the jury believe from the evidence that the horse of plaintiff was frightened by the noise and smoke arising from the machinery of the car of defendant, and that said noise and smoke was not incident to the ordinary operation of their cars, they are instructed that this raises the presumption that such noise and smoke would not have been caused if those who had the providing, maintaining, and care of defendant's machinery had used proper care in regard thereto, and, in the absence of an explanation on the part of the defendant showing due care on its part, they may infer that the defendant was guilty of negligence; and if they further believe that such negligence caused the accident as set forth in the declaration, and that the plaintiff was free from fault, they must find for the plaintiff."

SUFFICIENCY OF INDICTMENT FOR OBSTRUCTION OF STREET BY RAILS TOO HIGH AND NOT PROPERLY FILLED BETWEEN—CITY CANNOT AUTHORIZE DESTRUCTION OF REASONABLE USEFULNESS OF STREET.

Commonwealth v. Camden Interstate Railway Co. (Ky.), 68 S. W. Rep. 628. June 3, 1902. "Not to be officially reported."

An indictment read: "The grand jury of Boyd county, in the name and by the authority of the commonwealth of Kentucky, accuse Camden Interstate Railway Company, a corporation, of the offense of creating and maintaining a public nuisance obstructing a public street and highway in the city of Catlettsburg, Ky., committed as follows: The said defendant on the 10th day of Sept., 1901, and on divers other days within one year before said date, in the county and circuit aforesaid, did unlawfully create and maintain a public nuisance on a public highway in a public neighborhood, by so placing its ties and rails as to leave them above the level of the street, and by failing to fill between said ties and rails so as to enable vehicles and wagons to pass over them on Oakland avenue, a public thoroughfare in the city of Catlettsburg, Ky., to the great hindrance, delay, and inconvenience of the traveling public and many people who live in the neighborhood; said defendant being a corporation, and operating a street railway in said city and over said avenue under the laws of the commonwealth of Kentucky. Against the peace and dignity of the commonwealth of Kentucky."

It was contended that this indictment did not state facts sufficient to constitute an offense. Objection was also urged against it because it did not sufficiently specify the points of obstruction. The court of appeals of Kentucky is, however, of the opinion that the charge that it obstructed the street (naming it) sufficiently described the place. Nor does it think that the indictment should necessarily have stated how high the rails were placed above the level of the street, nor how deep the spaces between the rails. The indictment, it says, explicitly charged that it was so constructed that vehicles could not cross the road. If it should turn out in the evidence that the depressions and elevations were only such as reasonably attended the legal and proper construction and operation of the railway, it would, of course, follow that the defendant could not be guilty.

The indictment, it was further insisted, failed to allege that the road was operated contrary to the ordinance of the city. But the court does not think such contention was tenable. The city, it says, would have no power to authorize the construction and operation of a street by a railway company in such a manner as to de-

destroy its reasonable usefulness to the public. In other words, the street could not be entirely destroyed or rendered useless for public purposes simply to suit the convenience of a railway, and it may be fairly assumed that no such ordinance was ever enacted by the city, if a city will not presume to enact an ordinance in violation of the general law of the land.

Wherefore the court holds that it was error to sustain a demurrer to the indictment.

SEPARATE TAXATION OF FRANCHISE.

City of Dallas v. Dallas Consolidated Electric Street Railway Co. (Tex.), 66 S. W. Rep. 835. Mar. 6, 1902.

Section 118 of the charter of the city of Dallas provides that "the city council shall have power to levy and collect the ordinary municipal taxes upon the roadbed, rights, franchises, and all other property of street railroads of every kind," etc. Section 131 provides that "the city council shall have power to assess the property and shares of corporations, companies, banks, and such other institutions as the same are now or may be assessed by the state law in such cases made and provided," etc. Section 135 confers the power upon the council to prescribe the manner of rendering and assessing property for the purpose of taxation by the city. The supreme court of Texas holds that the charter authorizes the assessment of the franchise of a street railway company as a separate item in the rendition of its property for taxation, or, as it states it in another place, the city council has the power to require the franchise of a street railway company to be assessed separately from its tangible property.

However, it was insisted on behalf of the company that since, under the ordinances by which it acquired the right to operate its line over the streets of the city, it is required to pay an annual sum for the privilege, it could not be held liable to pay a tax for the franchise. In other words, the contention seemed to be that the sums required to be paid annually are a franchise tax, or are in lieu of such tax, and that the exaction of the tax here in question was double taxation. In some of the ordinances the fixed annual charge so imposed is called a "franchise tax," in others it is called a "bonus," and in still others it is simply imposed without being called by any name. It is clear, the court holds, that the ordinances which simply impose the annual payment as a condition of the grant and those which call such payment a bonus do not import a contract for exemption from taxation of the franchises granted. As to those in which the annual payments are called a franchise tax, the construction is not so clear. Still the court hardly thinks that such designation of itself is sufficient to show such clear and unmistakable purpose to contract for an exemption from taxation as the authorities hold necessary to show a contract for such exemption. But it says that it was not called upon to decide that question in this case. In the absence of legislative authority, a city has no power either to exempt property from taxation or to contract for a commutation of taxes legally assessable upon it. No provision in the municipal charter giving such authority was referred to in this case, and the court takes it for granted that none exists. It would seem, however, it adds, that the fact that the company is required to pay a sum annually for the use of the street is an important matter to be considered in assessing the value of its franchise. It is evident that a franchise burdened with such an exaction is not as valuable as it would be did no such burden exist.

DUTY WHEN A HORSE IS FRIGHTENED AT A CAR—AS TO RINGING OF BELL.

Oates v. Metropolitan Street Railway Co. (Mo.), 68 S. W. Rep. 906. May 21, 1902.

The sum of the adjudicated cases bearing upon the relative rights and duties of street cars and citizens traveling in vehicles drawn by horses or other animals is, the supreme court of Missouri, division No. 1, says, that both have a right to use the street, but that neither has an exclusive right. The operator of a street car is not necessarily obliged to stop the car every time a horse shies or scares at the approaching car; but when the operator of the car sees that a horse is frightened at the car it is his duty to manage his car in such manner as a man of ordinary prudence would do under the same circumstances, and it is always a question of fact for the jury

whether such care in the running of the car has been observed. This duty may or may not lead to the necessity for bringing a car to a full stop. The duty of the company in this regard is just the same as the duty of one individual or citizen to another when they meet on the highway and the horse of one becomes frightened at the vehicle of the other, or at anything upon the vehicle of another. Because a street car carries more people than any other kind of a conveyance, or because it is authorized to run more rapidly than a vehicle can ordinarily be legally driven, or because the rush and restlessness of the age makes unreasonable demands for more and more rapid transit along the crowded thoroughfares of populous cities, it does not follow that a street car can be run in disregard of the rights of persons traveling by other means, nor that a street car company is any more exempt from the common law duty of every one to exercise ordinary care, nor that it is only liable where the agents act wantonly, maliciously, and heedlessly.

Again, the court says that even a court may indulge the information that is possessed by every man that ringing a bell will not stop a runaway horse, or cause him to deflect his course so as to avoid a collision with a street car. The company admitted the ringing of the bell, but sought to justify it on the ground that it was thereby trying to assist the party suing in keeping his horse away from the car. Such an explanation did satisfy the jury, but it fails to satisfy the court. There was ample evidence to sustain the contention of the party suing that the horse became frightened at the approaching car, and began backing until the buggy was forced onto the track, and that the company's agents slowed up the car, but continued to approach the horse, all the while ringing the bell violently, until, when the car was within a few feet of the horse, he suddenly wheeled around, nearly turned over the buggy, ran away in the direction he originally came from, and threw the party suing out and injured him. This being so, a demurrer to the evidence was properly overruled, and the point here principally relied on by the company, that in no event would the party suing be entitled to recover, and therefore the verdict in its favor was for the right party, and the verdict should not be set aside, became untenable.

The true rule is, the court says, that while the bell must ordinarily be sounded to give notice of the approach of the car, still if the operator of the car sees that a horse is already frightened by the approach of the car, and that the citizen is in danger, it is his duty to cease sounding the bell, and to even stop, if necessary; and if, instead of doing so, he continues to sound the gong or ring the bell, and further frighten the horse, and cause him to run away, the company is liable for injuries inflicted in consequence thereof. Of course, if the driver of the horse knows that the horse is liable to become frightened at street cars, and to run away, and with such knowledge drives him on a street with a car line on it, he does so at his own risk. But this does not authorize or justify the operator of a street car to needlessly sound the gong or ring the bell, nor to continue to do so when it is apparent that the only effect thereof is to further frighten the horse.

OLD SPEED ORDINANCES NOT APPLICABLE TO ELECTRIC LINES.

Bonham v. Citizens' Street Railroad Co. (Ind.), 62 N. E. Rep. 996. Feb. 21, 1902.

The supreme court of Indiana holds inapplicable to an action for a personal injury by an electric car a city ordinance of 1864 granting to the company's predecessor in title a franchise and containing a speed restriction, as also an ordinance of 1876 practically re-enacting the latter, and this notwithstanding that the company assumed all of the obligations resting upon its predecessor. It says that there was no claim made, upon the evidence or otherwise, that the company was not entitled to use electricity as a motive power, and, as the court knows judicially that within 15 years last past electricity has become the ordinary motive power that is used in the propulsion of street cars, it feels justified in holding that prima facie the company was rightfully entitled to use electricity for that purpose. Assuming, then, the rightfulness of the company's action in that particular, could it, the court asks, be said that the speed ordinances referred to were violated by it upon the occasion when the party suing was injured?

The court knows that after the advent of electricity as a motive power for street cars such carrier corporations granted the demands of the public for swifter transit, and that by extending their lines

into what was before suburban territory such corporations have caused the environs of cities to expand until populous residence districts have sprung up at distances so great from the business portions of such cities as to now be practically inaccessible if there were an enforced return to the rate of speed that obtained in the operation of street cars 20 years ago. At the same time, while it is undeniable that the increased rate of speed at which street cars are now propelled has had a tendency to increase the peril to life and limb and property upon the street, yet that tendency has been in some measure neutralized by the greater care that the public now generally exercise in going upon or along street car tracks. The question as to the maximum rate of speed at which street cars shall be permitted to be propelled along the streets of a city is, in the first instance, at least, a legislative question, and it is evident that the new factors suggested could scarcely fail to receive due consideration in enacting a new ordinance.

Continuing, the court says that it is not called upon to and does not condemn the speed ordinances in question as unreasonable, but it points to the above considerations as manifesting the fact that the ordinances are inapplicable, because almost every material condition is now different from what it was at the time of the adoption of such ordinances. When substantially new factors enter into the problem as to what the written law ought to be as applied to a particular case, then the courts can no longer treat the statute or ordinance as an expression of the legislative purpose as applied to that case. Nor does the court consider that there was under these circumstances any force in the argument that the company ought not to enjoy its franchise without complying with that portion thereof that fixed a maximum rate of speed. The city, it says, has at all times had, and still has, the authority to enact a reasonable speed ordinance.

INJURY OF EMPLOYE BY STARTING OF CAR AFTER
INSPECTION OF ELECTRICAL APPARATUS—
INSPECTOR A FELLOW SERVANT OF
CONDUCTOR.

Shugard v. Union Traction Co. (Pa.), 51 Atl. Rep. 325. Feb. 24, 1902.

When a trolley car reached the terminus of the line on one of its trips, an inspector of the company was there, waiting with a testing car, for the purpose of making an inspection of the electrical apparatus. The test consisted in applying a wire connected with the testing apparatus to the various notches of the controller box, step by step. As the application to each notch was made, and indicated the proper condition, a bell was rung by the chief inspector, and then the assistant proceeded to turn on another notch by means of the controller handle. The test occupied but a few moments of time. The car was not taken away from the motorman or conductor, but was simply halted upon the track. While the test was being made, the motorman was within arm's length of his controller box and of the controller handle, and actually assisted in opening and closing the cover. The conductor, meanwhile, was sitting inside the car, looking over his accounts. There was some evidence to show that upon the completion of the test the inspector made use of the expression: "All right. Put on your pole." But whether or not he used the words, he undoubtedly did signify that the test had been completed and was satisfactory. The assistant inspector stepped down from the platform. The motorman was in the act of stepping upon the platform to take his regular place, when the car suddenly started, and ran upon the conductor, who had untied the trolley pole from the rear platform, to which it had been tied down during the inspection, and in accordance with his duty and his custom at that point had swung the pole around to the other end of the car, when, upon its coming in contact with the overhead wire, the car started.

Under these circumstances, the supreme court of Pennsylvania holds that there was nothing shown for which the company should be justly held responsible. It says that, under any aspect of the case, the inspector was not acting in the discharge of any duty which the law imposed upon the employer, and therefore could not be considered as a vice principal. When the employer has furnished reasonably safe appliances, and made suitable provision for their inspection and repair, his duty is done. He is not liable to an employee for the negligence of another employee who is intruded with the use or management of the apparatus. The purpose of the inspection

made in this case was not to determine the safety of the car, either for the employe or the public. The inspector was merely testing the efficiency of the electrical appliances, and while so engaged was merely a co-employe with his fellow workers. It would never do to hold an employer liable to one employe for the negligent or unskillful use by other reasonably competent fellow workers of the necessary and reasonably safe tools and appliances which had been furnished. The responsibility for this most unfortunate accident must therefore rest upon those who were co-employes of the conductor. The negligence, if any, was theirs, and not the company's.

ASSAULT OF INSPECTOR ON PASSENGER NO CAUSE
FOR AWARD OF PUNITIVE DAMAGES—REASON-
ABLENESS OF RULE AGAINST ANY ONE IN COM-
PANY'S UNIFORM SITTING ON FRONT SEAT
OF OPEN CAR—PAYMENT OF FARE HAS
NO EFFECT ON RULE.

Rowe v. Brooklyn Heights Railroad Co. (N. Y. Sup.), 75 N. Y. Supp. 893. Apr. 18, 1902.

The version of the party suing was that, while an employe of the company and clad in its uniform, which he owned, and off duty, he boarded one of its open cars, seated himself on the front seat, and paid his fare; and that upon his refusal to leave the front seat and take a place in some other part of the car he was assaulted by one of the company's inspectors. The jury was instructed that it might award punitive damages. The second appellate division of the supreme court of New York holds that this was error. It says that it found no evidence in the record that proved or tended to prove that the company either wittingly or negligently had engaged or had retained an improper servant, or that it had ever authorized him by special command or by general warrant to assault the party suing, or that it had in any way participated in the act, or had ratified or had approved it. It thinks that the charge was erroneous, and required a reversal of the judgment which was rendered for \$1,000 in favor of the party suing, particularly in view of the fact that the damages inflicted upon his person and property were but trifling, and were incidental to a mere scuffle or bout at fisticuffs, in which he appeared to have retaliated.

Moreover, the court says that it does not agree with the trial justice in his doubt that the company "had any right to make a rule that if a man is off duty and is riding as a common citizen and wearing his own clothes (i. e., a uniform of defendant, but bought by the plaintiff), he may not ride on the front seat," and in his holding, further on, that, as matter of law, "if such a man paid his fare he had a right to ride there despite any rules," or that, "even though the rule was as stated by counsel for the company on his opening, it gave to them no right to insist upon it if the man paid his fare," or similar holdings as to the validity of such a rule. It is the right and the duty of the company, the court says, to make rules and regulations for both the public convenience and the public safety, and the reasonableness of a regulation is a question of law. The court is of the opinion that a rule of the company that no man in its uniform could sit upon the front seat of one of its open cars while such car is in operation can be sustained as reasonable. It thinks that it promotes the safety of passengers. The car is operated by a motorman who alone applies and withholds the power, and who alone controls the brake and other checks. He stands at the front of the car. Immediately behind him is the front seat. There is no structure between him and that seat. It needs no detail of his duties to show that ordinary care and prudence on his part may require his constant and uninterrupted attention to prevent collisions or other accidents which may be fraught with danger to the passengers. Anything which diverts his attention from his work may entail accident. Conversation between the passenger and the motorman would tend to divert his attention and to impair his vigilance. The company had a right to assume that acquaintanceship between passenger and motorman might provoke conversation between them. It had the right to assume that an employment common between the passenger and the motorman might have made acquaintanceship between them, or might be a passport to acquaintance. If the passenger and the motorman were both clad in the uniform of the company, it had the right to assume that they were both in its employ. Therefore, when it enacted a regulation that no person in its uniform should occupy a

seat which afforded every opportunity to conversation with the motorman, it adopted a regulation which tended to prevent conversation with the motorman, and thus to remove a cause which might divert his attention from his duties. The rule worked, then, for the protection of the passengers, and is entirely reasonable.

Payment by the employe of the fare, the court continues, did not affect the reason of the rule, even though such payment might make him a passenger, in contradistinction of an employe who rode free. He was still an employe of the company, subject to the presumption that he either knew his fellow employe, or that common employment might beget acquaintance. The fact that the company might have secured the attention of the motorman by a rule that he should not speak to any passenger does not affect the reasonableness of the rule in question. It was argued that the reasonableness of the rule was not to be found in the safety of the carriage, because the rule did not prohibit occupancy of the rear seat. But there is a manifest difference, the court says, between the duties of a conductor and a motorman, for the latter is required to exert a vigilance which, if relaxed for an instant, even to the turning of his head, may bring danger or death, while the momentary inattention of the former is not fraught with any similar degree of peril to the passengers. And the court fails to see that such a regulation is attended with any unnecessary inconvenience to an employe who chooses to become a passenger to the extent of payment of fare. It was not contended that he is shut out from the car of the common carrier, or that he cannot occupy a seat in the place where the main body of the passengers must necessarily be seated.

LIABILITY FOR INJURIES FROM SHOCK FROM SLOT RAIL OF UNDERGROUND TROLLEY AFTER SNOW-STORM—TESTIMONY OF CERTAIN EMPLOYEES ONLY OF NO NOTICE OF LEAK—INSTRUCTIONS TO JURY—ESCAPE OF ELECTRICITY AFTER EXERCISE OF PROPER CARE.

Ludwig v. Metropolitan Street Railway Co. (N. Y. Sup.), 75 N. Y. Supp. 667. Apr. 11, 1902.

The party suing gave evidence tending to show that in stepping upon the slot rail of an underground-trolley road he received a shock of electricity in his foot and leg, which precipitated him to the ground, whereby he sustained a fracture of both bones of his right leg below the knee. There had been quite a severe snowstorm, and the first appellate division of the supreme court of New York says that there was a sharp question for the determination of the jury as to whether the party's injuries were sustained in consequence of an electrical shock or by his slipping upon the rail. But it says that the trial court fairly submitted that question to the jury, and in the charge in chief instructed them that the burden of proof was on the party suing of showing that his injuries were caused by an electric shock; and it affirms a judgment in his favor. The doctrine of *res ipsa loquitur*, or the matter speaks for itself, it thinks properly applied to this case, and that the trial court properly instructed the jury that, if the injuries were received through an electric shock from electricity escaping from the company's rail, negligence on its part would be presumed to such a degree as called upon it for an explanation or put it to its proof.

The track master, chief engineer, and electrical engineer of the company testified that they received no notice of any ground or leak at that time, but no one in direct charge of the company's appliances at the power house for indicating a leak was called to give testimony as to whether or not any leak was indicated, or record made thereof. In these circumstances, every inference warranted by the evidence, the court holds, would be indulged in against the company, which, presumably, having the evidence in its possession, omits to produce the same or explain the omission.

A request for an instruction which recited the conceded proper construction of the road, and that there was no evidence that the electric current could escape except as a consequence of the snowstorm, and stated that, if the jury found that the snowstorm was in fact the cause of the party's injury, the company was not responsible for that, and the jury must render a verdict in favor of the company, the court holds was properly refused. It says that it erroneously assumed that there was no evidence that the electrical current could escape except in consequence of the snowstorm; and it likewise erroneously assumed that the company would not be

liable if the escape of the electrical current was caused by the snowstorm, regardless of whether the company exercised care to remove the snow.

The jury were instructed that the company's duty was to exercise ordinary care, which is that care that an ordinarily prudent person would exercise under like circumstances, in view of all the circumstances requiring the exercise of watchful care and prudence to prevent the escape of the electric current. It was stated to the jury that the claim of the party suing was that the escape of electricity was due to the failure of the company to clear its slot rails of snow or other substances of a conducting nature, and their attention was drawn to testimony introduced by the company tending to show that it had exercised care in removing the snow and other substances that might be in the conduct, and they were told, "If you believe such testimony, it will be your duty to render a verdict for the defendant. No evidence to the contrary of the defendant's witnesses as to the cleaning of the track and of the slot rails has been given, except such as might be inferred from the accident in question." Evidence was given on the part of the company tending to show that it would be impossible for the slot rails to become charged with electricity, and the jury was instructed that, if they believed this evidence, it would be their duty to render a verdict in favor of the company. The jury were again told that if the company had given a sufficient explanation of the accident, or if the accident was unavoidable, and could not have been prevented or guarded against by the exercise of ordinary care and prudence, they should render a verdict in favor of the company. They were also charged that if they should find from all the facts and circumstances that the party suing was free from contributory negligence; that the accident was due to an electrical shock, and not to a fall in consequence of the slippery condition of the sidewalk; that the accident was not inevitable, but one that could have been prevented or guarded against by the exercise of ordinary care and prudence, and that the company was guilty of negligence, then they should render a verdict in favor of the party suing. At the close of the charge the jury were again instructed, at the request of the counsel for the party suing, that, if the slot rails were alive with electricity, and the company, by the exercise of ordinary care, could have discovered and remedied it, the company was liable; provided the party suing received a shock of electricity which caused his injuries. But at the request of the company and of the party suing, the jury were charged that the burden of proof rested on the party suing, and that, unless he established by a fair preponderance of evidence satisfactory to the jury that his injuries were caused by some negligence on the part of the company, he was not entitled to recover. Again, at the request of the company, the jury were instructed that, if the evidence was as consistent with the absence of negligence on the part of the company as with its negligence, then the party suing could not recover, because he was "bound to make it more than a balanced case." Further, at the request of the company, the jury were instructed that, there being no contractual relations between the party suing and the company, the former could not recover without affirmative proof that the company did not exercise ordinary care in the construction, management, and operation of its railroad on the occasion in question.

The company contended that it had overcome the presumption of negligence on its part raised by the doctrine of *res ipsa loquitur*, or the matter speaks for itself. But the court says that it did not sufficiently overcome the presumption as matter of law. The question was still for the jury to weigh the evidence introduced on the part of the company, in the light of the legal presumption of negligence arising from the happening of the accident, and determine from the whole whether the party suing had sustained the burden of proof which rested upon him of establishing that his injuries were caused through the negligence of the company. Of course, if the company exercised proper care, and, without negligence on its part, the insulators got out of repair, or the electric current escaped owing to snow or moisture, it would not be liable, unless it failed to remedy the defect within a reasonable time after actual or constructive notice thereof. In this case, however, the presumption of negligence was not so clearly or satisfactorily met as to warrant or require that the case be taken from the jury. Furthermore, the evidence tending to overcome the presumption of negligence was given by the company's employes, whose credibility was for the jury.

REMOVAL OF SNOW AND ICE IN THE BOROUGH OF MANHATTAN, N. Y.

BY W. BOARDMAN REED.

The handling of snow in the larger cities may well be treated under two heads. First, the keeping of the tracks clear for the moving of cars, and second, the clearing up of the streets in accordance with certain statutes and ordinances, and as we in Manhattan believe, for the benefit of our service and receipts.

My first experience as a railroad man was gained on a little steam road about sixty miles north of here, where twelve inches was not a heavy snowfall. I recollect some snow we had to handle there in 1888, after the storm ever since known as the "Blizzard," when one of the foremen stationed at an outlying mine came to the main office on snowshoes and was able to rest his hand on the top of the telephone poles on the way down. We were not, however, operating conduit electric lines, and in some way the locomotives of this northern country get used to traveling through the snow. A six-inch fall will tie up some of the steam roads entering New York, whereas up here such a storm is hardly noticed. We do not have such heavy storms in Manhattan as are usual in this section and the western part of the state, and our cars, like the New York locomotives, are not accustomed to traveling through snow and will balk at a few inches on the rails. Still, we have had storms during the past few years that have at times called forth our best efforts and once or twice tied up our cars not primarily from snow on the track, but from the conduit being filled so that the plows could not pass through it or get proper contact with the conductor bars. We hope, however, that we shall be able to overcome this difficulty in the future, as we have increased very materially our equipment for the cleaning of the conduit.

In 1893 I completed the construction of an electric road in Fulton County and remained a few weeks to finish estimates, etc., so was able to watch its operation. The master mechanic, a young Irishman, had charge of cars, equipment, maintenance and all else. The first snowstorm stalled many of the cars. He was appealed to by the general manager and asked what could be done. He replied with ready wit "Kape the cars a-moving." We in Manhattan endeavor to keep our tracks clear of snow upon this same principle, for we use rotary sweepers only and depend upon the frequency of their running. On about 153 miles of single track we have 58 rotary sweepers, or one for little more than each two and a half miles of track, enabling us to operate them on from fifteen to twenty minute headway, so unless the snow is dry and drifting badly there is no chance for much accumulation on the rails. In addition to rotaries we use walkaways or ordinary road machines drawn by two or four horses to shove the snow well back from the rails. These are worked in pairs, two machines covering from two to four miles of street. On streets that are narrow or have elevated railroad columns near the tracks we are obliged in case of heavy storms to shovel the snow back from the rails by hand, and, of course, use hand power to get rid of what falls between the tracks. Special work is also cared for by hand, from one to four men being sent to each place where there are switches, curves or cross-overs as soon after it begins to snow as possible. They keep the curved rails, frogs and switches, both slot and tram rails, swept clean, and use a very small amount of salt on the moving parts. No salt is used on straight track except on a few very steep grades, and none on curves except in severe sleet storms, when ice is forming in the groove. In Manhattan the "Trilby" section of rail is used almost exclusively. To keep the groove clean diggers or small scrapers fitted to the shape of the groove are attached to each sweeper. These have always proved sufficient for the purpose, except in the few cases where the road has been tied up and rails became covered with ice and packed snow, when picking and pickeling had to be resorted to.

In regard to pickeling, would say that we find salt plays havoc with electrical equipment, especially the plows. Salt water getting on the shank destroys the insulation and often forms a short circuit around the plow. No amount of paint or grease will prevent it. A few winters ago we were called upon to assist in the operation of a new conduit electric line in Manhattan. The superintendent,

who received most of his education on horse-car lines where salt is the principal factor in snow removal, had general charge of the operation and maintenance. I sent a track foreman with some men to help him handle a light snowstorm, cautioning both the foreman and superintendent regarding the use of salt.

In a few hours his entire line was in bad shape from burnt-out plows. The superintendent denied using much salt and the receiver, in whose hands the road was, severely criticized our electrical department for furnishing his road with poor plows. Investigation showed, however, that considerable salt had been used, which doubtless caused all the trouble. On overhead trolley lines salt does not cause such immediate damage, but I think many motors which show defects a few days after a snowstorm have been injured by salt water.

For cleaning the conduit we use a rubber scraper similar in section to the conduit suspended from a small flat car drawn usually by horses, though sometimes hitched behind a car. At all switches the conduit is much smaller than on straight track and a scraper has to be used that will pass them. It will, therefore, not remove all snow from the conduit, but keep it sufficiently clear to allow passage of plows and leave the conductor bars clean. From the conduit the snow is scraped into manholes situated from one to two hundred feet apart. These drain into sewers, but after little more than six inches of snow has fallen they have to be cleaned out. With the beginning of freezing weather we put a layer of salt in the bottom of the conduit and keep it thus salted all winter. This prevents the forming of hard ice and enables us to keep the conduit clean. We have always used mined salt when we could get it and consider it the best for our purpose.

To strictly comply with the statute which provides that street railway companies shall remove all snow that falls on its track, between its tracks and two feet outside it would be necessary to stop operation of cars as soon as it began to snow, fence in the area and stop all trespassing or else have some method of marking each flake for identification.

In Manhattan the street railways have always removed more or less of the snow from the streets, but until 1896 there was no system about it. That year an agreement was made with the street cleaning commissioner whereby the street railway companies were to remove all snow and ice from the entire area of certain streets or parts of streets, such area being as nearly equal as might be to the area they should clean under the statute, the street cleaning commissioner agreeing to remove the snow from all other streets having tracks upon them as promptly as possible. This arrangement has proved of great benefit to the public, to the commissioner of street cleaning and to the railway companies.

Previous to this arrangement little attention was paid by the commissioners to railway streets. It was therefore necessary to run horse cars doubled up, that is, four horses and two drivers to each car, electric and cable cars were badly blocked by trucks, passengers could not get on or off the cars without getting over their ankles in slush and snow machines were kept running until the snow melted or wore away. These conditions often lasted more than a week, whereas it is rare for us to be troubled more than 24 or 36 hours after a storm is over. In former days it required from four to five hundred bushels of salt per mile of track per season. Now I allow 275 bushels for horse car lines and 415 for electric and nearly all of which is used in the conduit.

The prompt removal of snow enables the public to go about its business and pleasures with comfort, thus adding very materially to our traffic; so the expense we are put to is about made up in the additional receipts.

Various ways of disposing of snow have been suggested and tried, but though the method may seem primitive, we have found no better one than hauling it by carts or trucks to the water front and dumping it overboard.

The island of Manhattan is of such shape that most of the snow can be thus carted with an average haul of little more than half a mile.

Melting machines have been tried and were used experimentally by the city last year, but they are not practical for our conditions. A few years ago the late Colonel Waring, then commissioner of street cleaning, thought it would be a grand thing to line sewer manholes with coils of steam pipe, then shovel the snow into them when it would melt and run away. We constructed for him a man-

*Read at the annual meeting of the New York State Street Railway Association, September 1902.

hole for this purpose and gave it a trial. It took but a few moments to fill it with snow but an hour or more for the snow to melt. It is hard to overcome the fact that it requires 142 units of heat to make water out of snow or ice. Carting snow by cars has been suggested many times and doubtless this method would be cheaper and more expeditious than carts and trucks if there were proper dumping facilities and the street railway company could give up the use of its tracks for a sufficient time to allow snow cars to do the work. On our lines cars are rarely operated on less than two minute headway, except between one and five o'clock in the morning, and even then they run on from five to ten minutes schedule, which would give no time for loading and handling of snow trains. A short time ago I estimated that were we to abandon the running of cars on 23d street between Broadway and the East River, about one and a half miles, between one and five in the morning, giving snow cars exclusive use of them, it would require for a 12-in. fall with two trains of four cars each, 36 hours, or nine such nights to clean up this small portion of the city, whereas it is done with carts and trucks in about twenty-five or thirty hours, and as these work both night and day this means but one or one and a half days.

Contractors are paid by the cubic yard of snow removed, both by the city and the railway companies, the latter using their own carts, trucks and men as far as they are able. This year, however, the city is to endeavor to let the work per inch of snowfall. Could this be done it would prevent much fraud that is sure to be practiced under the yardage system, especially since work of this kind coming but five or six times in a year does not permit the maintenance of a proper organization of foremen, tallymen, checkers, ticket men, etc., the city being obliged often to use ordinary laborers to act in such capacities.

The shrinkage of snow is so variable, however, that one making a contract in this way must be something of a gambler. The average shrinkage on our work last winter was 80 per cent, though the heaviest storm gave only 59 per cent; that is, of the quantity that fell on the area of streets we cleaned we removed on an average only 20 per cent, whereas in the larger storm we removed 41 per cent. This shrinkage is caused by the packing, wearing away by vehicles and melting of the snow depending on the humidity and temperature of the atmosphere and the amount of snow that falls at one time.

Last winter the street railway companies of Manhattan removed the snow and ice from about 90 miles of streets and with a total snow fall of 30.16 inches hauled about 117,000 cub. yd. of snow. In the heaviest storms, which occurred February 16th to 20th, there was a fall of 12.2 in., and we removed 681,727 cub. yd. at a cost of about 30 cents per yard, including superintendence, etc.

ADDITIONS TO RAILWAY POWER PLANT AT PROVIDENCE.

The Rhode Island & Suburban Railway Co. is making extensive additions to its power station on Eady St., Providence. The plant now building was originally designed for a rated capacity of 7,500 h. p., but recently the company decided to largely augment its power equipment and contracted with Westinghouse, Church, Kerr & Co. for a new Westinghouse vertical cross-compound Corliss engine designed for a maximum capacity of 6,600 h. p. The cylinder dimensions of the engine are 42 and 86 in. diameter with a stroke of 60 in. The engine will be approximately 35 ft. in height and will be direct connected to a 2,500-kw. Westinghouse 600-volt direct current railway generator, mounted between the main bearings together with a flywheel 24 ft. in diameter and weighing 125 tons. In encouragement of the proposed legislation upon smoke prevention the Rhode Island & Suburban Railway Co. has contracted with Westinghouse, Church, Kerr & Co. for a complete equipment of mechanical draft and Roney mechanical stokers for the 5,200 h. p. of boilers which the new station will contain. Provision for the greatly increased boiler capacity will be made by the addition of a second story to the boiler house for the accommodation of the upper deck batteries.

The line of the Doylestown (Pa.) & Easton Railway Co. has been opened as far as Pipersville and cars are running on a regular schedule.

MASSACHUSETTS NOTES.

The railroad commissioners of Massachusetts have been making a western tour, including Chicago and Detroit, to investigate street railways in that territory. At the last session of the Legislature the commissioners were instructed to report on the advisability of compelling the use of air brakes and fenders and equipping street railway cars with lifting jacks with which to get injured persons from under the wheels in case of accident, and were authorized to go outside the state for their information.

While the lifting-jacks proposition was merely an easy way of letting down the legislator who wanted all cars to be equipped at once, the accident at Pittsfield has brought to the public notice the advantage of power brakes, which it is proper to add, that most of the roads have recognized and already so equipped their cars.

The state has hardly more than entered upon the development of long distance lines with other features, more of a steam road nature so much further advanced in the middle West, and as the railroad commission is having more power delegated to it on these matters yearly by the Legislature, it has determined to investigate for itself.

Several recent hearings have developed the fact that the board is decidedly opposed to any more diagonal crossings of highways by street railway tracks at grades. There have been cases where the board was forced to admit that such crossings were necessary where it has taken pains to suggest to the local authorities that they should order the companies to operate their cars on these crossings at a low rate of speed, an order which the board itself cannot give.

Hearings on approval of locations nearly always develop something that causes an adjournment so that one of the board's inspectors can view the route in person. So common has this become that the board has practically decided to have an inspector look over the ground in all cases before even a first hearing is held.

The statistician of the board is getting in readiness a list of the street railways in the state that have paid 5 per cent dividend for the past five years. Under a new law savings banks are allowed to invest in the bonds of companies that can show such prosperity.

PROPOSED IMPROVEMENTS AT NEW ORLEANS.

The New Orleans Railways Co. has given out the general plan of its proposed change to a four-barn system. Superintendent Black of the construction department is working out the details. The barn improvements will cost about \$1,000,000, and it will require a year to complete the work. The Carrollton, Arabella, Canal and Poland barns will be enlarged for the concentration of the equipment and inside work. The Carrollton barn will be enlarged and fixed over for the headquarters of the Carrollton equipment, which is of different gage from the other lines, being 4 ft. 8½ in., whereas the other roads are 5 ft. 2 in. The buildings of the Canal barn will cover four large blocks of ground, containing modern shops, where the company will be able not only to rebuild its old cars but can construct new ones also. The Arabella barn will be increased so as to cover two blocks instead of one as at present. The Poland barn will be largely increased and will contain wash-houses, repair shops and large sheds.

THROUGH CARS OVER EADS BRIDGE, ST. LOUIS.

An ordinance was passed by the East St. Louis City Council October 28th, giving the East, St. Louis & Suburban Railway Co. permission to connect its tracks to the Eads Bridge line. For this permission the railway company will make a through rate of 10 cents from any part of East St. Louis to Third St. and Washington Ave., St. Louis. The tickets sold for this ride will be somewhat like the ordinary transfer ticket. The time of its issue will be punched on it and the tickets will be dated so the purchaser will be compelled to use it for a continuous ride. The fare for a single ride across the Eads Bridge is at present 10 cents and this will remain the same, the reduction in the fare applying only to those who use the East St. Louis street car lines in connection with the bridge line.

SLOW SPEED GENERATING UNITS AT LOUISVILLE, KY.

What is probably the slowest speed generating unit ever built for electric railway work has been operating in the main power house of the Louisville Railway Co. since February of the present year. The management of this company has for several years strongly favored the tendency toward larger direct connected units that has been so manifest in all later day railway power house designs, but it has also urged that not only the size be increased but that the speed of running be decreased, thereby reducing the peripheral speed of fly wheels and minimizing wear and tear on moving parts. Accordingly in 1898 the company contracted for and installed a 1650-kw. unit built to run at 75 r. p. m. The unit comprised a 1650-kw. 22-pole General Electric generator, direct connected to a 2,500-h. p. vertical cross compound Reynolds-Corliss engine having cylinders 40 and 78x48 in.

This unit gave such good results that the company determined to carry the idea a degree further, and requested the builders to design and construct a 1650-kw. unit to run at 60 r. p. m. The E. P. Allis Co. and the General Electric Co. contracted to do this and the unit illustrated herewith was installed and placed in commission in February of this year. It has been running continually since that time, at a speed of 60 r. p. m., and the results are stated to be entirely satisfactory.

The engine is a 2,500-h. p. vertical cross compound condensing engine of the Reynolds-Corliss type with cylinders 40 and 78x60 in., taking steam at 150 lb. The cylinders are made with the exhaust chamber separated by an air space from the cylinder barrel in order to reduce condensation. The valves are in the cylinder heads, and the engine is provided with Reynolds-Corliss automatic valve gear; a special weighted governor controls both the high and the low pressure cylinders and a safety stop is provided to prevent the engine running away in case the governor belt should break.

The main journals are 28 in. in diameter and 48 in. long. The main engine bearings are of the ball and socket type, having the lower bearing shell rounded to fit suitable receptacles in the bed block.

The pistons are made of cast iron heavily ribbed inside and have follower ball and packing rings. The piston is so constructed that the rings may be inspected or replaced without removing the piston from the cylinder or taking it from piston rod. The vacuum pots are not attached to galleries but to lugs on the sides of the cylinders. The throttle valve stem is of extra heavy pipe to serve as drip pipe.

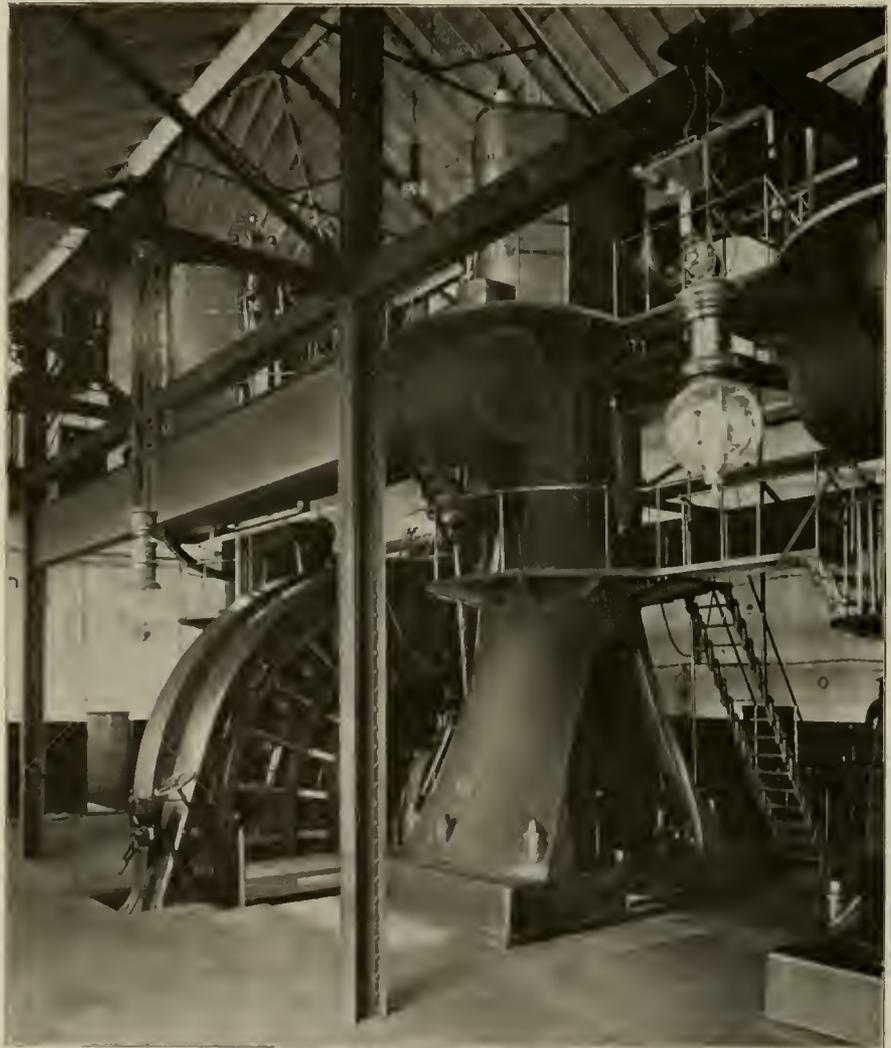
The crosshead pin is 14x11 in. and is fitted into the crosshead with a taper fit and held in place by a heavy steel nut so that it can be removed without dismantling the engine. The crank shaft is 32 in. and the balance wheel 24 ft. in diameter. The latter weighs approximately 200,000 lb. and is made in ten segments. The crank is of the counterbalanced type with crank pin 14x11 in.

The connecting rod is open hearth steel with solid crosshead end and bolted strap crank end, and the cross shaft for the regulating governor has roller bearings. The engine bearing and crosshead guide are water jacketed, the water after passing around the bearings going to the feed water tank to which is also led the exhaust steam from the condenser and feed pump.

The frame is of the Allis circular type bored at the upper end where the crosshead travels. The ends are faced and the slide

bored at one setting insuring perfect alignment. The bored slide reduces the chances of hot journals by allowing the crosshead to travel in any path required by the crank pin should the engine get out of level through settling of foundations. The inside of slide and frame has a sheet iron casing to keep oil from the generator and wheel. The galleries and stairways around the engine are made of checkered cast iron plates supported by brackets attached to the engine and are provided with brass hand rail supported by iron stanchions. The lower galleries as well as the cylinder galleries are connected giving ready access from one gallery to the other.

The generator is a 1650-kw. 26 pole engine type machine built by the General Electric Co. The company guarantees this generator to deliver 3,000 amperes at 550 volts continuously, and also 50 per



ENGINE AND DYNAMO ROOM LOUISVILLE RAILWAY CO.

cent overload for 5 hours without sparking at the brushes, and further guarantees that there shall not be a rise in temperature above the surrounding atmosphere exceeding 40 deg. C. on the 3,000 ampere load and 45 deg. C. on the 50 per cent overload; it also guarantees a 100 per cent overload for short periods without injury to the generator or injurious sparking at the brushes. The brushes remain stationary from no load to 50 per cent overload without appreciable sparking, excessive burning or blackening of the commutator. The dimensions and data on the generator are approximately as follows:

The magnet frame is of cast iron and pole pieces are of cast steel with laminated pole faces bolted to the pole pieces; weight of armature and commutator, 87,000 lb.; weight of magnet yoke and spools complete, 132,200 lb.; weight of generator complete, 226,000 lb.; wire on shunt field, No. 6 B. W. G.; diameter of armature, 204 in.; width of armature and commutator, 54 in.; bore of armature, 32 in.; active length of commutator, 20 in.; allowable wear on

commutator, 2 in.; number of brushes per stud, 12; amperes per sq. in. of contact, 20½

The commercial efficiency at full load is 96 per cent; at ¾ load 95.5 per cent and at ½ load 95.0 per cent.

This unit operates satisfactorily with the 500-kw. and 1650-kw. generators previously installed at this station. The circuit breaker has been pulled at 100 per cent overload without flashing or injury to the machine.

The shaft is 12 in. in diameter and is of Bethlehem open hearth steel, hollow forged, and the unit rests on a foundation of semi-vitrified extra hard brick. The brick foundation is 25x30 ft. x15 ft. deep, and rests on a sub-base which in turn rests on a bed of hard gravel and sand. The sub-base consists of a layer of concrete on which were placed old 50-lb. T rails laid in rows side by side



SLOW SPEED GENERATOR LOUISVILLE RAILWAY CO.

spaced 6 in. apart. Next a leveling course of concrete was laid between and on top of the rails. On this was placed a layer of rails laid at right angles to first layer. This was also filled with concrete, and a third layer of rails laid at right angles to second layer. On top of all was laid about 2 ft. of Louisville concrete cement making a total depth of the sub-base 40 in. The sub-base extends 3 ft. beyond the brick foundation on all sides.

IMPROVEMENTS AT MONTGOMERY, ALA.

The Montgomery Street Ry. was recently purchased by Mr. Richard Tillis and is being greatly improved. Since acquiring the property Mr. Tillis has expended about \$100,000 in improving and reconstructing the entire 20 miles of road which the system includes. New ties have been placed and 70-lb. T rails, made by the Lorain Steel Co. in 60-ft. lengths, have been laid on about four miles of the road outside of the paved district. Ten new convertible cars have been added to the service and new wheels are being placed on all of the old rolling stock.

The Merchant's Light & Power Co. has been recently incorporated in Alabama with a capital stock of \$100,000, and the whole stock has been subscribed by local people. A large interest in the new company has been taken by Mr. Tillis and the purpose of the new company is to furnish light in the business portion of the city and power for the cars of the Montgomery Street Ry. The plant is to have a capacity of 1,500 h. p. and will occupy half a block in the heart of the city. It is expected to be ready for operation by Feb. 1, 1903.

The Montreal (Que.) Street Railway Co. will hereafter run freight cars over its lines between 1 a. m. and 4 a. m.

PERFECT TRACK.

At the regular monthly meeting of the New York Railroad Club, held in New York City on the evening of September 18th, the topic for discussion was "The Construction of Perfect Track." Mr. J. C. Brackenridge, chief engineer Brooklyn Rapid Transit System, had been appointed to open the discussion, and said in part:

A perfect track is one that will always keep its alignment and surface and never wear out. Unfortunately I cannot tell you how to build one or tell you where you can find out. I will confine my observations, therefore, contrary to the title of this paper, to that style of track which, in my experience, is the best track.

The track construction replaced by electric track was the stringer construction; this was adequate for the light horse cars in use in former days and for moderate speeds. With the advent of the electric car came successively heavier stringer construction, the "butterfly" box girder, 5-in. girder on chairs, and others with innumerable styles of joint construction, until with the very heavy equipment and high speeds of the present time the 9-in. girder now so extensively used was adopted for city use. Large sums of money have been wasted upon poor designs of rail, of special work, and on poor installation. The conditions existing upon our city streets are distinct from steam railway practice. The track once laid should last the life of the rail head without attention. This is important, as the cost of track work is largely that necessitated by disturbance of pavement.

The secret of securing the best results is due more than half to the care and skill in laying. In preparing the roadbed to receive the ties, care should be taken to excavate as little as possible below the finished grade line of the bottom of the tie. When the holes are dug carelessly, some being deeper than others, it is impossible to tamp up the track in such a manner that it will retain a perfect surface and line. After the tie holes have been dug and ties laid, the rails should be distributed, then driven up tight to the abutting rail spiked (no allowance being made for expansion). The end of the rails being in close contact, the friction between the faces of the ends will help support the joint, prevent working, and the consequent loosening of the electric bonds. Before tightening up the joints, the rail ends should be in surface and line. This latter is a matter that track foremen are very apt to be careless about, and when this is the case a kink will result which it is difficult to get out. The rail is then buried within the pavement which restrains movement of the rail laterally and protects it from sudden temperature variations.

When the track is laid with T-rail without paving, surfaced and lined, it should be filled in to within about 1½ in. of the top of head of rail and to a distance of about 30 in. outside the gage line. This method of covering the ties prolongs their life, and furnishes lateral support for the tracks. Should the rail buckle or get out of line, due to expansion, it can be remedied by taking off a joint at the place affected, and putting in a trailing-point split-switch; this, however, we find is rarely necessary if the track is properly lined and surfaced in the first place. Apropos of this just a suggestion for steam railroad work—when the rails and ties are left exposed, the rails are apt to creep, especially on grades, thus making it difficult to keep crossings with other tracks in line, particularly so if the crossing be at right angles. This difficulty can be overcome and the crossing maintained in perfect line by putting in switch points on either side to take care of the movement of abutting rails. This is a simple method and will double the life of a crossing at points where there is much movement of the connecting track.

The most expensive as well as vexatious question in track work is that of maintaining joints, especially in paved streets. In designing a fishplate, advantage should be taken of every square inch of bearing area that a rail affords for a distance of 10 in. from its end. It stands to reason that a rail can be better supported by using the 50 or 60 sq. in. of bearing area offered by the base of the rail than by the angular bearing obtained by most fishplates under the rail head and on the flange of the rail.

In street railroad construction, where the best pavements are used, such as granite block, brick or asphalt on a concrete foundation, as I said before, the paving costs more than the actual track work. It is, therefore, of first importance that the track, once laid, and paved up, should not be disturbed until such time as the rail is worn out. This would not be difficult were it not for the joints, which, with the ordinary fish-plates, give way long before the rail is half worn. I have found that by using a sole plate similar to the old stringer joint plate in connection with the regular fish-plates or above-mentioned joints, placing ties 5 in. between faces at the joints (making a suspended joint), and driving the rails up tight together, tightening the joints, then paving the street with as tight longitudinal joints between the stones as possible from the head of the rail toward the curb, being careful to see that the stone next the rail is fitted up close to it in order to prevent the rail from getting out of line (due to expansion)—on such track there will be no necessity for repairs until the head of the rail is worn out. I am a believer in wooden tie construction, having used the longitudinal concrete beam with steel tie rods and found that the rigid foundation shortened the life of the rail more than 25 per cent.

One of the difficulties I have found with the 9-in. girder-rail track under heavy traffic was that it always became wide gage, no matter how carefully the track was laid. After giving this subject considerable thought, I came to the conclusion that this was due to the fact of the web being in a perpendicular line with the gage, which threw the weight outside the center of gravity, resulting in the tipping out of the rail, and the consequent widening of the gage of the track. This difficulty I overcame by designing two rail sections, known as the standard Brooklyn Heights R. R. section, which is a tram rail, and a grooved rail on the same principle. In these sections the web was moved back from the gage line about $\frac{1}{2}$ in. and no more difficulty was experienced. The design of the groove rail is such that the flange of the wheel forces the dirt over the lip of the rail and insures a good contact between the head of the rail and tread of the wheel. In other types of grooved rail there is a tendency for the flange to pack the dirt in the bottom of the groove, thereby lifting the tread of the wheel off the head of the rail, making poor contact and causing a greatly increased power consumption.

In closing I realize that the discussion may deal largely with the wisdom of laying the track with tight joints, but my experience has been that, even where the joints are left open, it was found that the friction between the plate and the rail was great enough to prevent the expansion from closing up the joint.

After the reading of the paper by Mr. Brackenridge, Mr. R. Trimble of the Pennsylvania Lines West of Pittsburg, presented a paper dealing with the subject of track construction for steam railroads.

President Vreeland of the club then called for general discussion.

Mr. W. Boardman Reed, engineer maintenance of way, Metropolitan Street Ry., of New York, said in part:

The subject of track construction, whether perfect or otherwise, is one of great import to nearly every department of all railroads, and though it has been written about, talked about and discussed for many years, is worthy of more thought. Especially is this so since the great increase in weight of all rolling stock and speed of trains demands a much better structure than was required a decade ago. Then again, the introduction of electric power for urban, interurban and suburban service demands a far better track than had been used for horse-car and also, owing to difference in application of power, I believe requires a different construction for a perfect track than does a steam railroad. The points to be set forth are more for the purpose of provoking discussion than imparting information.

The subject under discussion being "Construction of Perfect Track," it is well to endeavor to decide what would constitute a perfect track. The definition given by Mr. Brackenridge hardly covers the matter, and I must differ from him as to the best track construction for electric railways, especially for paved streets. As the power applied to the wheel emanates from a revolving armature there it, or should be, on even application at all points of the circumference and there is nothing to cause a pound or hammer blow, therefore, I believe no necessity for a flexible roadbed; I consider a perfectly rigid roadbed by far the best. Especially is this true on paved street for every movement of the rail is imparted to the pavement and tends to raise it off its bed. It is impossible to maintain asphalt in even a safe condition unless the track is as nearly

rigid as possible and the repairs to any first-class pavement alongside of a flexible track will exceed the extra expense of rail renewals, if there is any such extra expense, which I doubt.

In Manhattan all electric tracks built since 1868 by the Metropolitan Street Railway Co. are constructed on a perfectly rigid foundation. In lieu of ties cast-iron yokes, bedded in concrete, 5 ft. between centers, are used, so that with a 9-in. 107-lb. rail, and 12-hole, 30-in. joint plates there is but little or no give to the structure even with the heaviest cars. This same result can be obtained on the ordinary trolley roads by laying a good concrete foundation under and around the ties or laying the rails on a concrete beam of sufficient cross-section. To be sure, at crossings, switches and frogs there is always a pound and consequently excessive wear, but that this is increased by having a solid foundation I doubt.

On steam railroads, where the power applied to the locomotive drivers is conveyed by reciprocating parts, no matter how much care is used in balancing, there is always a hammer blow struck with each revolution of each driving wheel. The experiment of laying a copper wire on the head of a rail is old, but it illustrates the effect of these hammer blows perfectly. With a solid foundation, therefore, for steam railroads there would not only be excessive wear on the track structure, but upon the locomotives as well, so that a flexible track is desirable; I believe for this reason joint plates should not be too long and should be supported and fitted as well as possible to the rail, so as to prevent any lateral motion, and to prevent the drop of the drop rail. Track for steam railroad has been laid experimentally on concrete foundation, but did not prove a success, for the concrete was not sufficiently elastic to withstand the pounding of locomotives.

The joint has always been the weakest part of any track, whether on a steam or electric road; the 30-in. 12-hole joint so generally used on 9-in. girder rails for electric railways is strong enough and should never break, yet it will not hold up the rails during their life. The theory of supporting the rail at the base as well as the head by the joint plate is, like many others, better than the practice owing to the variation, slight as it may be, in the height of adjacent rails. Welding, whether cast iron or electric, makes as nearly a perfect joint as can be had, but it is not suitable for rails exposed to great changes of temperature, and even on rails buried by pavement it has its drawback. The necessary heating of the rail-ends makes them brittle, so that either rails or joints will break in cold weather or track will get out of either line or surface, and is likely to play havoc with intersecting lines. Could ends of rails be machined and joint plates of almost any of the existing types be machined to fit them a perfect joint could perhaps be obtained and joints would hold up during the life of the rails, thus lessening materially the worry and labors of all trackmasters.

Mr. J. V. Davies drew attention to the fact that the conditions of loading and operating rolling stock on electric railways are so different from steam railroad conditions that track built for electric railway purposes would not be suitable for steam roads. He also thought that the maintenance and keeping up of track is really of far greater importance than even the original construction, for, an original construction could be imagined that would be almost, if not altogether, perfect, but it would be difficult to conceive, from our present point of view, of a way to maintain track in perfect condition.

Mr. Davies said in conclusion:

In this matter of track construction there is another and new feature which is becoming of considerable importance in this and other large cities in connection with subway construction. In the Rapid Transit Subway there was originally adopted a concrete construction of track, in which ties and rails would be imbedded solid in a concrete bed. There are some samples of this track on the Long Island Railroad in the neighborhood of Jamaica, L. I., which were put down some time ago for experimental purposes; but, I understand, the Rapid Transit Commission has definitely abandoned the idea of using that type of concrete track and intends to substitute therefore a ballasted track with an exceedingly thin quantity of ballast beneath the ties. It seems to me that the ballasted track for this service is without doubt the better type of construction for the heavy and continuous loads placed upon it, principally on account of the ability to surface and maintain it. The construction of track on concrete is one that it seems to me is impossible to maintain in any kind of condition after it once gets out of shape; but it is quite a question whether there is anything which can be designed which

can be better and more advantageous than the ballasted track, under the special and particular conditions of this service.

The president then called on Mr. W. L. Derr, who spoke as follows:

I will not attempt to examine the subject before us from other than an engineering point of view. Speed is speed, no matter whether the power developing it is steam, electricity or other kind of power, and the structure over which the power moves a body is practically the same for all.

The general principles of railway location are so well known to those who make a business of it—and no one else should undertake it—as to need little comment here. It is a matter of careful attention to details, as well as the general situation. Many matters, not engineering but commercial, confront the locating engineer and cause a change of his plans. Naturally, then, results are attained only by a careful attention to details.

To ensure perfect track, one must begin at the beginning and see that the location of the line is correct. To enumerate all the details of location is out of the question, but a few important "don'ts" apropos of safety, the first consideration, may be mentioned.

Don't locate cuttings in drift formation, in or upon a hillside.

Don't dam the flow of natural drainage waters or snow drifts by an embankment.

Don't divert a stream in a formation of porous character.

Don't, in loose soils, locate a railway close to a highway. Even at an outlying station it may be well to keep some distance from a highway. If the railway is above the highway the former may slip on the latter; if below, highway may slip down on railway.

Don't locate stations on other than a surface of natural soil.

Don't fail to examine closely formation on both sides of a valley. Even in the narrowest, one side may be the firmer.

Don't fail to find out which side of a valley receives the greatest amount of sunshine.

Don't fail to remember that the side of a mountain to leeward of prevailing wind generally receives the greatest rainfall.

Don't, in snowy regions, unless there is some very good reason for it, locate a railway on the bare side of a valley, but on the side that has trees.

Don't locate a tunnel under the low point or pass of a mountain. At such point, the rock formation has probably been much more disturbed by geological action.

Don't approach a river bridge by a high embankment.

The drainage of a roadbed must be as nearly perfect as possible if perfect track is to be maintained. Too much attention cannot be given to this detail. Bear in mind that while air, frost, vibration and overloading may cause your earthwork to fail, water in sufficient quantity is sure to do so and is the greatest enemy to the stability of a line. Work above sub-grade is almost wholly a question of details. Ballast of the best obtainable material must be used; the material which will free itself of water quickly is the best, and broken stone will do this better than any other material.

The foundation for the rails, that is the ties, is the next consideration. Wood is, and probably will for a long time be, the principal material for this purpose. Durable timber is necessary in order to reduce cost of reconstruction. It may be safely assumed that for each renewal the unit cost of timber is considerably greater. Wood is generally destroyed by two kinds of rot: common rot and dry rot. Common rot is nothing more or less than the very slow burning of wood by atmospheric action. The difference between active combustion and the effect of air on wood is the relative speed of destruction. Dry rot starts within the wood, and converts the fiber into dry dust; its cause is inherent in the timber, and only requires the concurrence of a few conditions to come into action. To prevent the destruction of timber, more methods have been devised than for any other one purpose. To drive out the sap, and prevent air from entering the wood is the requirement necessary for its preservation. I wish some one would try the experiment of driving out the sap and coating the outside of the tie with a plating of lead. Lead, as you all know, is one of the least destructible of metals.

Next is the rails—the real railway as it were. One of the many things in which our electric railway friends are to be congratulated is the use of rails of greater depth of section. Steam roads are gradually adopting the same practice and will, no doubt, keep doing so until they get a much deeper rail than now used. The principal

reason for deepening the rail, is to increase its vertical stiffness and provide room for a better joint fastening. But another and quite as important reason may be given—the effects of the transverse minute cracks developed in the head of the rail by the loads passing over it are better resisted by a rail having the least deflection. Recent observations seem to indicate that the deterioration of steel rails is confined almost if not wholly to the upper side of the head, or running side of the rail, the character of the base not changing even after long heavy service. Generally speaking, the deterioration consists of increased hardness, with corresponding loss of toughness, and the development of transverse cracks, minute at first but gradually increasing with the use of the rail.

The rail joint comes in at this juncture for consideration. The aim in designing a joint is to make it as strong as the rail, which means that the joint must withstand the action of a passing load the same as the rail. When a joint settles under a moving load it usually moves laterally as well as vertically and, therefore, should be able to resist lateral thrust. On curves, joints always receive lateral thrust from a moving load. I predict that in the near future rails of high-speed lines will be tied laterally, in addition to the ordinary fastening to the cross ties; this can be accomplished only with the use of a deeper rail.

Frogs and switches which are weak points at best must, for safety, be of the best material and workmanship and, if possible, be made of a better grade of steel than the ordinary rails. Indeed, a special grade of material for these articles is needed. The wearing parts of the wings of frogs should be strengthened in every possible way. It goes without saying that perfect track will be fully equipped with perfect interlocking devices for operating the switches.

But after the structure is completed and the very best rolling stock placed upon it the whole aim, safety and comfort at high speed, will be defeated unless it is well maintained. Build as good cars as you may, with the best wheels and trucks known to the mechanical department; build tracks of the best material; but if you do not keep good gage, line and surface, the whole goes for naught.

Mr. M. M. Wood, of the General Electric Co., spoke on the subject of bonding of electric railway track. Mr. Wood said in part:

I would like to refer to surface contacts. We represent here (referring to a sketch on a blackboard) the cross-section of a rail showing the web—this will be half an inch in thickness, generally speaking. Into this we will put a long terminal bond whose terminal we will consider as merely a common copper plug or rivet placed in the web. I will undertake to say that 95 per cent of the holes drilled in rails for the purpose of inserting bonds are left in a rough state. You drill a hole through a piece of steel and there is no man can sharpen a drill but it will leave a little line running down through; as you drill deeper and deeper you apparently get a very fine thread in the hole. As long as the surface is bright that thread is a good thing to have in there—it is better than if you reamed the hole out smooth, because you have an anchorage; but if you do not take advantage of that anchorage it is of no account whatever. If you smooth that hole out and look at the surface through a microscope—you don't have to in general practice, you can see it with your naked eye—you will find many small holes in it and only 60 per cent of the surface is left for contact, the other 40 per cent is made up of little imperfections in the steel itself. If you expand a piece of metal, no matter whether it is copper, silver, gold, or whatever it is in there for the purpose of carrying current you give it a certain pressure and a certain angle, you are supposed to expand it so that the metal will flow into those imperfections or holes in the steel surface and give you additional surface contact.

But this is the result that you actually do get: When you put a solid plug in a hole and then compress the ends together through hydraulic pressure, hammer blows or any other method, and batter that together, as soon as you commence to drive the copper down into the hole it expands and goes into these imperfections or small holes in the steel; not satisfied, however, with getting a little expansion so that the metal in the plug creeps out into these small holes, you try to get a solid connection and therefore ram the plug down just as hard as you can. When you get it down so that it is riveted in there or eyeletted you have carried your copper longitudinally along on the surface, so that the edges of all these imperfections into which the copper has crept have sheared off the

metal along the remaining body of the terminal. We have made tests on plugs of copper in steel, starting at (we will say) a thousand pounds' pressure, applying a certain number of amperes of current and then noting the resistance; increasing the pressure and testing again we have invariably found that a certain limited pressure will produce the best results—but as that pressure is exceeded the results are less and less satisfactory. Try the experiment in this way: Cut one hundred threads to the inch through the web of the rail, or a block of steel, put in a plug of copper and expand it any way you choose so that the copper changes in position as you drive it along. Then saw the block open and you will find that the threads still remain on the steel and are not on the rivet—you have an intermediate film of copper which oxidizes and increases electric resistance.

If you are going to use a flexible bond see that you get a perfect union between your cable and the terminal itself, that you get an expansion of your terminal directly in line at right angles—do not try to get an expansion by shoving the plug through a hole and then expanding it and shoving it a little further. Keep your terminal as near the same length when you get through as when you put it in, and expand it by some means; there are several schemes for that purpose. If with the bond you use a terminal seven-eighths of an inch in diameter, drill your holes with soap water—don't use oil, it is not necessary; have your drilling done right ahead of the man who puts in the bonds, so that the metal will be bright and clean for the reception of the terminals; don't ream the drilled holes out, but wipe them out with a piece of clean waste. When you drill your hole through the plate to the rail, have a little collar made with a cutting edge and put on the drill, so that when the hole is drilled the collar will face off any burr on the edge.

We are indebted to the Proceedings of the New York Railroad Club for the foregoing transcriptions of the remarks before the September meeting.

YORK (PA.) NOTES.

Several large companies have recently been organized for building power plants on the Susquehanna River between Havre De Grace, Md., and Wrightsville, and it is stated that these plants are being built in connection with a large electric railway which is to operate between these places for passenger, freight and mail traffic, also for the equipment of the old Susquehanna & Tide Water canal for running freight boats by electricity, and for the proposed Maryland & Pennsylvania R. R., which is to operate trains by trolley from York to Delta, a distance of 50 miles. It is expected subsequently to convert the steam road from Delta to Baltimore into an electric line. Work has been commenced by the power plant companies and surveys are being made for the building of several dams across the lower Susquehanna River. The company which expects to operate the canal boats by means of a trolley system has employed mechanical and electrical experts who are now engaged upon the plans for hauling the boats by means of trolley cars.

The Maryland & Pennsylvania R. R. was chartered in 1856 and since the organization of the York Traction Co., its patronage has fallen off considerably. For this reason it is now proposed to substitute electricity for steam.

NEW TERMINAL COMPANY IN CINCINNATI.

The Traction Terminal Co., of Cincinnati, has been organized and incorporated by interests connected with the Cincinnati Traction Co. and several of the interurban roads centering in Cincinnati. The object of the new company is to build a line within the city which will afford entrance into Cincinnati for standard gage interurban railroads, the gage of the Cincinnati Traction Co. being 6 in. wider than the standard. None of the details of the proposed road have yet been decided upon, but the plan includes the building of a terminal station for the joint use of the interurban lines.

Since the Millcreek Valley, O., lines have changed hands and are practically operated by the Cincinnati Traction Co., the by-laws of the Mutual Protective Association of the Traction Company's employees have been amended so that the Millcreek Valley men may become members. A general invitation has been extended them to join the association.

REMOVING PAINT BY SAND BLAST.

The ordinary gasoline blow torch commonly used in paint shops for removing old paint from cars and trucks preparatory to repainting is not only an inconvenient thing to handle but is constantly a menace to property and requires the strictest attention to prevent fires.

Mr. J. Millar, superintendent of rolling stock for the International Ry. of Buffalo, has abandoned the use of blow torches entirely in this work and now uses a home-made sand blast consisting of a sand tank, a few feet of 3/4-in. iron pipe, and a nozzle made by

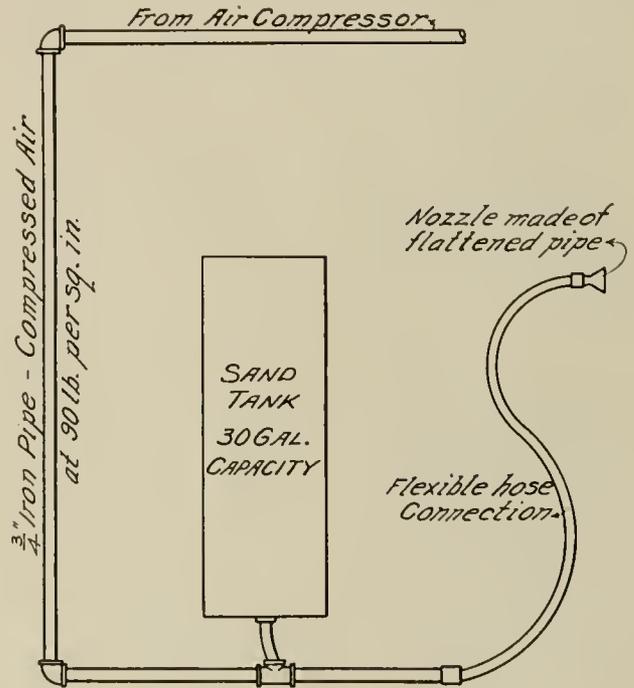


DIAGRAM OF SAND BLAST.

flattening out a piece of 3/4-in. iron pipe. Compressed air is taken through the iron pipe from an air compressor in the main shops. The sand which must be of fine clean quality is fed from the tank into the air pipe in the manner indicated in the diagram, the force of air combined with gravity, being sufficient to draw the sand down into the pipe in a good steady stream. By means of the flexible connection and nozzle one man directs the sand against the surface to be cleaned, exactly in the same way as he would handle a blow torch of any kind. Mr. Millar states that with an air pressure of approximately 90 lb. and a good quality of sand every particle of old paint is removed and a cleaner surface is secured than could be obtained with a blow-pipe flame, and in just one-half the time, inasmuch as one man now does the work formerly requiring the services of two men.

REORGANIZATION OF THE NORTHERN OHIO TRACTION CO., AKRON, O.

The reorganization of the Northern Ohio Traction Co., which will be known as the Northern Ohio Railway & Light Co., with a capitalization of \$7,500,000, was completed early in November. The purpose of the reorganization is to raise funds for the purchase of additional cars, double tracking, and building a new bridge over the Cuyahoga River at the gorge between Akron and Cuyahoga Falls. The bridge has already been contracted for. The company is contemplating building an extension from Barberton to Wadsworth, a distance of seven miles, early next year and the entire line will be greatly improved.

Mark W. and George J. Woods, who are small stockholders in the Lincoln (Neb.) Traction Co., have brought suit to restrain the use of the profits of the traction company for the construction of a steam heating plant now under way.

WEAR OF STREET RAILWAY RAILS.

The wear of street railway rails at Sheffield, Eng., was the subject of a paper read by Mr. C. F. Wicke, city surveyor of Sheffield, before a meeting of the Association of Municipal and County Engineers and Surveyors.

The municipal railway of Sheffield consists of 50 miles, measured as single track, and about 100 cars are in use. The maximum grade is about 10 1/2 per cent and the shortest curve has a radius of 30 feet. The rails are grooved girders weighing 108 lb. and are in 30-ft. lengths. They have 7 1/2-in. flange, 7 in. total depth and 1 11/16-in. tread, the groove is 15/16 in. deep. The clearance between the wheel flange and the bottom of the groove is 7/16 in. and it is considered that when the rails have worn sufficiently to enable the flange to touch the bottom of the groove their life will be at an end. Before this can happen, steel with a cross-section area of .700 in. must be worn away.

Observations have been taken from time to time to ascertain the rate of wear on these rails and the results are given in the following table. These are interesting as showing how much more the wear is regulated by the gradient than by the number of journeys, the reason for this being that the action of the brakes is much more destructive to rails than the up-hill traction.

Track.	Gradient.	Months wear.	No. of journeys.	Reduction, depth of groove, in.	Total possible reduction, sectional area of tread of rail, per cent.
A.	down / up . . .	1 in 15	34	764,200	0.25 } 54.1 7.09 } 15.1
B.	down / up . . .	1 in 23	34	865,507	0.15 } 30.6 0.09 } 15.1
F.	down / up . . .	1 in 787	34	593,704	0.125 } 20 0.06 } 8
K.	down / up . . .	1 in 268	19	254,412	0.07 } 11.6 0.035 } 5
L.	down / up . . .	1 in 15	34	166,734	0.07 } 11.6 0.03 } 3.9
N.	down / up . . .	1 in 84	30	65,384	0.06 } 8 0.06 } 8
O.	down / up . . .	1 in 79	26	172,558	0.06 } 8 0.028 } 3
P.	down / up . . .	1 in 17	30	65,384	0.06 } 8 0.025 } 2.9

CHICAGO UNION TRACTION CO.

Two court decisions affecting the Chicago Union Traction Co. and one arbitration award have been made public since our last issue.

The two decisions were rendered by the Illinois Supreme Court October 25th, one in regard to transfers and the other on cleaning streets.

TRANSFERS.

The court holds that the Chicago Union Traction Co. and the Chicago Consolidated Traction Co. are practically one system, so that transfers must be given everywhere within the city limits between the north and west side lines operated by the Union Traction Co., and between these lines and those of the Chicago Consolidated Traction Co. The court holds it to be apparent that the street railway lines of the outlying companies were built as feeders to and extensions of the West Chicago and North Chicago roads and that they all constitute one system. The Union Traction Co. acquired nearly all the capital stock of the Consolidated company in 1899 and this is held to make the relationship of the two companies still more positive. In the second case these transfers were refused from one line of the Union Traction Co. to another line of that company on the ground that the city council has no power under the statutes to regulate the fares charged by street railway companies or to require transfers to be given. The court states, however, the contention that the city has no power over street railways would be found incorrect upon examination of its charter, and holds that the traction company has not shown that the enforcement of the transfer ordinance would reduce the company's earnings so as to constitute a taking of its property without due process of law. In meeting this contention the court says that "a railroad company is not entitled to exact such charges for transportation as will enable it at all times not only to pay operating expenses, but to meet the

interest regularly accruing upon all its outstanding obligations and justify a dividend on all its stock."

The Chicago Union Traction Co. will apply for a rehearing on this case.

STREET CLEANING.

In this case the court says:

"It does not seem unreasonable that the city should require the traction company to clean and render healthy that portion of the street occupied by the tracks of the company under the circumstances of the case. In order to secure the public health and comfort the property of individuals and corporations alike may be subjected to reasonable restrictions and burdens. It does not appear unreasonable that the traction company, having in the exercise of the special privilege enjoyed by it contributed to the unsanitary conditions which injuriously affect the public health and comfort, should be required to aid in removing such conditions. The privilege enjoyed by the defendant in error to maintain its railway in the street and operate its cars thereon is to be exercised in the interest of the public; it was to serve the public that the privilege was granted to it. Its business and property are impressed or affected with a public use. It may therefore be subjected to municipal regulations of a greater scope in the interest of the public at large than that of a railway company exercising its franchises on its own road bed."

The court had previously decided that an ordinance requiring individuals to clean the street in front of their property was invalid, but distinguishes this case from the others because "the street railway occupies the street itself and the presence of its track contributes to the accumulation of dirt and makes it more difficult to keep the street clean.

WAGES.

The negotiations between the Chicago Union Traction Co. and its employes which have been pending for several months resulted in the question of wages being submitted to a board of arbitration. On November 6th the board made public its award, which was as follows:

In the matter of the differences between the employes of the Union Traction and Consolidated Traction Street Railway Companies, and said companies, the board of arbitration makes the following finding:

1. The wages of motormen and conductors running electric cars on the Union Traction lines, and conductors of grip cars or trains, shall be 24 cents per hour, except as hereinafter provided.
2. The wages of gripmen and conductors operating more than one car, including combination grip cars, on the Union Traction lines shall be 25 cents per hour.
3. The wages of the motormen and conductors of the Consolidated Traction Co. shall be 23 cents per hour.
4. Employes who have served the company for less time than six months shall receive the same wages as are now paid, provided the company shall not discriminate so as to discharge old employes and take on new ones for the purpose of hiring at a lower rate.
5. Trippers shall receive \$1.75 per day, excepting such trippers as have not been in the employ of the company for a period of six months, and as to such trippers, the rate shall be the same as now fixed.
6. Night men on the West Side shall receive 40 cents per hour; night men on the North Side shall receive \$2.50 per night, for such men as now receive \$2.25, and \$2.65 per night for such men as now receive \$2.40.

This scale of wages shall be in force and effect from Sept. 15, 1902, to May 31, 1904.

The question of reinstatement of discharged employes is still pending before the arbitration board. The board did not find evidence that the company had discriminated against members of the union since the agreement made May 31st not to do so.

The Richmond (Ind.) Street & Interurban Railway Co. has received four new interurban cars which will soon be put into service between Richmond and Cambridge.

The Toledo Railways Light Co. has awarded the G. C. Kuhlman Car Co., of Cleveland, a contract for the construction of ten closed cars which are to be delivered in 60 days. The cars will be of standard size with double trucks and will be equipped with the Detroit platform, rattan seats, and side lights.

RULES FOR STREET RAILWAY EMPLOYEES.

The Birmingham Railway, Light & Power Co., of Birmingham, Ala., has recently adopted a code of rules for the government of conductors and motormen, in the introduction to which are treated a number of points not usually mentioned in books of rules, and we believe the following extracts will be found of interest.

The rules were formulated by Geo. H. Davis, general manager of the company; J. B. McClary, manager of the railway department, and Geo. H. Harris, superintendent of traffic, who have endeavored to compile a code that would cover all the essential features in the operation of the road.

ORGANIZATION AND DISCIPLINE.

All employes of the Railway Department of the company engaged in operation and maintenance, with the exception of the overhead line maintenance, are employed and discharged by the manager of the Railway Department. The manager of the Railway Department being responsible to the president and general manager of the company for the condition of the road and the conduct of employes, his authority is necessarily absolute.

General orders or instructions applying to more than one employe at one time and one place will always be issued in written or printed form and published on the bulletin boards of the company or in bound copies issued to individual employes.

Special instructions may be given by any officer in charge at any time. These may be given in oral or written form, but they never apply to more than one employe at one time and one place.

GENERAL DEPARTMENT.

The officers of the Railway Department of the company are as follows:

- President.
- Vice-President.
- General Manager.
- Manager of the Railway Department and Claim Agent.
- Secretary.
- Auditor.

TRANSPORTATION DEPARTMENT.

- Manager of the Railway Department.
- Superintendent of Traffic.
- Assistant Superintendent of Traffic.
- Schedule Agent.
- Instructor and Employment Agent.
- Station Foreman.
- Division Dispatchers.

MECHANICAL DEPARTMENT.

- Manager of the Railway Department.
- Superintendent of Equipment.
- Master Mechanic.
- Roadmaster.
- Shop Foremen.
- Track Foremen.

In general, all orders or instructions issued by an officer to employes will be issued through the officers of the company next in rank, as outlined in the foregoing statement. In case orders or instructions are issued by any officer of the company direct to an employe, the officers in a given department of the service ranking between the employe to whom the order or instructions are issued and the officer issuing them, will immediately be given copies or other information of the orders or instructions thus issued. Where practicable, orders or instructions will be issued in written form and copies sent to all officers of the department receiving the order.

All orders given by any of the above officers of the company in the departments as mentioned will be promptly obeyed. If conflicting oral orders are given, the order given by the officer of superior rank will be obeyed.

If orders given by any of the above officers of the company are exactly carried out, the officer giving such orders will alone be responsible for the same.

PROMOTIONS

Promotions in a department will be made according to seniority in the service, provided candidate have equal qualifications. A record

is kept of reports of officers of the company of each employe's work for each day, and an employe's discharge is based upon this record.

There are, however, six things, the reports on which do not form a part of this record, and which are, due to their character, considered sufficient cause for immediate discharge. They are:

- (1) Disloyalty to the company.
- (2) False reports, either oral or written.
- (3) Intoxication.
- (4) Dishonesty.
- (5) Fighting, or gross ungentlemanly conduct.
- (6) Failure to flag crossings.

No employe who has been discharged will be reinstated. It is the policy of the company to re-employ men in good standing who have resigned from their positions.

OPEN RECORDS.

An employe is at liberty to inspect his own record as reported by officers of the company, or that of any other employe at any time.

Records are made according to a fixed scale which applies to all employes alike. This is open to all employes for inspection.

Whenever an employe does anything unusually creditable for the interests of the company (for example, making an excellent stop when a person or vehicle crosses directly and unexpectedly in front of a car), if an officer of the company does not see the occurrence, the company would be pleased to have employes hand in the names of one or two witnesses who observed it; in this way credit can be given for every creditable thing that is done.

STUDY OF THE STREET RAILWAY BUSINESS.

Many of the employes of the company are studying street railway design, construction, maintenance and operation, with a plan of preparing to advance themselves in the various lines of the business. It is the desire of the company to suggest, from time to time, such lines of practice, reading and study as will be of the greatest advantage to employes in obtaining information in this connection. To prepare for making any advancement in railway affairs, it is necessary to know well the following: Reading, Writing, Spelling, Arithmetic, the correct use of the English language, the elements of bookkeeping and business methods. Also, if possible, an elementary knowledge of: Car Equipment, Shop Appliances, Steam Engines, Generators, Overhead Lines, Tracks, etc.

It is also necessary to know the price of supplies and the various grades and quality of each variety.

In addition, the following publications are most important for study:

- (1) Street Railway Journal, published weekly by the Street Railway Publishing Co., No. 120 Liberty St., New York.
- (2) Street Railway Review, published monthly by the Windsor & Kenfield Publishing Co., 45 Plymouth Place, Chicago.
- (3) American Street Railway Investments, Street Railway Publishing Co., New York.
- (4) Street Railway Law, published by the Windsor & Kenfield Publishing Co., Chicago.
- (5) Reports of the Boards of Railway Commissioners of each of the following states, which can be obtained by addressing the Secretary of State of each state, and paying the expressage on the books: New York, New Jersey, Connecticut, Illinois, Michigan, Massachusetts, Pennsylvania, Ohio, Iowa.

GENERAL BULLETINS.

1. REQUIREMENTS OF THE SERVICE.

- (a) Skill in the work to be performed.
- (b) Strict attention to business while on duty.
- (c) Absolute reliability.
- (d) Hard and efficient work.
- (e) Genuine interest in the company's success.
- (f) Gentlemanly deportment.
- (g) Neatness.

2. KNOWLEDGE OF BULLETINS.

Ignorance with reference to bulletins will not be considered an excuse for mistakes or delinquencies on the part of employes.

New bulletins issued by the company are kept on file at the different stations of the company. All employes will become thoroughly familiar with bulletins issued previous to their entering the service.

3. EXAMINATIONS.

Every employe entering the service will be required to pass examination covering the work to which he is assigned, together with all bulletins of the company. The result of the examination is entered in the record of the employe.

CITY ORDINANCES.

City ordinances will be carefully obeyed by employes. The following are the ordinances particularly referring to street car operation.

Patrol wagon, fire apparatus, etc., have prior right of way. The patrol wagon, all fire apparatus, trash wagons, and all wagons used for city improvements have prior right of way, so far as necessary for them to perform the work for which they may be detailed or provided, and any person knowingly, carelessly or willingly obstructing, delaying or intercepting the same, or any of them, shall be fined, on conviction, not less than one or more than one hundred dollars.

RAPID BRIDGE REPAIR WORK.

An interesting piece of emergency bridge repair work was performed at Utica, N. Y., on September 16th. On that date the Savage Reservoir, located about two miles above the city of Utica, suddenly failed, permitting approximately 200,000,000 gallons of water to flow down the valley in a raging torrent, destroying property to the amount of several hundred thousand dollars. After having spent considerable of its force, the volume of water was turned aside by a steam railroad embankment, and brought up against a second embankment, which carried one of the double-track suburban lines of the Utica & Mohawk Valley Ry. At this point in the electric railway embankment was an old culvert, built some years ago of solid masonry, with dirt fill on top. The opening in the culvert was about 40 x 30 ft., but this was entirely insufficient to carry off the flood, the result being that the volume of water rapidly rose above the opening of the culvert and was soon surging against the bank, nearly to the level of the rails. The old



IMPROVISED TRESTLE ON UTICA & MOHAWK VALLEY RY.

The following are some of the captions of city ordinances which you will take due notice of and not disobey:

Running over fire hose, Section 554.

Willfully causing a collision, Section 550.

Driving through funeral procession.

Must clear crossing before stopping car, Section 484.

An ordinance to regulate street cars and railroad trains at street crossings:

Be it ordained by the Mayor and Aldermen of Birmingham, That it shall be the duty of all persons having charge of locomotives, cars, trains, electric cars or dummy trains in the city, to bring the same to a full stop before crossing any railroad, street railroad or dummy railroad within the city of Birmingham, Jefferson County, Alabama; and any person violating any provision of this section, shall be fined, on conviction, not less than five dollars nor more than one hundred dollars, and may be imprisoned, and may be required to work at hard labor on the streets in said city for thirty days.

Provided, That this ordinance will not apply to any dummy, railroad or electric car crossing where flagmen are now, or may hereafter be stationed, while such flagmen are on duty.

Street railway tracks have been completed and car service inaugurated between Superior, Wis., and Billings Park on the St. Louis River.

masonry work was not equal to the pressure, and in an hour or so the entire culvert and bank gave way.

The break in the reservoir occurred about 2 o'clock in the afternoon, and the break at the electric railway embankment about 3 o'clock. By 5 o'clock of the same afternoon the waters had receded sufficiently to permit inspection and estimate of the damage done. By 7 o'clock Mr. C. Loomis Allen, general manager of the Utica & Mohawk Valley Railway Co., had a force of men at work repairing the damage. At Mr. Allen's suggestion it was decided to repair the break by building four cribs of ties, as shown in the illustration, two supporting piers being put in for each track. The ties used were sawed yellow pine, 6 x 8 in. x 8 ft. A good foundation for the piers was obtained in the bed of the creek, and they were carried up to the top of the bank without bolting or binding of any kind. On the top of the piers were placed heavy stringers 8 x 12 in. x 36 ft. long for supporting the rails and track ties. Several street arc lamps were strung at advantageous points, and a force of 30 men was organized in the repair work all night. By 7 o'clock next morning one track was ready for use, and by 9 o'clock the second track was completed. The illustration shows a double truck car on the improvised trestle, the photograph having been taken on the morning of the day after the flood. The trestle has been in use continuously since the break, and is evidently as strong and trustworthy as the old masonry culvert. The total distance from the bed of the stream to the base of the rail is 20 ft., and there are

about 620 ties in the four piers. An odd occurrence in connection with the break, and one that somewhat delayed the work of repair, was the breaking of a trunk gas main, which was embedded in the embankment close to the railway tracks. When the bank gave way this gas main was broken, and the escaping gas became ignited, making an incipient Pelee until the gas company could be notified and the gas shut off.

The Savage Reservoir was built in 1873-1875 at a cost of \$157,000. The bank at the north end was 70 ft. high, had a base of 30 ft., and was 20 ft. across at the top. The reservoir was about $\frac{1}{4}$ of a mile in length, had an area of 30 acres, and a capacity of 300,000,000 gallons when filled to the brim. The actual quantity usually carried was from 150,000,000 to 250,000,000 gallons, and at the time of the failure the reservoir contained approximately 200,000,000 gallons. The cause of the break was not determined, but was thought to have been due to burrowing by beavers. Fortunately, signs of weakening were discovered in time to give ample warning throughout the valley below, and no lives were lost as the result of the flood.

TRAM CAR DRIVING.*

BY H. B. PHILLIMORE.

With the advance of electric trams we have had many examples of a car getting beyond the control of the driver, and accidents resulting of a more or less serious nature. Some have necessitated an official inquiry; in the majority of cases nothing more serious has occurred than a damaged panel, or a shock to the nerves of the passengers. But even these are of serious consequence, for our cars will not be a success or pay as they ought, unless we obtain the entire confidence of the public.

Probably in the future many of these accidents will be averted by our being able to give the driver more instantaneous command over his car.

Meanwhile, we must make the utmost of the means of control at present provided. This we are not doing so long as drivers are to be seen in some of our large towns who have to look at their controller, or who ring their gong with their right foot.

A great deal could be done towards ensuring public safety by more careful training and more efficient supervision than prevails in some places.

And there is another direction in which more trouble might be expended; namely, in the designing of the front platform, and in the arrangement of the various means provided for controlling the car. There are usually six handles and pedals to be manipulated:—

1. Controller handle for regulating power.
2. Emergency brake and reversing lever.
3. Gong pedal.
4. Hand brake lever.
5. Hand brake ratchet pawl.
6. Sandbox pedal or pedals.

These are arranged to be worked as follows:—

1. By the left hand.
3. By the left foot.
4. By the right hand.
5. By toe of right foot.
6. By the heel of right foot.

No. 2 is worked by the left hand for reversing, and the right for the emergency brake.

The various duties are distributed in this way, because it is of utmost importance that it should be possible to perform more than one operation at the same time.

Thus, in the event of a foot passenger not noticing the approach of a car and stepping suddenly in front of it, the driver wants to cut off current, ring the bell, apply the hand brake, and, perhaps, sound the track, and they must all be done instantly. For, suppose it takes the driver one second to cut off current before he can ring his bell, and one second to ring his bell before he can apply his brake, and suppose the car to be travelling 12 miles an hour, then the car will have travelled six yards before retardation commences, and those two seconds may mean much to the future life of the pedestrian.

*From *The Electrical Review*, London.

A driver who can retard and accelerate the speed of his car quickly can, with equal safety to the public, do quicker time through traffic than one who is less expert.

But there have been cars built in which it is quite impossible to stand in such a position that all the necessary operations can be carried out at one and the same time.

The driver must have one hand on his controller and one on his hand brake lever.

The left heel should be on the floor of the platform, and the toes on the gong pedal. The gong is sounded by raising the toes and then depressing them again.

The right foot should be so placed that the toe touches the pawl of the ratchet, and the heel is at the side of the sand pedal, so that it can be quickly raised and brought down again on a sand pedal. It should be possible to keep the sand pedal depressed with the heel while the toe is pressing the pawl into place.

The hand brake lever should be able to make a revolution without touching the ribs of the driver when he stands with his feet in the necessary positions.

Great care should be taken that a man can comfortably stand in the position indicated, and have instantaneous control over each of the levers and pedals. The best arrangement can be got by trial, and that should be adhered to on all cars.

It then remains for the eventual proprietors of the cars to train and pick their drivers carefully, and for the driver to carry out instructions, drive with care, and keep cool.

Prompt manipulation of his somewhat complicated means of control is only to be obtained at the cost of considerable practice. A man may know everything about the mechanism of a car, but let some unforeseen complication arise in the traffic, and, without practice, he will be unable to apply his knowledge in the fraction of a second which may just avert disaster.

A driver must be able to control his car without having to think what actions he has to go through, just as he walks without thinking which foot has to be moved next.

The exact actions become more or less reflex, with the consequent advantage that they approach as nearly as possible to being instantaneous.

Take the case of a racing cyclist. There was a day when he could not even balance his bicycle. First he had to learn to ride at all; while he could still ride only slowly, he had to learn to steer, and then to use different muscles at different positions of his feet, so as to get as uniform a turning effort as possible. In a race he never thinks of these things. The whole energy of his brain is concentrated on the race itself. To pass an opponent he has to alter his direction several times, each time necessitating a fresh balance of his body, and he must pedal his very hardest. But in the race these actions are all done with no tax on his brain. He considers it time to pass and he passes. Had it been necessary for him to use his brain to think what to do, he could not so accurately have gauged the exact fraction of a second in which to pass his opponent.

So with our car driver. In case of emergency, he should be able to stop, slow down, or accelerate his speed without any tax on his brain due to minor details. The whole energy of his brain can then be absorbed in observing the conditions of the traffic and other affairs outside his car which demand his attention. There would be no reply then at an inquiry into a collision to a question as to the exact distance of the other vehicle. "I cannot say exactly. I was putting on my brake at the time."

Drivers should get practice in making emergency stops. If they are taught by being sent out on cars on service during the day time, then they should have one or two nights on a special car learning to use their brakes and to make the most of them at speeds that would not be permissible in the traffic. Make him drive first from one pole to another with his controller full over and then see how soon he can stop, ringing his bell at the same time. Then do the same yourself, and show him that by your greater experience you can stop the car in a much shorter distance. Show him where you think he made mistakes, and let him try again. Then take him to a hill which has a straight length at the bottom with no turn outs, and give him practice in stopping at as high speeds as possible. If this part of his education is omitted we may get the following case:

A man has learnt in traffic, he is a careful driver, and his car

has never travelled over 12 or 15 miles an hour, and has always been under city control. A day comes, he is starting down a steep hill using his electric brake. One of the controllers contacts has been deranged, and before he realizes it the speed has increased to the greatest he has ever driven at, and is increasing every second. He has never before driven down that hill at more than 8 miles an hour. By the time he has got his hand brake blocks against the wheels the car is going 20 miles an hour. The feel of his brake is different to anything he has ever felt before, it does not seem to be having any effect, because he is unable to appreciate the difference between 20 miles an hour and 8 miles an hour.

Under these circumstances can we be surprised if he loses his head?

A man who had had practice in making stops at that speed would have no cause for losing his head. He would know the strength that would make the brakes most effective, and he would be able to recognize when the car was beginning to slow down, and would be perfectly confident that he could stop.

Teach the drivers all you can about driving, and try to leave them nothing to find out themselves. Institute a system of driving, and make them stick to it. If not taught, they find out little dodges themselves, and they show some of them to others, and you are apt to get several different methods amongst them all, which makes it harder for you to pick out the drivers who have the best control.

One portion of the equipment of some cars demands a few words—the track brake. This is worked by a wheel on the platform, which turns a screw. The screw enables great force to be applied, and does away with the need of a ratchet. But it takes a long time to move the block down to the rails. It cannot be brought quickly into action as the ordinary hand-brake can. It is, therefore, no use as an emergency brake. Also most of the track-brakes used in this country will not stop a car on a steep hill. The track-brake should be applied at the top of the steep hills, and left alone till the bottom is reached. Stops and starts are made with the hand-brake and controller, and the track-brake simply makes driving down a hill as easy as driving on the level.

SAN BERNARDINO TRACTION CO.'S EXTENSION TO REDLANDS.

The San Bernardino Traction Co. is now building an extension of 6½ miles to Redlands to connect with the Redlands Street Ry. Material for the extension has been contracted for; the rails, which will be 60-lb., are now on the way from Antwerp, Belgium, and shortly after their arrival, which will be about Jan. 1st, 1903, the road is expected to be in operation, as the roadbed and overhead work is now well under way.

The company has also applied for a franchise to Highlands, a distance of 6 miles, and will begin the construction of this line as soon as possible. The power now used by the San Bernardino Traction Co., and that to be used on the new lines, is furnished by the Edison Electric Co., of Los Angeles, from its power house in the canyon about 20 miles away. This power is generated by water and the alternating current is converted to direct current at the company's car house. Mr. A. C. Denman, Jr., is general manager of the company.

FIGHTING TROLLEY COMPETITION.

The Columbus, Delaware & Marion Traction Co., which has recently been opened for traffic between Columbus, O., and Delaware, is meeting with considerable opposition from the steam roads in this territory, which have combined to fight the new trolley road. The Hoeking Valley, Big Four, and Columbus, Sandusky & Hoeking railroads have issued a commutation ticket good for 20 trips, which is unlimited as to date. This ticket is honored on any one of the three roads and may be used by anybody.

The Twin City Rapid Transit Co., of Minneapolis, has purchased 20 acres of land in Ramsay County. The land was purchased without any immediate idea as to what use it would be put to, but it is considered a good investment.

BIRMINGHAM NOTES.

In accordance with an agreement with the city the Birmingham Railway, Light & Power Co. inaugurated a system of transfers on September 20th. Before this, on three of the company's lines formerly controlled by another company a system of transfers was in effect, but now transfers are issued on 13 of the divisions of the company's lines. Each division of the road uses a transfer of a different color and new sets of transfers on which the date is prominently printed are issued each day. Before the transfer system went into effect the company sold various kinds of tickets. For example, 100 tickets for \$4, and on the suburban lines, where the fare was 12 cents, a laborer's ticket was sold for \$3 per month, but, with the adoption of the new transfer system, all sales of tickets are discontinued and now every one is charged a full cash fare. Sufficient time has not elapsed since the inauguration of the transfer system to determine whether the receipts will fall or not on account of the discontinuation of the sale of tickets.

The conversion of the Bessemer & Birmingham dummy line, 13½ miles in length, from a steam to an electric line is being pushed as rapidly as possible; both day and night shifts are at work on it and it is believed that it will be ready for operation by January 1st.

The freight business on this line has increased so materially that it was found impracticable to run a mixed train and do justice to both passenger and freight traffic, so a steam freight train, making three trips to Bessemer daily has been put in service and the train frequently consists of eight and ten cars. The service is more after the fashion of an express service and merchants in the suburban towns are taking advantage of the opportunity to get goods within a few hours after ordering them rather than wait a day and sometimes longer for them by the trunk lines.

The work on Third Avenue, a street on which a franchise was recently granted, is progressing nicely and a lot of special work consisting of turnouts and crossings has just been placed at 3d and 19th Sts.

The city council recently passed an ordinance requiring the company to equip its cars with fenders and to that end an order has been placed for the entire equipment. The type to be used is that of the St. Louis Car Co., which was approved by a committee of the board of aldermen who witnessed some practical tests of fenders.

The first installment of the 27 new cars recently ordered from the St. Louis Car Co. has arrived. They are 21½ ft. long and mounted on Lord Baltimore single trucks and equipped with two G. E. motors. They are vestibuled and have electric arc headlights and Hunter signs set in the upper part of vestibule window. They have a seating capacity for 28 and are supplied with Hale & Kilbourne walkover cane seats. Signal bells with buttons at each seat are provided and the cars are equipped with the type of fender approved by the city council. They are painted the company's standard color, chrome yellow, with white roofs. These cars are to be used on the cross-town lines and are to take the place of the open cars now in use.

In connection with the Brown system of discipline now in effect the management is preparing to adopt a rule that when a man has received a certain number of demerits on his record and has no credits to counter balance them he will be lowered on the list, and when he has a certain number of credits with no demerits he will be promoted. By this means a good man will steadily rise and an indifferent man will go down, and good men will be retained in the service for occurrences that would ordinarily discharge them.

The Guthrie (Okla.) Light and Traction Co. has been incorporated to construct an electric railway system in Guthrie.

Two companies, the Raritan Traction Co. and Central Jersey Traction Co. have made application for a franchise through South Amboy, N. J.

It is reported that an electric railway will be constructed between Withee and Maplehurst, Wis. A. E. Jeffrey, Milwaukee, is said to be a promoter of the scheme.

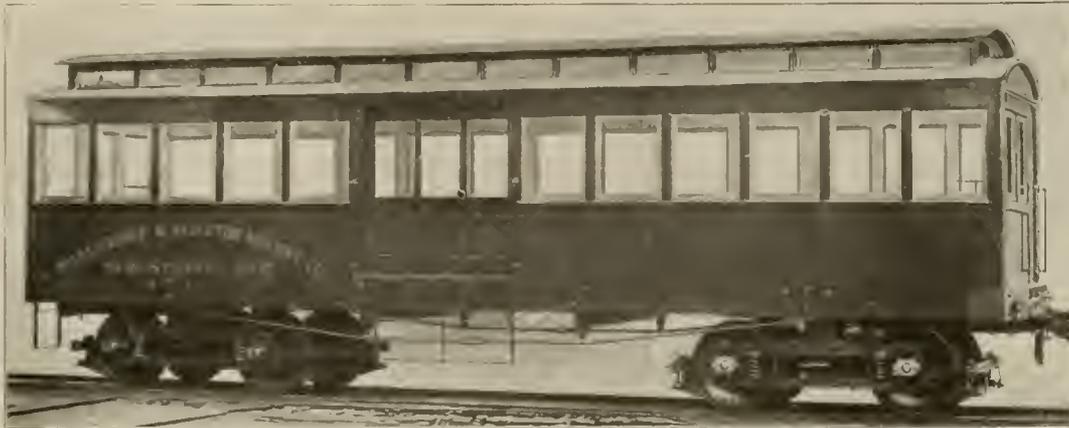
A charter was granted November 10th to the Oklahoma Traction Co. for the purpose of building a line from Guthrie to Oklahoma City and to El Reno. The line will be 75 miles long.

A MOVABLE SUB-STATION.

Not infrequently the question has been raised as to the most economical method of supplying sufficient current to outlying parts of systems which at times carry heavy traffic. Lines to distant pleasure parks used only, or chiefly, in summer, come particularly under this heading. The delivery of a heavy voltage of direct current over several miles of line involves a waste too great to be continued for

There are no trap doors, as the trucks are not equipped with motors, therefore the floor is entirely clear for the machinery. A 5 ft. 6 in. sliding door is on one side and 30-in. sliding doors at the diagonal corners. The length over sheathing is 36 ft., and width over posts 9 ft. 6 in. Weight of rotary converter, 20,600 lb.; three transformers, 10,050 lb.; switchboard, 1,200 lb.; a total of 50,750 lb. The trucks are Brill No. 28.

The car can be used, with and without machinery, for a variety



PORTABLE SUB-STATION CAR—BUILT BY J. G. BRILL CO.

any length of time, and therefore sub-stations with rotary converters are built, although their maintenance during half the year is a dead loss.

During the past summer a very practical expedient has had a successful trial by the Wilkes-Barre & Hazleton Railway Co., consisting of a car built by the J. G. Brill Co., of Philadelphia, arranged to contain a 400-kw. rotary converter, three transformers and a switchboard. The car is, therefore, a movable sub-station ready to be placed on sidings wherever needed and connected with wire bearing an alternating current. As the percentage of waste for distance is slight with alternating current, the car may be placed as far from the power house as need be. The current operates the converter and is delivered in the proper quantity on the main line through the transformers or boosters.

The roof of the car is constructed to be entirely removable in one piece like a box cover, in order that the large and heavy machin-

of purposes which will suggest themselves according to local needs. The economy and convenience of the rotary converter car will probably bring it into considerable use in the near future.

PHILANTHROPIC IDEA IN BOSTON.

The Boston Elevated Railway Co. is carrying out the modern idea that it pays to be not only fair and just, but generous as well, with employes, and as an example of its desire to cater in every way possible to the needs of its men, it arranged during the recent coal strike to import from abroad a steamer load of coal which it sold to its employes at very nearly normal price, and at a cost way below the price asked by the coal dealers in the city of Boston.

The circular to its men announcing this move reads as follows: "It having been represented to the Boston Elevated Railway Co. that many of its employes are in great need of fuel which they cannot obtain in the present fuel crisis, the company will undertake to furnish as many of them as possible with 'English Admiralty' soft coal, laid down at such wharf or landing in Boston as may be obtainable, and as nearly as possible, at cost prices, approximating as nearly as may be to \$5.50 per ton of 2,000 lb. small coal and \$6.75 per ton for large coal. To this must be added cost of delivery from dock and other expenses of undertaking. The newspapers are full of instructions for using this coal in house furnaces and stoves.

"Employes who desire some of this coal must sign application blank at once in ink for the amounts they desire and kind preferred, must take whatever kind the company can best obtain, and must be prepared with their money and otherwise to assist in prompt discharge of cargo on its arrival.

"Further information and application blanks will be furnished by the committees of employes designated for each division."

The Ashtabula (O.) and Jefferson extension of the Pennsylvania & Ohio Electric Ry. was opened October 20th with a two-hour schedule between the two points. An hourly schedule will soon be established.

Reports from New Orleans state that the "Jim Crow" law effective November 3d, is being enforced with difficulty. The street railway company reserved the rear seats for negroes and placed screens in the cars, but since the recent strike the number of cars operated is so much smaller that all of them are crowded. The whites are sitting upon riding in the seats set aside for blacks and the conductors are finding it practically impossible to make the law effective. Negroes in many instances had difficulty in getting aboard cars.



INTERIOR OF CAR.

ery may be installed on a crane. Eight large eye bolts, set in blocks secured to the rafter and top plate of the monitor deck, constitute the lifting connections and make the removing process comparatively easy. Every alternate rafter is reinforced with an angle iron carline and all parts of the roof are made extra strong to withstand the stress of moving.

SIGNAL FOR STOPPING INTERURBAN CARS.

A useful device has been patented and placed upon the market by Mr. A. J. Havcox, superintendent of the Citizens Electric Railway, Light & Power Co., of Mansfield, O., the object of which is to enable intending passengers to signal suburban cars at night.

The device, as will be seen from the accompanying illustration, is very simple in design and at the same time is a very necessary adjunct to the suburban railway as it obviates the necessity of passengers lighting matches or burning paper, which are very troublesome expedients for signaling cars on dark nights. The signal box is usually placed above the bracket on a pole near the point where it is desired to stop cars. This signal box is connected by wires to the contact box or switch which is placed about four feet from the



SIGNALING INTERURBAN CAR AT NIGHT.

ground. The pipe containing the wires is fastened to the pole by staples. By raising the handle the lamps in the signal box are lighted, and but little current is consumed by the device as the lamps remain lighted only while the handle is being held up.

The device, in fact, has the effect of saving power, as without the signal the motorman, not knowing that he is to stop, will leave his controller wide open, and when he sees an intending passenger he is just passing, will throw on the brakes very suddenly to stop the car. In this way he uses current to accelerate his car which would have been unnecessary had he known in advance a stop was to be made. In order to operate a car economically a motorman should know about 1,000 ft. in advance that he has a stop to make and by means of this signal he can handle his car so as not to waste current unnecessarily.

The device consists merely of a group of lamps in the signal box, one end of which is connected permanently to the trolley wire and the other end of the circuit passes to the ground through a switch which is operated by the intending passenger. There is no complication and it is so simple that it is almost impossible for it to get out of order.

The interurban line between Mansfield and Shelly, O., has been

equipped with these signals and they have proved entirely satisfactory both to the railway company and its patrons along the line. The device not only saves current and time, but decreases the liability to accidents and avoids the wear and tear on cars and equipment caused by very quick stopping.

STREET RAILWAY STRIKE AT GENEVA, SWITZERLAND.

By courtesy of Mr. H. P. Bradford, general manager of the Compagnie Genevoise des Tramways Electriques, Geneva, Switzerland, we have received an account of the labor troubles with which his company has recently had to contend.

This company was formed a few years ago and purchased the existing tram lines in Geneva and the interurban roads in the vicinity which were then operated by steam. Under the new ownership the old lines have been rebuilt and equipped for electricity and a number of new extensions made to small towns in the territory. The first year of operation the return on the capital was but little more than 1 per cent and for the current year will not exceed 2 per cent. The stockholders of the company were insistent upon the property paying a better revenue and one of the results was the resignation of the manager and the appointment of Mr. Bradford as his successor. Mr. Bradford took charge August 16th and having in mind the necessity of reducing expenses, on August 30th published an order discharging 44 employes to take effect September 12th. On the following day a general strike of the men was declared, the total number quitting service being 489. The sympathy of the public was with the strikers, doubtless to some extent because of the fact that Mr. Bradford was a foreigner and also because Switzerland is the home of many socialists and labor agitators who have been driven from other European countries.

On September 1st it was agreed that the questions in dispute should be referred to a commission of three members appointed by the Council of State and on the following day the strikers returned to work pending a decision. This decision was rendered September 12th and was favorable to the employes who obtained a reinstatement of the 44 men discharged and some modifications of the rules to which they objected.

On September 25th a complaint was made to the Council of State by the men, it being alleged that the company was not living up to its agreement. The Council of State heard both sides of the controversy and decided that complaints of the men were without cause. On the 27th of September a strike was ordered for the 28th, but this was not general. A number of cars were sent out that day and more the succeeding day until October 3d when the regular service was given, and the company announced that after that date none of the old men would be reinstated.

The first few days of the strike resulted in but little disturbance but beginning with October 1st it was necessary to call out several companies of militia to suppress disorder. On October 6th it was sufficiently grave for the Council of State of Geneva to issue a proclamation calling attention to the fact that instigators of the trouble were, for the most part, not natives of Geneva and calling on all good citizens to lend their aid in suppressing the disorder.

ELECTRIC RAILWAYS IN SOUTHERN INDIANA.

"There are railroads talked of, dreamed of, surveyed, prospected, promoted—good, bad and indifferent in this community just now.

"What with the Black Diamond, too dead to skin, the Indianapolis Southern past redemption, the Columbus, Brownstown, Salem, Paoli and French Lick Electric Line just sticking up its head, the Jasper, French Lick and Mitchell with its surveyors in the field and courting two routes, the Walsh road from Indian Springs to West Baden, Paoli and down the pike to the River, the Taggart-Buskirk-Dickerson-Fairbanks line up the pike and a Chicago company awfully anxious to build over the same route it begins to look really dangerous to life and limb, they are so awfully thick.

"But, of course, they won't all get here at once—come gradually perhaps, so that we can become some accustomed to the whiz and roar and clang and bang and be able, with a little time and education, to keep off the numerous tracks and thereby save our scalps."

—Fredericksburg (Ind.) Gazette.

REPORT OF THE COMMITTEE ON STANDARDS.*

BY N. H. HEFT, JOHN I. BEGGS, E. G. CONNETTE, E. A. NEWMAN
AND R. T. LAFFIN.

The members of the committee on standards, appointed in pursuance of the action of the last annual meeting of the associations, have given individually, at their homes, and collectively as a committee at meetings, considerable thought to the matters involved, and have carried on much correspondence in an earnest effort to obtain data which would enable them to present at this meeting of the association ideas that would be of advantage to the electric railways throughout the country.

It is unnecessary, however, to suggest that because of the great changes and vast improvements being made in the type, design and construction of motors that it is difficult to make any definite recommendation upon this point, as we feel that the next year or two may radically change the ideas of the manufacturers as well as the operating departments of the several roads with relation to the matter of motors.

With regard to the matter of rails and trucks we present more definite conclusions for your consideration.

At the first meeting of the committee the subjects to be considered by the committee were divided and assigned to the members as follows:

N. H. Heft (Meriden, Conn.)—Wheels, axles, axle brasses, journals, journal-boxes, brake-heads, brake-shoes, etc.

John I. Beggs (Milwaukee, Wis.)—Rails.

E. A. Newman (Portland, Me.)—Motors.

E. G. Connette (Syracuse, N. Y.)—Trucks.

R. T. Laffin (Worcester, Mass.)—Painting.

Will Christy (Akron, Ohio)—Car bodies for city and suburban service, including ventilation; also the question of the oval roof.

C. F. Holmes (Kansas City, Mo.)—Standard overhead construction for high-speed and suburban roads, including trolley wheels.

Rails.

The committee having carefully considered this subject, and having consulted with experts, recommends that this association adopt as a standard for either a T or girder rail, the form of rail shown in Figs. 1 and 2; the height of the rails to be governed by the character of the pavement required, in the municipalities, and the weight of the rail to be not less than 70 lb. for the T rail and not less than 90 lb. for the girder rail per yard.

It will be observed by examining these illustrations that the head of the rail is made to conform to the angle of the tread of the car wheels, for the following reasons: First, to increase the contact area, thus increasing the tractive force; and second, to cause a more uniform wear across the head of the rail and tread of the wheel.

The width of this head should be not less than 3 in. With a rail-head of this form and dimensions, a car wheel having a 3-in. tread and flange of $1\frac{1}{4}$ in. in depth (which should be used on all suburban cars), can be operated without interfering with pavements, with safety, at a high rate of speed on suburban and interurban roads, and with less cost for maintenance than the present form, due to the increased surface contact between the wheel and rail and decreased wear on flange.

The committee is of the opinion that the T rail is the most desirable and practicable rail for all purposes, and advises its use wherever the consent of the municipality can be obtained; and an earnest and persistent effort should be made on the part of all electric railways to obtain such consent.

In all places where a T rail, as here described, cannot be used, your committee recommends a grooved girder rail of the form shown in Fig. 2. This form of rail, owing to the bearing being placed directly over the center line of web, gives a rail of greater stiffness, one with a head of 3 in. in width, as well as a deeper and wider groove, and one which can be paved in the same manner as other girder rails.

In view of the rapid construction of suburban and interurban lines which enter the cities over the tracks of city lines, the committee deems it advisable to recommend, in the renewal of special

work where suburban or interurban cars are operated, and in all special work for new construction, that particular attention be given to the depth and width of the groove, as shown in Fig. 3, applicable to special work in connection with T or grooved girder rails.

Motors.

Street railway motors are subjected to such varying conditions and uses as to render it almost impossible to outline what might be considered a standard motor. Neither would it be practicable to standardize certain horse-power motors for certain weights of cars, as the conditions of operation are so varied that what might be perfectly satisfactory in one case would be unsatisfactory in another. Generally speaking, for city service motors of between 35 h. p. and 40 h. p. are most practicable. For ordinary suburban service motors of this capacity, with four motor equipments, would meet nearly all ordinary conditions and requirements. For high-speed service on long suburban and interurban roads motors of greater capacity are desirable and should be selected with special reference to the specific duty to be performed.

As there is a possibility of alternating-current motors being developed the committee feels, in view of the experiments now being made both in this country and abroad, that it is advisable to await the outcome of these experiments before any recommendation on this subject is made.

Trucks.

Your committee is of the opinion that the time is inopportune for recommending any particular design of trucks for motor-car service, especially for single-truck cars, except such parts of trucks as wheels, axles, bearings and journal boxes.

For interurban service the committee recommends that the standard dimensions, as given in this report for wheels, axles, bearings and journal boxes be followed, and also that the M. C. B. practice in the construction of trucks for double-track cars be adhered to as closely as possible.

Axles, Journals, Journal Boxes.

In view of the great demand on the part of the traveling public for a more frequent and rapid service, not only in large centers of population, but in suburban and interurban service, and in view of the increased weights of the equipment required to safely perform this service, your committee recommends the standard axle adopted by the M. C. B. Association, which is the result of developments and improvements covering a period of fifty years. This standard axle can be applied to all electric railroads, which are now performing practically the same service as steam railroads.

We recommend for adoption an axle of the size and form shown in Fig. 4 for all motor cars weighing under 15 tons, including in such weight trucks, motors and car bodies and full load; also the M. C. B. standard journal brasses, journal boxes, dust guards and key seats, as shown in Figs. 4, 5, 6 and 7.

For all cars weighing from 20 tons to 28 tons, including in such weight trucks, motors and car bodies and full load, the M. C. B. standard axle, also journal brasses, journal boxes, dust guards and key seats shown in Figs. 8, 9, 10 and 11.

For all cars weighing up to 30 tons, including in such weight trucks, motors and car bodies and full load, the M. C. B. standard axle, also journal brasses, journal boxes, dust guards and key seats shown in Figs. 12, 13, 14 and 15.

For all cars weighing up to 40 tons, including in such weight trucks, motors and car bodies and full load, the M. C. B. standard axle, also journal brasses, journal boxes, dust guards and key seats shown in Figs. 16, 17, 18 and 19.

For all cars weighing up to 50 tons, including in such weight trucks, motors and car bodies and full load, the M. C. B. standard axle, also journal brasses, journal boxes, dust guards and key seats shown in Figs. 20, 21 and 22.

Car Wheels for Suburban and Interurban Service.

Your committee has taken up with operating managers the subject of car wheels for suburban and interurban service to centers of population over public streets, and finds that their views accord with those of your committee.

We recommend for adoption as standard a steel-tired wheel and a cast chilled wheel, as shown in Figs. 23 and 24.

With a view to safety and economy we recommend for motor cars used in suburban and interurban service a steel-tired wheel of the dimension shown:

*Adopted at the Detroit meeting of the American Street Railway Association, October, 1902.

For use with an axle as shown in Fig. 4, wheel to weigh 640 lb.; in Fig. 8, wheel to weigh 695 lb.; in Fig. 12, wheel to weigh 700 lb.; in Fig. 16, wheel to weigh 840 lb., and a cast-steel wheel of the same dimensions. For use with an axle as shown in Fig. 4, wheel to weigh 440 lb.; in Fig. 8, wheel to weigh 490 lb.; in Fig. 12, wheel to weigh 590 lb.; in Fig. 16, wheel to weigh 640 lb.

Car wheels of the weights mentioned conform to the M. C. R. standard.

Brake Head and Brake-Shoe

Your committee recommends for adoption as a standard the brake-head and brake shoe shown in Figs. 25 and 26.

Painting.

As a standard method of painting cars your committee would recommend the following: All grease and rust should be removed from the ironwork and the car body should be rubbed down to a smooth surface; then thoroughly paint the ironwork with pure red lead and raw linseed oil. Then the outside of car body should be painted as follows: First, pure lead and oil priming thoroughly rubbed in; second, one coat of flat lead, egg-shell gloss; third, white lead putty; fourth, three coats of flat lead; fifth, two coats of rough stuff; sixth scour to smooth surface; seventh, two coats of ground color; eighth, special color to cover; ninth, ornament on flat color; tenth, two coats of best finishing varnish.

No coat is to be applied until the preceding coat is thoroughly dried.

The roof canvas should have three coats of lead and oil, and no glue size or patent filler should be allowed on the roof.

For the inside or standing finish, we would recommend that one coat of lead and oil and one coat of Prince's metallic be put on back of same before finish is put in place.

All standing or inside finish, if of open grain wood, such as ash, oak or mahogany, we would recommend to be thoroughly filled with Silex filler. If the wood is of open grain nature, such as cherry, maple or birch, we would recommend a good oil stain instead of the filler. Then thoroughly sandpaper, after which apply two thin coats of absolutely pure grain alcohol shellac, either bleached or orange, according to the wood. Then sandpaper and apply two coats of varnish. All inside work should be rubbed to a dead finish, and all outside or exposed work should be left in the gloss.

In car floors, the under or lining floor should have one good coat of oil before the upper or corrugated floor, which has received a coat of oil, is laid. When finished it should receive one coat of bleached shellac and one coat of good floor varnish.

Return Circuit.

The committee believes that one of the most important factors in the construction and operation of an electric railway is to provide for a standard return circuit in such manner as to give the least resistance and largest and most reliable carrying capacity, thus avoiding loss of power and increased cost of maintenance. We, therefore, recommend a supplementary return, in addition to the usual practice at the present time, in all congested sections, crossing all special work and in the vicinity of the power plants.

Standard Overhead Construction and Car Bodies.

Owing to the inability of the committee to obtain any report from the members to whom were assigned the subjects, "Standard Overhead Construction for High-Speed City and Suburban Service, Including Trolley Wheels," and "Car Bodies for City and Suburban Service, including Ventilation; also the question of the Oval Roof," we are unable to present any report embodying recommendations on these subjects.

Conclusion.

We earnestly recommend that the incoming officers of the Association be authorized and directed to appoint successors to the undersigned committee to carry on the work for which they were appointed, as we feel that the recommendations here made are only preliminary to much work that can be done in this direction.

The Pittsburg Railway Co. gave 150 of its motormen and conductors who were members of the National Guard leave of absence when they were ordered out with the militia to assist in quelling the strike disturbances in the anthracite coal region. The company provided substitutes to fill the places of the men until their return.

KANSAS CITY NOTES.

The work of excavating for the foundations of the new power house for the Metropolitan Street Railway Co. was practically completed on November 15th and the foundations will be put in as rapidly as the weather will permit.

The accompanying illustration shows a view of the new power house site, which will help more clearly to explain how the work is being done, as was described in the "Review" for October. About 1,500 cu. yd. of material is being removed every 24 hours by the six hose lines and 500,000 gallons of water per day are used.

The company is now engaged in changing the lines on 9th St. and 15th St. from cable to electric operation; 109-lb. center bearing rails made by the Lorain Steel Co. will be put down, the steel being already on the ground.

Standard heavy rail construction is being substituted for the cable track on Troost Ave. and Summit St.; by the use of portable



EXCAVATING FOR POWER HOUSE FOUNDATIONS.

crossovers this work is being done so as not to interfere with the regular service cars.

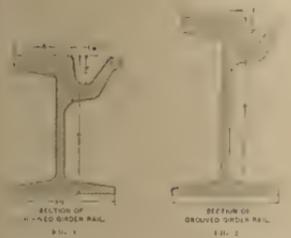
Since the park season closed the company has been giving each of its division superintendents a two weeks' vacation.

A great deal of interest is being taken by the employes of the Metropolitan in the merit system of discipline and nearly all of them have made a point of reading the paper presented at the Detroit convention by Mr. W. A. Satterlee, general superintendent of the Metropolitan company, on this subject.

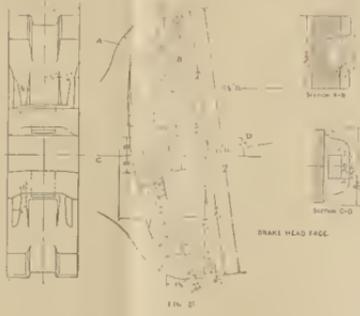
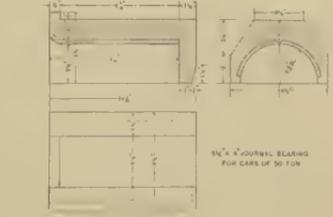
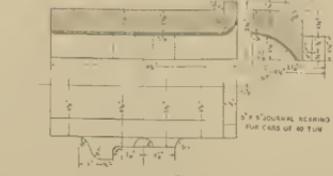
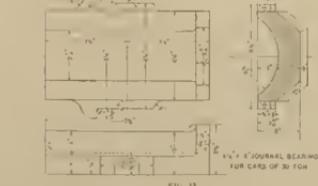
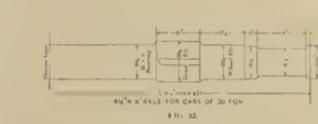
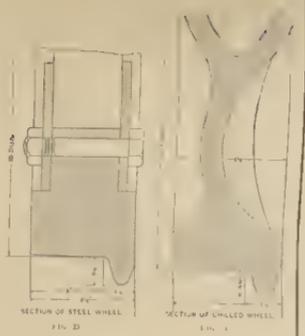
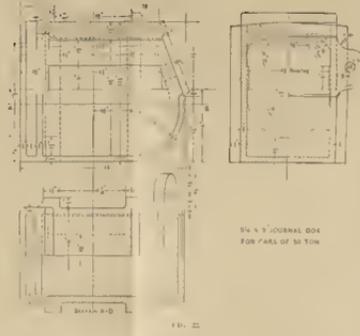
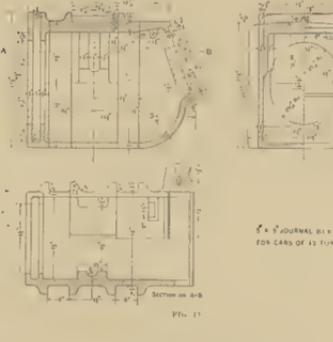
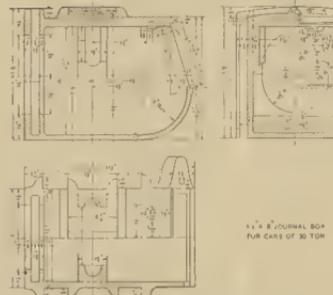
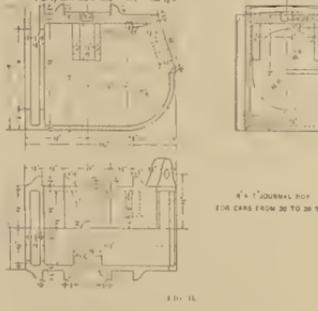
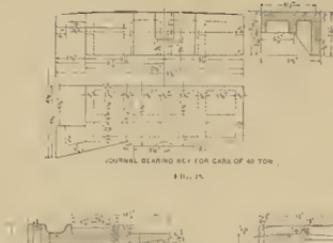
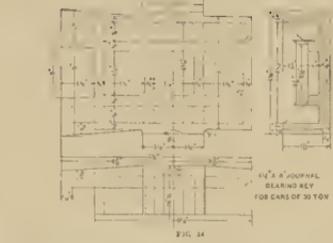
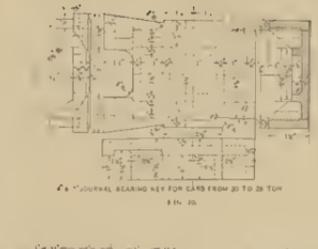
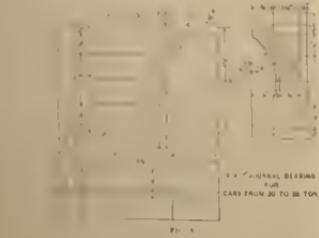
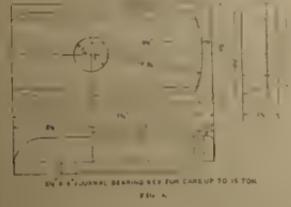
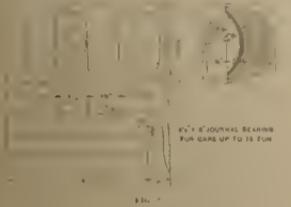
THEFT OF WIRE AT BIRMINGHAM.

On November 5th nearly a mile of live copper feed wire was cut down on the Ensley line of the Birmingham Railway, Light & Power Co. This wire measured nearly a 1/2 in. in diameter and is worth 18 cents per lb. as old copper. The lot stolen weighed 900 lb. After the discovery of the robbery the following morning, the sheriff was notified and with his men discovered the wire in concealment, rolled up and with the insulation burned off. Men were detailed to watch the wire, and after dark two negroes drove to the place and loaded it upon a wagon. They were immediately arrested, but one of them escaped, although it is believed he was shot. The robbers in the meantime had offered the wire to a dealer in old metal, and while the men were preparing to deliver the wire the dealer notified the police, so that the robbers were being watched from both ends of the line, and in this way another one of the party was caught and placed under arrest. The negroes who stole the wire were formerly employed by the Birmingham Railway Light & Power Co., and their knowledge of electricity probably saved them from being killed in the operation of cutting the live wire.

The New Orleans Railway Co. has purchased the Oteri fuel oil storage tank in New Orleans; the tank has a capacity of 55,000 barrels, and the price paid for the tank and property is reported to have been \$17,000.



Private Street, White Street, Boston, Mass., and 7th Street, New York, N. Y., and 7th Street, New York, N. Y., and 7th Street, New York, N. Y.



Rails, Wheels, Axles, Bearings, Brake Shoes and Journal Boxes recommended by the American Street Railway Association Committee on Standards in its report presented at the Detroit Convention, Oct. 10, 1912. For report see "Street Railway Review," Nov. 20, 1912, page 853.

N. H. HEFL, JOHN J. BEGGS, E. G. CONNETTE, E. A. NEWMAN, R. T. LAFFIN, Committee.

VERONA & WILKINSBURG INTERURBAN OPENED.

October 25th, the opening trip over the line of the Verona (Pa.) & Wilkesburg Street Ry. was made by the officers of the company, after which, the line was thrown open to the public. The work on this road has been in progress for a year and the company was under a bond to complete the road by September 1st, the time, however, was extended to November 1st. The new route is six miles and the scheduled time for the run is 20 minutes. Ten cars will be used through the winter and 15 in the summer, and at present they all run only to Verona. The line will be extended to Oakmount as soon as the question of railroad crossings has been adjusted.

NEW PRIVATE CAR FOR NORTHERN TEXAS TRACTION CO.

The accompanying illustrations show the exterior and interior of the new private car "Sagamore" built by the G. C. Kuhlman Car Co., Collinwood, O., for the Northern Texas Traction Co.



PRIVATE CAR, NORTHERN TEXAS TRACTION CO. - G. C. KUHLMAN CAR CO.

The length of the car is 50 ft. over buffers and it has seating capacity for 25 people. We are advised by the president of the road, Mr. Geo. T. Bishop, that this car attained a speed of 78 miles per hour on the initial trip.



INTERIOR OF PRIVATE CAR.

The Northern Texas Traction Co. operates 22 miles of city line in Fort Worth and the new interurban line between Fort Worth and Dallas, a distance of 35 miles.

Three men formerly in the service of the Milwaukee Electric Railway & Light Co. as conductor, recently pleaded guilty to embezzlement and were fined, two paying \$25 and costs and one \$50 and costs. The method of defrauding the company was to secure punched tickets which had been once turned in and ordered destroyed.

MARKING RAILWAY TIES.

The secretary of the American Railway Engineering and Maintenance-of-Way Association has addressed, under date of Nov. 12, 1902, the following letter to the managing officers of American railways:

"The attention of the managements of American railroads is invited to the system of marking cross-ties, advocated in the report of the Committee on Ties, submitted at the third annual convention of the American Railway Engineering and Maintenance-of-Way Association."

"The plan proposed is similar to that adopted by the U. S. Department of Agriculture in a section of experimental track laid in the state of Texas, and briefly described is as follows: Each tie is marked with a dating nail; this is placed between the rails on top of the tie, generally at a specified distance from the rail. They are of steel, covered with zinc or tin, and have the year stamped in the head. When renewals take place, the date at which each tie was laid is noted, and in this way an absolutely reliable record is obtained. The nails cost very little (about 6 cents per pound, thirty nails), and when put in by the section gang, the labor is very slight. Several American railroads have already adopted this plan,

and it is to be hoped that the practice will eventually become general.

"Accurate statistical information in regard to the life of treated and untreated ties, a comparison of the different kinds of wood used for cross-ties under varying conditions of soil and climate, etc., is essential to the proper study of the tie question. For the purpose of making data of this character available and presenting it from year to year, series of blank forms had been prepared by the Committee on Ties, which have been adopted by the Association as standard, and it is suggested that each road take the necessary steps to at once inaugurate the system of keeping tie records in the manner proposed by the committee.

"The value of an accurate record of the life of ties cannot be overestimated, for it is the only way in which reliable conclusions can be drawn. It is to be hoped that all roads will appreciate the importance to themselves and to others of keeping up this information.

"Samples of the blanks above referred to will be gladly furnished by the Secretary of the Association, 1562 Monalnock Block, Chicago, Ill., on application."

INJURY SEEKER CONVICTED.

It has developed that an organized gang of conspirators has been at work in Philadelphia with the object of obtaining money from the Union Traction Co. by fraudulent representations. On Sept. 3, 1901, two young men boarded a Fourth St. car and rode as far as Lasker St. On reaching this street one of them named Rosenberg, stepped on the running board of the car and, it is claimed, allowed himself to be thrown to the ground sustaining slight injuries. He then engaged an attorney who filed a claim for \$5,000 damages said to have been sustained. The Union Traction Co. put an inspector on the case who, after collecting evidence, caused Rosenberg's arrest. The jury, after hearing the witnesses, found him guilty. William Dorn, who was the leader of the gang organized to rob the Union Traction Co., was also arrested and pleaded guilty and was sentenced to five years' imprisonment.

PERSONAL.

MR. A. H. WARREN has been appointed superintendent of the Houghton County Street Railway Co., Hancock, Mich.

MR. F. F. GROVER, president and manager of the Fond du Lac Street Railway & Light Co., Fond du Lac, Wis., was a recent visitor at the "Review" office.

MESSRS. W. CARYL ELY and T. E. MITTEN, of the International Traction Co., Buffalo, recently visited Chicago for the purpose of inspecting the Aurora, Elgin & Chicago Ry.

MR. ALBION E. LANG, president of the Toledo Railways & Light Co., presented his resignation at a meeting of the directors of his company held November 7th and Mr. Henry A. Everett was chosen to succeed him. Mr. Lang's resignation is to be effective



ALBION E. LANG.

December 15th and shortly after that date he will leave for an extended European trip; his interests in the company are in no wise changed and he will remain chairman of the board of directors, the reason for retiring from the presidency of the company being to enable him to obtain a respite from the arduous duties which he has had ever since first entering the street railway business in 1881, when he acquired the Monroe & Dorr Street R. R., of Toledo. In 1885 Mr. Lang was active in uniting the six street railways then operating in Toledo, and formed the Toledo Consolidated Street Railway Co., of which he was successively, secretary, vice-president and general manager, and president. A second consolidation occurred in 1895 when the Toledo Traction Co. took over the Consolidated and two other companies which had entered the field. Mr. Lang served as president of the Toledo Traction Co. until it was taken over by the Toledo Railways & Light Co., in 1901, and he was then chosen president of the new company. The Toledo Bee editorially pays Mr. Lang the following graceful tribute: "The resignation of Mr. Albion E. Lang as president of the Toledo Railways & Light Co. removes temporarily at least from active business life a man who has been a potent factor during the last quarter of a century in making Toledo a commercial and industrial power. If a man who makes one blade of grass grow where none grew before is entitled to commendation, what may be said of a man who transforms a bob-tailed single line of mule cars into one of the finest electric systems in the country. This development has taken place be it understood under the direct personal supervision of Mr. Lang. Handicapped as he was by many adverse conditions, he has wielded a greater influence in making Toledo the recognized city of beautiful homes than any other living man. That beautiful residence portion of the city, all the way from Bancroft St. to Ten Mile Creek, was fifteen years ago little more than a wilderness. Just as the steam railroad is the pioneer of civilization, so is the trolley car the constructor and preserver through the medium for travel it furnishes, of commodious and comfortable homes. Mr. Lang has been a persistent friend of Toledo's advancement. He has proved the faith that is in him by interesting himself financially and personally in almost every enterprise that has tended to build up the city. It is to be sincerely hoped that Mr. Lang's retirement from public life will be brief. Toledo needs such men."

MR. D. CLARENCE DURLAND has been elected second vice-president of the Sprague Electric Co. For the past three years he has been assistant general manager of the company.

MR. HENRY A. EVERETT, who will December 15th succeed Mr. A. E. Lang as president of the Toledo Railways & Light Co., has announced that he will retain his residence in Cleveland.

MR. H. H. VREELAND denies the truth of the report that he is to resign as president of the Interurban Street Railway Co., of New York, and become manager of the Yerkes road in London.

MR. ERNEST GONZENBACH has resigned as electrical engineer of the Aurora, Elgin & Chicago Ry. and will be succeeded December 1st by Mr. Sylvester Potter, who was formerly with the Toronto (Can.) Ry.

GEN. JAMES JOURDAN, president of the Brooklyn (N. Y.) Union Gas Co., and Mr. T. S. Williams, vice-president of the Brooklyn Rapid Transit Co., have been elected directors of the Mechanics' Bank, of Brooklyn.

THE CINCINNATI TRACTION CO. has made the following promotions: Dana Stevens, treasurer, to be assistant general manager, W. H. McAllister, auditor, to be treasurer, and Charles F. Callaway, assistant auditor, to be auditor.

MR. R. L. CRUMP has resigned his position with Ford, Bacon & Davis to engage in the engineering practice for himself. Mr. W. S. Nichols, of New York, succeeds Mr. Crump with Ford, Bacon & Davis; he will have charge of the excavation and foundation work on the power house.

MR. ROBERT STOCKTON, general manager of the South Jersey Gas & Electric Traction Co., of Camden, N. J., and A. R. Kuser, assistant to the president, and Frank G. Moses, general engineer of the company, have resigned their positions to embark in another enterprise in New York city. Mr. Stockton is succeeded by J. A. Gilkyson, of Trenton, N. J.

MR. H. A. FITZSIMMONS, superintendent of the Troy and Fort Edward division of the Hudson Valley Railway Co., resigned October 25th. Mr. Fitzsimmons entered the employ of the company April, 1901, prior to which time he had spent five years in the employ of the United Traction Co. and the Troy City Railway Co., having charge of the belt line at Cohoes.

MR. GEORGE DORN has been promoted by the New Albany (Ky.) Railway Co. to the position of superintendent, to succeed Mr. Louis Meyer, who recently resigned that position to become manager of the New Albany Coal Co. Mr. Dorn is one of the oldest and most efficient men in the service of the company and is thoroughly experienced in street railway work.

MR. W. G. WAGENHALS, who recently severed his connection with the Millcreek Valley Street Railway Co., of Cincinnati, as noted in the last issue of the "Review," was tendered a pleasant surprise on the evening of October 14th, by the presentation of a handsome gold watch, chain and locket, the gift of the employes of the Millcreek company in appreciation of his kindly treatment during his term of management of the company.

MR. GEORGE A. WARDLAW, who for several years was connected with the advertising and publishing department of the Westinghouse companies, at Pittsburg, has recently moved to New York, and is at present acting as assistant to Mr. Pope, secretary of the American Institute of Electrical Engineers.

PRESIDENT MARSH of the Bryan & Marsh Co., 136 Liberty St., New York City, has resigned the active management of the company, owing to the many demands made on his time by his other interests. Mr. Guy V. Williams, formerly manager of the Minneapolis Agency, succeeds Mr. Marsh as manager of the company.

MESSRS. KERN DODGE and CHARLES DAY, of the firm of Dodge & Day, modernizing engineers, have recently returned from an extended trip through the middle West, where they visited many of the principal machine shops and foundries, gathering data on shop efficiency and critically comparing factory methods.

INVITATIONS have been issued for the marriage of Mr. Henry James Crowley, general manager of the American Railways Co., Philadelphia, and Miss Serena Virginia Ford, daughter of Mrs. Anna M. Ford, on the morning of November 26th, at the Church of the Holy Spirit, Sharon Hill, Pa. Mr. and Mrs. Crowley will reside at No. 55 Owen Ave., Lansdowne, Pa.

MR. C. C. BENSON, who has been superintendent of the Citizens' Electric Street Ry. at Newburyport, Mass., for some time, has resigned to accept a very important position with the new electric railway system at San Juan, Cuba. Mr. Benson's many friends in New England will be sorry to have him leave this country, but extend their heartiest best wishes for his unqualified success in the new position.

COL. ALLAN C. BAKEWELL, who was recently elected president of the Sprague Electric Co., has long been identified with the electrical industry, and has won many friends through his executive ability and honorable business methods. He was vice-president and general manager of the old Interior Conduit & Insulation Co., which was absorbed by the Sprague Electric Co. some years ago. Previous to his present office he was for three years second vice-president and general manager of the Sprague company.

MR. W. S. STOCKS, who for several years has been master mechanic of the Chicago, Rock Island & Pacific R. R., has resigned to become a representative of the Gold Car Heating & Lighting Co.

Mr. Stocks has been with the Minneapolis & St. Louis, the Great Northern and the Rock Island roads for some 25 years, during which time he has held the position of foreman, general foreman and master mechanic in the mechanical departments of these roads.

MR. WILLIAM L. ELKINS, of Philadelphia, the electric railway capitalist, had a narrow escape from death on November 3d by the collapse of a derrick and the consequent fall of an iron girder weighing several tons at the annex that is being added to the sky-scraper office building of the Land Title & Trust Co., Broad and Sansom Sts., Philadelphia. Mr. Elkins was passing in front of the building and the girder in its fall missed hitting him by less than one foot. He was buried in the brick and other debris but was quickly released and on examination was found to have sustained no injuries more serious than numerous bruises and general shock. City Treasurer J. Hampton Moore, George D. Widener and B. F. Whitman, who were with Mr. Elkins, escaped injury. One workman was killed in the accident.

MR. ALBERT EASTMAN, who has just severed his connection with the Detroit United Ry., to become general express agent of the Utica & Mohawk Valley Railway Co., Utica, N. Y., entered the steam railroad field in 1889 as night telegraph operator on the Canada Southern Division of the Michigan Central R. R. He resigned in 1891 to enter the local freight office of the Wabash R. R. at Detroit. The following year he resigned this position to become freight and ticket clerk for the Grand Trunk R. R. at West Detroit, remaining with the Grand Trunk system in various capacities until 1900, when he resigned to accept a position with the Michigan Central R. R. as assistant agent, having charge of one of the important sub-freight houses. He remained with the Michigan Central R. R. until September, 1901, when he received an offer from the Detroit United Ry. to enter its express department. Later he received the appointment of traveling express agent for the Detroit United Ry., and recently was made traveling express and passenger agent, which position he resigns to go with the Utica & Mohawk Valley Ry. as general express agent.

OBITUARY.

It is with much regret that we have to announce the death of Mrs. Duffy, wife of Mr. C. N. Duffy, secretary and auditor of the Chicago City Railway Co., which occurred very unexpectedly on the morning of November 8th. The interment was at St. Louis on the 10th.

PROF. SIDNEY HOWE SHORT, technical director of the English Electric Manufacturing Co., died at his residence in London last month after an operation for appendicitis. Professor Short was born in Columbus, O., in 1858 and his primary education was in the public schools of that city. He next became a student in the Capital University of Columbus, which he left to enter the Ohio State University. He became a student under Professor Mendenhall, and upon the latter being called to the University of Tokio, Japan, Mr. Short succeeded to the professorship; he became the laboratory director, in 1879, one year previous to his graduation. Immediately after his graduation he accepted a position as professor of physics and chemistry, and vice-president of the University of Denver, Colo. While in Denver, Professor Short invented a motor for street railways and subsequently resigned his professorship to give his entire attention to street railway work. He built a number of lines in western cities using both the conduit and overhead trolley systems. In 1869 he removed to Cleveland, O., where he organized the Short Electric Railway Co. in which the Brush Electric Co. was largely interested. Both of these companies were later bought out by the Edison company, one of the consolidated companies which afterward formed the General Electric Co. In 1893 Mr. Short became connected with the Walker Manufacturing Co., of Cleveland, O., and under his management this concern became a formidable competitor of the older electric companies, until it was finally absorbed by one of them. Mr. Short then went to Europe and completed arrangements with Messrs. Dick, Kerr & Co., Ltd., for the construction of works in England for the manufacture of apparatus under his patents. Since that time Mr. Short has held the position of technical director of the English Electric Manufacturing Co. During the past year he was engaged upon plans which have recently been carried out for the erection of large shops in Paris for the manufacture of machinery under his patents. It was generally under-

stood that Mr. Short considered his work in Europe as nearly finished and it was his intention within a short time to return to America with a view to re-entering the electrical field in this country. Over 500 patents have been issued in his name in the United States and foreign countries. Professor Short was a Fellow of the American Society for the Advancement of Science; a member of the Cleveland Electrical Society; the American Institute of Electrical Engineers; the Institution of Electrical Engineers in London; the Engineering Society of Liverpool, and the New York Electrical Society. He leaves a wife, three sons and a daughter.

NEW ENGLAND STREET RAILWAY CLUB.

The first fall meeting of the New England Street Railway Club was held at Wesleyan Hall, Boston, October 23d, and the subject of discussion for the evening was the "Multiple Unit System." The first speaker was Mr. Paul Winsor, of the Boston Elevated Railway Co., who read a paper on this subject describing the system of control in use by the Boston elevated. The Sprague system was selected after competitive tests which were carried out in the Tremont St. subway at night.

After giving a general description of the operation of this method the speaker recommended four fundamental requirements for any system of multiple unit control. These are: First, absolute certainty of the opening of the main motor circuits when the master controller comes to off position. Second, proper car direction of movement under all circumstances. Third, motor-control circuit never closed until all resistance is in, and then the step by step cutting out of this resistance. Four, in the author's opinion very important, automatic throttle control.

The best of brakes should be installed on all such high-powered equipments as are today utilizing the multiple unit control. Straight air is easier to handle than automatic air in many classes of service as simply opening the valve handle applies the brakes by direct-air pressure, but with more than one car straight air brakes are very dangerous, especially on grades. The brakes must be entirely released before a second application can be made, and if many are made on a single grade it is not long before the motorman finds himself out of air supply. It takes about one second to restore 1 lb. of air with this system, and unless the valve is in the off position the auxiliary resistance cannot be restored. Steam roads using straight air employ a retaining valve to enable long applications to be made on grades.

In the discussion, Mr. H. S. Knowlton, of Boston, described the multiple unit control installed on the Seattle-Tacoma Interurban Ry., which was built by Stone & Webster. Chief Electrician Hall, of the Boston & Maine Railroad, also stated that his road uses a multiple unit system of control on its electric line between Concord and Manchester, N. H. It has been found very useful, especially in handling rush business.

SECRETARY OF THE ACCOUNTANTS' ASSOCIATION.

Mr. W. B. Brockway, secretary and treasurer of the Street Railway Accountants' Association, requests us to announce that correspondence on matters pertaining to the association should be addressed to his residence, No. 40 Morris St., Yonkers, N. Y. Mr. Brockway's business address for other than Association correspondence is Room 417, Broad-Exchange Bldg., 25 Broad St., New York City.

The railroad commissioners of Massachusetts have issued an order for the issue of \$750,000 of capital stock of the Boston & Worcester Street Railway Co.

The John W. May Co. has purchased a controlling interest in the street railway lines of Clinton, Ia. The properties will be improved by the laying of new 70 lb. rails and the purchase of new cars throughout.

The Toledo, Columbus, Springfield & Cincinnati Traction Co. has started condemnation proceedings against a number of land owners in Allen and Hardin counties. The managers claim cars will be running early in the spring.

FINANCIAL.

PHILADELPHIA CO., PITTSBURG.

The Philadelphia Co. and affiliated corporations have issued the following report for the month ending September 30th:

	1902.	1901.
Gross earnings from operations	\$1,085,792	\$938,215
Operating expenses and taxes	650,529	574,870
Net earnings from operations	429,293	393,344
Other income	193,457	15,889
Total earnings and other income	619,720	379,233
Total income	428,218	343,141
Fixed charges	323,145	295,845
Surplus	105,072	77,296
Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Co.	135	58,541
Balance representing Philadelphia Co. interest in the total net income	104,937	18,755

BROOKLYN RAPID TRANSIT.

The Brooklyn Rapid Transit Co. has issued its annual report to stockholders for the year ending June 30th, 1902. March 20, 1902, the stockholders authorized a mortgage upon the property of the company, securing bonds bearing interest not higher than 4 per cent, and of a total amount not exceeding \$150,000,000. None of these bonds were issued during the year ending June 30, 1902. Under the terms of the mortgage, these bonds may be issued convertible at the option of the holder into stock of the company, both at par, at any time after July 1, 1904, and before July 1, 1914. The financial report, which is for the whole of the Brooklyn Rapid Transit System, is as follows:

	1902.	1901.
Total earnings from operation	\$12,510,622	\$11,899,824
Total operating expenses	8,209,397	7,216,008
Net earnings from operation	4,301,225	4,683,816
Income from other sources	277,546	235,735
Total income	4,578,771	4,919,551
Deductions for taxes, interest and rentals	4,475,450	4,341,748
Net income	103,321	577,803
Special appropriations	84,428	228,678
Surplus	18,893	349,125

The total car mileage was 52,684,980, or an increase of 2,528,955 over the preceding year.

A comparative statement for the month of September, 1902, and 1901, is as follows:

	1902.	1901.
Gross earnings	\$1,124,383	\$1,080,158
Operating expenses	607,581	604,610
Net earnings from operation	516,802	415,547

MONTREAL (CAN.) STREET RAILWAY CO.

The report of the president and directors of the Montreal Street Railway Co., submitted at the 42d annual meeting of shareholders, held November 5th, shows the following for the year ending Sept. 30, 1902.

	1902.	1901.
Gross receipts	\$2,046,268	\$1,900,680
Operating expenses	1,135,176	1,105,266
Net earnings	911,032	795,413
Passengers carried	49,947,467	46,741,000

During the year the company added 14 miles of new track to the system and 29 motor cars to its rolling stock.

The American Railway Co., of Philadelphia, has increased its dividend rate from 4 to 6 per cent. The Chicago & Joliet Electric Railway is one of the profitable constituent companies.

The Aurora, Elgin & Chicago Railway Co. has declared its first semi-annual dividend of 3 per cent on preferred stock, payable Dec. 1, 1902.

The September earnings of the Lake Shore Electric Ry. are more favorable than anticipated, the gross earnings being \$46,051. This is holding very close to the midsummer earnings of the road, the earn-

ings for July having been \$49,121, and for August \$47,967. The good showing for September is attributed to the inauguration of the new through service. The total earnings for the first nine months of the present year were \$331,874. The earnings for the year 1901 were \$358,180.

The Metropolitan West Side Elevated Ry., of Chicago, carried a daily average of nearly 120,000 passengers for the month of October. It is expected to do at least as well as that in November, December and January. Some friends of the road predict a daily average of 130,000 for December. On such a showing it is claimed the company would be fully able to pay 2½ per cent on its preferred stock in February, which would make 4 per cent for the year. The gross earnings for October were \$115,980, as compared with \$96,020, for October, 1901. A large part of the gain is due to the opening of the Aurora, Elgin & Chicago Ry.

The earnings of the South Side Elevated, Chicago, for October, were \$83,112, an increase of \$10,950 over the corresponding month last year.

The Northwestern Elevated, Chicago, reports gross earnings for October as \$69,562, an increase of \$10,518 over October, 1901.

A. A. HILTON.

Mr. A. A. Hilton, who is well known to most of our readers, having for several years been general sales agent of the St. Louis



A. A. HILTON.

Car Wheel Co., has recently removed to Chicago where he becomes the successor to the late Mr. Wallace, vice-president and general manager of the Fort Wayne Foundry & Machine Co., who died a few months ago after 30 years continuous service with the J. H. Bass interests. Mr. Hilton has given the subject of wheels for electric cars a great deal of thought and his work in adapting the product of the house he has heretofore represented to various classes of service and to special conditions in different cities is well known. The Chicago plant of the Bass companies

is materially increasing its capacity by the erection of an additional wheel foundry of a capacity of 500 wheels per day and their plants at Ft. Wayne, Ind.; Lenoir, Tenn., and Rock Run, Ala., are said to be much behind in their orders. We congratulate Mr. Hilton on his previous work and welcome him to Chicago.

Mr. T. L. Roy, who has been with J. H. Bass and his successor, the Ft. Wayne Foundry & Machine Co., for over 14 years, has been appointed sales agent with headquarters in Chicago. Mr. Roy will give particular attention to the street railway car wheel department.

The electric street railways projected for Manila by the Philippine Commission will be 35 miles long and cover the important streets of the city. The term of franchise is not to exceed 50 years nor the rates of fare to exceed 7½ cents first class and 5 cents second class in gold. The road is to be completed in 26 months after the award of the contract.

The Toronto (Can.) Railway Co. proposes to carry its fight against the taxation of rolling stock to the Imperial Privy Council. A notice of writ for a declaration by the courts that the assessment of the rolling stock of the company for 1902 is illegal, and for an injunction restraining the city from distraintment on the rolling stock for the taxes until the matter is decided, has been served upon the city. The taxes for this year amount to \$8,775. Under a judgment of the Court of Appeals last year rolling stock is now exempt from taxation. The claim of the city is that the assessment was made before the judgment became effective.

NEWS OF THE MONTH.

As a result of an investigation into an accident on the Mountain Lake Railroad Co. at Gloversville, N. Y., July 4th, in which 14 people were killed and over 50 injured, the Fulton County grand jury has returned an indictment charging the railroad company with culpable negligence. It further charges the employment of incompetent help and the willful dispatching of two cars close together.

Vice-Chancellor Pitney of New Jersey, has rendered a decision granting an order for the Bergen Turnpike Co., which is building an electric line from Hoboken to Hackensack, to cross the West Shore Railroad at Little Ferry at grade. At the crossing an electric signal system will be established and operated by a watchman in a tower.

Plans have been completed for a large car barn at Montclair, N. J., for the North Jersey Street Railway Co., and also for one at Paterson for the Jersey City, Hoboken & Paterson Street Railway Co.

It is reported that the Philadelphia Rapid Transit Co. is negotiating for the purchase of the 33 buildings between Front and Water Sts., and Market and Arch Sts. These negotiations are in connection with the projected Market St. subway, and the turn-off on Front St. On this site the offices of the company will probably be located. The company is understood to have begun the purchase of these properties four or five months ago, under the agreements providing that the present tenants should be prepared to vacate by next June.

It is rumored that plans are now being discussed in Philadelphia for the consolidation of all the traction, electric lighting, elevated railway, underground railway and gas franchises of the states of Pennsylvania, New York and Ohio. The financiers said to be interested are P. A. B. Widener, W. L. Elkins and John Mack of the Philadelphia Rapid Transit Co.; the Whitney-Ryan syndicate of New York; Thomas Dolan, president of the United Gas Improvement Co., in which Widener and Elkins are interested, and Senator Foraker of Ohio, representing the Ohio and Minnesota capitalists interested in the North American Co., of Milwaukee, Wis. It is understood that for some time past there has been a desire on the part of certain eastern capitalists to combine their interests but the strict laws under which they were chartered prevented such a consummation. It is said that the combination can be effected under the liberal charter of the North American Co. Should the plans materialize the consolidated company would undoubtedly be capitalized for a larger sum than any corporation now extant.

Since the opening of the electric road October 15th between Reading and Kutztown, Pa., Reading has direct communication with Philadelphia via Allentown.

Passenger earnings of the Detroit United Railway Co. for October were \$292,528.96, an increase of \$32,429.28, representing an average daily increase of \$1,046.19.

Passenger earnings of the Toledo Railways & Light Co. for October were \$86,839.01, an increase of \$7,233.96.

The street railway branch of the Young Men's Christian Association of Rochester, N. Y., held its third monthly entertainment in its rooms the evening of November 7th, the entertainment being for the street railway employees and their families. Mr. T. J. Nicholl, vice-president of the Rochester Railway Co., presided during the exercises. The recreation rooms for the men are well patronized and much interest is taken in the work of the Association. Much interest is manifested in the bowling matches between the conductors and motormen, the motormen holding at present the silver cup presented by Mr. Nicholl.

The election of Mr. W. Kesley Schoopf, president of the Cincinnati Interurban Co., as a director of the Cincinnati, Hamilton & Dayton Traction Co., which occurred November 10th, is taken as an indication that the Widener Elkins and Mandelbaum Pomeroy interests have arranged to work in harmony in developing their electric railway in Ohio and Indiana. Some profess to see in this the essential consolidation of a large number of the important electric systems in those two states.

The passenger receipts of the Lake Shore Electric Railway Co., Cleveland, O., for the month of October were \$49,637, an increase over the corresponding period of last year of \$8,343, or 25.6 per cent. The receipts for freight and other sources have not yet been

made up, but are expected to be equally favorable. The October earnings are regarded as about equal to the monthly average for the year.

The Northern Ohio Traction Co. is pushing the work on the stone bridge which it is erecting over the Cuyahoga River between Akron and Cuyahoga Falls. It will be one of the largest stone culverts in the United States and will cost about \$100,000.

Work has begun on the Windsor (Ont.), Sandwich & Amherstburg Street Railway lines from Ojibwa to Amherstburg; 150 men are at work grading and laying track. The line is owned by American capitalists, and American foremen and engineers are in charge.

The G. C. Kuhlman Car Co. has contracted to build several sleeping cars of the same class Pullman type for the Lake Shore Electric Railway Co. When they are completed a fast night service will be established between Cleveland and Detroit.

The Ohio Central Traction Co. is operating its line between Bucyrus and Mansfield, O., on a three-hour schedule. An hourly service will soon be established.

The new car line of the Winchester Railway, Light & Ice Co., Winchester, Ky., was expected to be in operation November 15th.

There is almost always current a more or less well defined rumor regarding plans for a merger of the street railways of Chicago, and a letter made public November 11th from Mr. S. W. Allerton, a director of the Chicago City Ry. to the stockholders of that company, in which he says that "there is an effort being made to secure the property of this company or to lease the same, has given the matter more prominence than usual.

The merit system has been adopted by the Muskegon (Mich.) Traction & Lighting Co., 100 demerits resulting in discharge. Every year three prizes will be given. First, two week's vacation with full pay or \$25 in cash; second, eight days' vacation at full pay or \$15 in cash; third, five days' vacation with full pay or \$10 in cash.

The work of laying the rails has been begun on the line of the Albion Electric Railroad Co. at Albion, N. Y. This is said to be the fifth projected line running west out of Rochester. Ostensibly, the road is to be a street railway for the village, but in reality it is to connect Rochester with Buffalo and Niagara Falls. The road as planned is to pass through several places of considerable business importance and through a productive country. The roadbed will be constructed for heavy traffic. It is not yet decided how much of the work will be attempted this year.

The employes of the Lexington (Ky.) Railway Co. are considering the formation of a benefit association.

It is probable that the new franchises asked for by the Cincinnati Interurban Co. will be granted by the councils of St. Bernard, Elmwood, and Carthage. It is understood that the company will carry passengers between Gas Hall, Carthage, and Cincinnati, giving transfers east and west through the city, for a 5-cent fare.

The Muncie (Ind.), Hartford & Fort Wayne Traction Co. has received a number of interurban cars for service between Muncie and Hartford City this winter. The line is expected to be in operation between these cities by December 1st.

A new \$1,500 street railway depot has been erected on the grounds of the Soldiers Home at Quincy, Ill.

The Springfield & Central Illinois Railway Co. has been organized and will have control of the Springfield Consolidated Railway Co. and the Springfield & St. Louis Railroad Co. In addition it will build an interurban line from Springfield to Riverton, which when completed will give the new company a total of 56 miles of track.

In order to have its line in operation on Saturday, October 25th, the day of the celebration of the opening of the great water power canal at Soo, the Trans St. Mary's Traction Co., of Salt Ste. Marie, Mich., ordered one of its new cars to be sent from St. Louis by express.

The Interurban Railway Co., of Des Moines, Ia., ran its first car over the new line to Mitchellville November 8th.

The streets committee has presented an ordinance to the city council of Salt Lake, Utah, giving the Consolidated Railway & Power Co. to January 1st to have all its street cars provided with fenders.

A bill has been presented to the Legislature of Georgia which if passed will allow electric light companies of the state to own and operate steam heating plants.

LONDON, AYLMER & NORTH SHORE ELECTRIC RY.

This road will be a single track line about 45 miles in length, running from London to Port Burwell, Ont., through the counties of Middlesex and Elgin. The road will run through one of the finest farming sections in Canada and there are also numerous factories along the line. The harbor at Port Burwell is one of the finest on Lake Erie, and it is expected, will open up a big freight traffic for this road. It is proposed later to put on a line of boats between Conneaut, O., and Port Burwell for coal trade. The road is to be equipped and operated in a thoroughly up-to-date manner. The officers of the company are, president, R. M. Luton, vice-president and treasurer M. E. Lyon, secretary C. R. Luton, assistant secretary N. E. Stevens. The engineers are Messrs. Field & Hinchman, of Detroit, who are now engaged on the profile. The road will be built by the Aylmer Construction Co., Ltd., of Detroit, whose offices are in the Majestic Bldg. The officers of the construction company are, chairman Frank Hassler, treasurer M. E. Lyon, secretary C. R. Luton, assistant secretary and purchasing agent F. M. Hitchcock, and attorney Paul J. Davis. The company is preparing specifications which will be ready during December, after which the work will be pushed to a finish as rapidly as possible. If possible the company wishes to build its power houses and sub-stations this winter.

EXTENSION OF SOUTH SIDE ELEVATED.

Plans have been proposed for the extension of the South Side Elevated road to the Chicago Stock Yards which include the elevation of the Chicago Junction Railway Co.'s tracks from Emerald Ave. to the Illinois Central Railroad. According to these plans the elevated road will build a new structure extending from 39th to 43d St. at which point it will turn west, enter the stock yards district and make a loop around the outer edge of the yards. It will extend west to Ashland Ave., south to 47th St., east to Halsted St., and south to 43d St. The tracks of the Chicago Junction Ry. will be elevated to the same plane as the tracks of the elevated road now on 40th St. These tracks will be used by the Chicago Junction Ry. to a point where they turn south between Indiana and Calumet Aves. At this point the elevation of the Chicago Junction tracks will begin again and continue to the Illinois Central right of way where they run down to grade.

To accommodate its growing traffic the South Side Elevated desires to run a third track from 40th St. to Congress, but the ordinance will ask for the extension to 20th St. only. North of 40th St. the company owns the entire right of way, but between 40th and 12th St. it owns only 11/15 of the right-of way, and to obtain the other 4/15 for another row of track and pillars the company agrees to open and pave its right of way for use as a street.

NO TITLE TO FRANCHISE.

Three offers have been made to the city of Lincoln by different parties for the purchase of the franchises and property of the Lincoln Rapid Transit Co. and the Home Street Railway Co. in that city. One offer is from J. E. Riley, of Omaha, who has bid \$10,500 for the franchise and proposes to construct an interurban line for both passenger and freight between Lincoln and Omaha, and with several connections with smaller towns. The second offer was made by E. C. Hurd, who offered \$8,000 for the franchise but whose plans do not include any new track within the city limits. The third offer was made by William J. C. Kenyon, who offered \$7,000 for a franchise and also offered to pay one percent of the gross receipts of operation of the line during the first 10 years and three per cent thereafter. A special committee of the city council has reached the conclusion that it will not recommend the acceptance of any proposition that binds the city to furnish a good title to a franchise and it is deemed that the city has no such franchise to confer upon the purchaser.

Later advice state that the bid of W. J. C. Kenyon was accepted with certain modifications agreed to by Mr. Kenyon. He is to accept the right and franchise with such warrants of title as the city may be able to give, to pay one per cent of gross receipts for ten years and two per cent thereafter, and shall within two years have in operation two miles of street railway and ten miles in ten years.

MERIT SYSTEM OPPOSED.

The employes of the Scranton (Pa.) Railway Co. object very strongly to the Brown system of discipline which has been inaugurated by the company, and early this month sent an ultimatum to the company threatening to strike if this system of discipline was not discontinued. In the system adopted by the Scranton company 90 demerit marks means dismissal, and as the secretary of the union was discharged under this condition the men have determined to do away with the system if possible. The company, however, has fully as many non-union as union men in its employ and will be able to operate its cars in spite of a strike.

RECEIVER FOR SUPPLY HOUSE.

Frederick K. Day, of Elizabeth, N. J., was on October 31st appointed receiver of the American Electric Supply Co., which was incorporated last June with a capital of \$7,000,000. Among the concerns acquired by this company were the following: Union Railway, Power & Electric Co., the Morris Electric Co., the Falcon Electric Manufacturing Co., the Electric Motor Specialty Co., the Fountain Manufacturing Co., the Metropolitan Switchboard Co., and the Federal Manufacturing & Specialty Co., all of New York City.

The reason given for the embarrassment of the company is that the price of raw materials has so increased as to make it impossible to deliver goods on long time contracts taken when prices were lower.

SALE OF BROWNELL CAR PLANT.

It was announced early in November that the Brownell Car Works located in North St. Louis had been acquired by the American Car & Truck Co. This company, it will be remembered, is a reorganization of the American Car Co., which was purchased a short time ago by the Brill interests and which has been reorganized with John A. Brill as president.

ELECTRIC STORAGE BATTERY CONVENTION.

It is the practice of the Electric Storage Battery Co., of Philadelphia, to have annual conventions of its sales managers and engineers which afford opportunity for the exchange of ideas and experiences, and these meetings have not only proved valuable to the company and its men from a business standpoint, but are also most enjoyable socially.

This year the convention was held in Philadelphia, October 13th to 16th inclusive, the sessions being at the Colonnade Hotel. At the first session the president of the company, Mr. Herbert Lloyd, made the address of welcome, and papers were read by Charles Blizard, manager of the sales department; Walter G. Henderson, secretary and treasurer; and A. D. Stoughton, general counsel for the company. At later sessions technical papers were read by various members of the engineering and sales staff.

The entertainment features of the convention were not neglected, and included a tour of the works, a reception at the residence of Mr. Lloyd, a theater party on Wednesday evening, and a banquet at the Germantown Cricket Club.

The Montgomery (Ala.) Railway Co. is relaying five miles of track with new rails.

The Winnipeg (Manitoba) Street Railway Co. is installing an additional 1000-h. p. boiler in its power house.

The Cincinnati Traction Co. has instituted a trial board composed of three of its foremen, to consider complaints of employes, and report its findings to the general manager for revision.

The Urbana, Mechanicsburg Columbus Electric Ry. has purchased a tract of five acres in Columbus, O., which will be used for terminal and shop purposes; the Columbus sub-station and a freight depot will also be located there.

A car on the Lake Shore Electric Ry. made the run from Cleveland to Toledo, 120 miles, in 3 hours and 10 minutes, leaving Cleveland at 3 a. m. November 13th.

ACCIDENTS OF THE MONTH.

A collision between a Clybourn Ave. electric car of the Chicago Union Traction Co. and a switch engine of the Chicago, Milwaukee & St. Paul Ry. occurred November 1st at Wrightwood Ave. crossing, Chicago. The street car was thrown ten feet and partly demolished and the cars attached to the engine were derailed. The motorman was killed and three passengers were injured. It is believed the accident was due to a long string of freight cars which obstructed the view of the approaching engine.

A rear end collision occurred on the Hampshire & Worcester Street Ry. at Ware, Mass. the evening of October 18th, by a Gilbertville car slipping on a heavy grade and running into a West Brookfield car. Leaves on the track are supposed to have caused the accident. Twelve persons were reported injured but only two seriously hurt.

October 18th an electric car of the United Power Co., East Liverpool, O., became unmanageable while descending a hill and dashed into a passing freight train with such force as to overthrow a box car. Eleven persons were more or less injured.

An electric car on the Westbrook division of the Portland Railroad Co. ran into the side of two freight cars crossing the track at Cumberland Mills, Me., October 24th. Two persons were slightly injured. The electric car and one freight car were considerably damaged.

At Yonkers, N. Y., October 26th, an electric car collided with an automobile, overturning the latter and throwing the car on its side against the sidewalk. Twenty-two passengers on the car were injured, the four occupants of the automobile and the motorman escaping without injury. The fault is attributed to the chauffeur, who was racing with the car and had several times crossed the tracks ahead of it.

Two electric cars on the line of the Cumberland Valley Traction Co. met in a head on collision near Boiling Springs, Pa., on October 10th. Six persons were reported to be seriously injured and both cars demolished. The collision is said to be due to a misunderstanding of orders and a dense fog obstructing the view of the motorman.

A collision between a rapid transit electric car and a belt line locomotive drawing several freight cars occurred near Chattanooga, Tenn., October 26th. Seven persons were reported injured, two of them seriously. The rapid transit cars are operated over the belt track. It is said that the belt road engine disregarded a signal which gave the rapid transit car the right of way. The electric car was demolished.

A heavy electric car on the Broadway line of the Metropolitan Street Railway Co., Kansas City, jumped the track on the curve at Fifth St. and Broadway, November 5th, and crashed into a saloon, killing a pedestrian and the driver of a wagon and injuring six others. The saloon front and the car were badly damaged. The accident was caused by the motorman losing control of the car at the top of the hill two blocks away.

On November 8th a similar accident occurred at the same place by a runaway car dashing into another as it was discharging passengers near the foot of the hill. Both cars were considerably damaged and five passengers were injured.

A head-on collision between a suburban on the Kutztown electric line and a street car of the United Traction Co. occurred at North Reading, Pa., November 4th. Both cars were badly damaged. The motorman of the street car had his feet crushed but is expected to recover. Several passengers were slightly injured. The accident was caused by a disregard of signals probably due to the heavy fog which prevailed at the time.

November 8th a collision occurred between a tram of the St. Louis Valley R. R. and a car of the East St. Louis & Suburban Electric Ry. at the Terminal Ry. belt crossing of the Belleville Rock road. Nine persons were injured.

During a heavy fog in Battle Creek, Mich., November 7th, two street cars collided head on at the corner of East Main and Bennett Sts., fatally injuring one of the motormen. One woman passenger was also slightly injured.

In a head-on collision between two cars of the Union Railway Co. at Washington Ave. and West Farms Road, New York City, November 5th, the motorman of one car was killed and the motorman of the other sustained a broken leg. Seven of the passengers received slight injuries. The collision occurred in a dense fog.

DO ATTRACTIONS PAY STREET CAR COMPANIES?

An instance of the practicability of the park theater as a promoter of street railway traffic is afforded at Macon, Ga., where, for a number of years, the management of the street railway company has treated its patrons to the highest order of summer theatrical entertainments with most satisfactory results. The Macon Consolidated Street Railroad Co., under the direction of its superintendent, Mr. E. E. Winters, closed a 16 weeks' season of vaudeville and musical entertainments at Crumps Park, early in September, the cost of which ranged from \$175 to \$225 per week. A charge of 10 cents was made for reserved seats, but the majority of the park frequenters did not care for these and were admitted to the theater free of charge. The revenue from the sale of reserved seats alone, however, almost paid the expenses of maintaining the theatrical companies, and in fact it was only necessary to draw upon car fares to the extent of \$145 to make up the deficit for the purpose. The attendance at the park throughout the season was from 4,000 to 6,000 per week, which represents from 8,000 to 12,000 increase in fares per week. This is certainly an admirable showing for a city of only 25,000 inhabitants.

NEW PLANT OF THE JOHN DAVIS CO.

The accompanying illustration shows the new plant and office building now practically completed by the John Davis Co., of Chicago, one of the largest and oldest concerns in the country engaged in the manufacture of valves, piping, and steamfitters' and plumbers' supplies. In 1864 the business was located at Michigan and Wells Sts., the plant being entirely destroyed by the great fire of 1871. After the fire the business was resumed at No. 79 Michigan St., where continual and steady growth resulted in successive enlargements of the plant until it extended from No. 45 to No. 79 Michigan St. Recently it became necessary to secure more commodious quarters and the factory and office building illustrated were erected at Halsted, 22d and Union Sts.

The large building in the foreground is the stock and office building. In this building all the plumbing and steam supplies will be carried. The office will be on the second floor. One half of the entire first floor, 80 x 165 ft., will be devoted to shipping room. In the rear will be a large platform, at which five cars may be loaded or unloaded at the same time.

The one-story building directly in the rear is the pipe-bending and



JOHN DAVIS CO.'S NEW PLANT.

blacksmith shop, 50 x 100 ft. The brass foundry is also in this building, 50 x 50 ft.

The first section of the large building in the rear, 100 x 150 ft., will be the pipe-cutting shop. The rest of the building, 100 x 150 ft., will be the machine shop. The other buildings are foundry, pattern shop, warehouse, barn, and pipe warehouse.

There will be trackage on the property for twenty cars. The entire frontage on Halsted, 22d and Union Sts. is over a quarter of a mile.

This new plant is to be occupied with the latest and most up-to-date machinery, and it will be a worthy home for this old and well-known firm.

EMERGENCY BRAKE FOR STREET RAILWAY CARS.

The accompanying illustrations, representing an emergency brake for street railway and other cars is the invention of A. H. Morrow, Allegheny, Pa., and its object is to provide a simple, cheap and effective device which can be readily applied to standard electric street railway cars without in any way interfering with the ordinary brakes. It is designed to be quickly and easily operated by the motorman to check the movement of the car on steep grades or slippery rails, especially at such times and places as the car cannot be controlled by the regular brakes.

Fig. 1 is a side elevation showing the floor framing and truck of an ordinary electric car upon which the improved safety brake is mounted. Fig. 2 is a plan view of the same and Fig. 3 shows some of the details of construction for the brake.

The car is supposed to be running from right to left as shown by the arrow. AA represents the longitudinal timbers of the car and TT are the ordinary traction wheels to which any approved form of brakes are applied. The emergency brake wheel W has its axle at a in yoke Y which is hinged at b, some convenient point on the car frame, and so arranged that it can be swung from the position in which it is shown at the rear end of the car to the position in which a duplicate equipment is shown at the front end, where the toothed flanges of the wheel are brought into forcible contact with the pavement between the rails.

end or to the middle of the car, but cars making return trips by "changing ends" should be equipped at both ends as shown. The inventor claims that this device will stop a car with unflinching certainty, regardless of slippery rails or an ice-coated surface on the street, and that the stop will be made no more suddenly, and with no greater danger to passengers and property than if made with the regular brakes under ordinary circumstances.

CHEAP POWER IN CALIFORNIA.

When the Riverside & Arlington Railway Co. built its electric lines in Riverside, Cal., the city made a contract with the company to furnish power for operating the road for \$500 per year for the first three years, \$1,500 for the next two years, \$2,400 for the next three years and \$3,700 per year for the next four years. The city got current from the Redlands Electric Light & Power Co.

About a year ago the city undertook to rescind its contract with the railway company, on the ground that its action had been ultra vires, and charge the actual cost of the power. Nov. 1, 1902, the United States District Court rendered its decision sustaining the validity of the contract.

NEW QUARTERS FOR STEWART HOWLAND.

The Stuart Howland Co., of Boston, announces in a circular letter to the trade that owing to the rapid growth of its business it

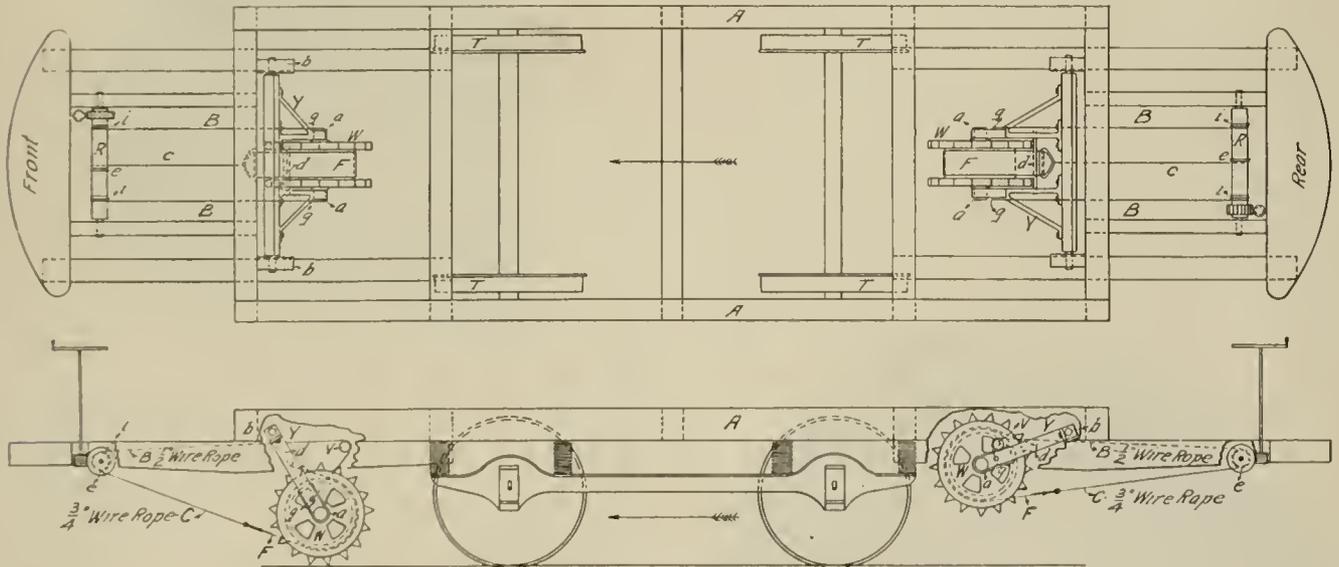


DIAGRAM SHOWING ARRANGEMENT OF EMERGENCY BRAKES.

The two flanges of the wheel W are connected by a drum of smaller diameter, around which passes a steel friction band F. One end of the band is firmly secured to the yoke Y at d and the other end is connected by means of a chain or cable C with the roller R at e. This roller is connected with the brake shaft by means of a worm and spur wheel or other suitable device. When not in use the wheel W is held up by two light chains BB, connected at g, with yoke Y, passing over sheaves V V, thence to the roller R and connecting with the same at e, on the side opposite the chain C.

By turning the brake shaft to the right the roller revolves producing tension in chain C and slackening the chains BB, thus bringing the toothed flanges of the wheel W in contact with the pavement with a degree of force depending upon the power applied to the brake shaft. The band F produces powerful friction on the wheel W, regarding the rotation of the latter in proportion to the force exerted upon the brake shaft, and as the wheel cannot slip or kick upon the pavement the speed of the car is controlled or stopped at the will of the motorman.

By turning the brake shaft to the left, the motion of the roller is reversed and tension produced upon the chains BB and chain C is removed. The wheel W is thus elevated to the position shown in the rear end of the car.

The construction is such that the brake can be applied to either

has been compelled for the third time in 18 months to materially increase its quarters. The latest addition includes the entire premises until recently occupied by Pettengill-Andrews Co. This will give the company about 30,000 sq. ft. of floor space with a frontage on Devonshire St. and Winthrop Sq. of about 240 ft., and when remodeled will make a store and offices the equal of any electrical supply store in the United States. The company had much outgrown the former quarters, and the added space was badly needed. Its stock is one of the largest to be found anywhere, and is carefully assorted and includes practically everything electrical. The location is in the heart of the busiest business section of Boston, within three minutes' walk of the South Terminal station and convenient to the car lines from the North station as well as from suburban points. The Stuart Howland Co. started in business less than three years ago, and its growth, which has been phenomenal, proves what can be done by a thoroughly up-to-date business policy, as the business is now one of the largest in the country. We congratulate the company on its enterprise.

The traffic on the Noma & Springfield (O.) Traction Co. was so heavy on November 11th that the company had to redeem several hundred tickets from intending passengers who were unable to find accommodations on the cars.

EXPRESS SERVICE ON LAKE STREET ELEVATED.

The express service on the Lake Street Elevated which had been discontinued was resumed Nov. 12th. It was discontinued some days previous for the reason that the Cicero town board ordered the company to remove the cars from the storage tracks west of Lombard St., and the resumption of the express service was made possible by a resolution passed by the city council, granting the company the right to store its surplus cars on the line of the old Chicago, Harlem & Batavia Ry., between South 40th Ave. and South 52d Ave.

ROOT TRACK SCRAPER.

With the approach of winter the necessity for making provision for cleaning tracks becomes imperative and one of the most successful devices for this purpose which has been put upon the market is a track cleaner made by the Root Track Scraper Co., of Kalamazoo, Mich. This machine is built not only with a scraper, but with a flanger for cleaning out the grooves of the rails, and the flangers and scrapers are mounted so as to work independently. One of the most important details of this device is the method of fastening. It is made to fasten directly to the trucks and this is a special advantage in the case of double truck cars as it is obvious that by no other manner of fastening it can follow the rails on curves. The scrapers may fasten either to the body or trucks as desired.

NEW WESTON INSTRUMENTS.

The accompanying illustrations shows new types of Weston instruments for use on small switchboards which have been designed to meet the demand for good but low-priced instruments. Fig. 1 shows one of the round pattern instruments, known as type K, which are similar in general construction and appearance to the type F instrument, which is extensively used for switchboard work in all kinds of stations.

The type K instruments are, however, much smaller than the type F, and are specially suited for small switchboards, or where



FIG. 1.

space is limited. These instruments are well made and carefully designed, so as to secure the highest grade of reliability and durability. They are absolutely dead-beat and their indications are correct to within one per cent.

Fig. 2 shows a small switchboard equipped with the Weston duplex instrument, which contains both a voltmeter and an ammeter in one case. These instruments, known as Models R and T, are especially useful where practically simultaneous readings of current and voltage are to be made. As the scales are close together

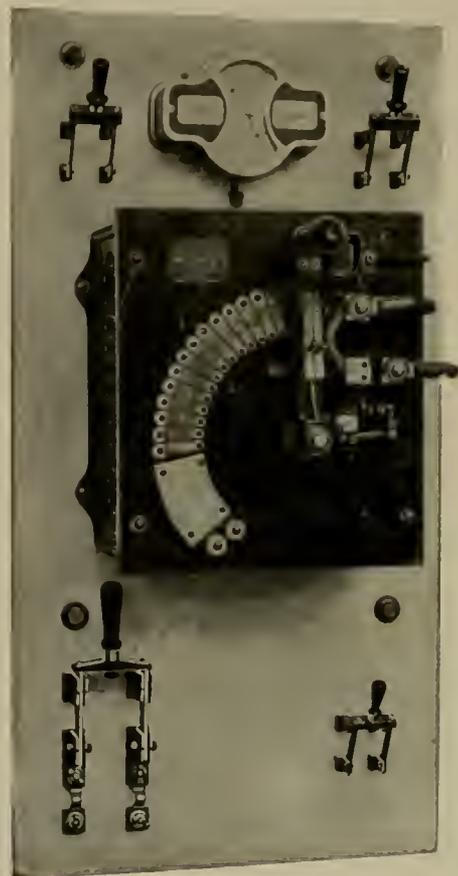


FIG. 2.

both may be read at a glance. Type R is built with a water-proof aluminum case, closely surrounding the operating parts of the instrument, thus reducing both the weight and the size to the smallest amount. This instrument is particularly suitable for outdoor use where water or dampness would affect a less securely enclosed instrument.

Type T is identical in design with type R, except that the scale is larger and can be read to smaller divisions. The case of this instrument is made of wrought iron, and is larger and much heavier than type R. The function of the cast iron case is to shield the instrument from external fields, which it does very effectively.

WATER TANKS AND TOWERS.

It has probably not occurred to the casual visitor to an office building or factory that all of the water used in these buildings is obtained from overhead tanks, and in looking across the wilderness of roofs in a large manufacturing city a large number of these tanks placed, either upon the roofs or independent towers, cannot fail to attract attention. An idea of the extent to which tanks and towers are manufactured is afforded by the figures given by the W. E. Caldwell Co., of Louisville, Ky. These tanks are used for fire protection for manufacturing plants, for water supply in villages and for private grounds. This company sends out an average of 30 tank and tower jobs a month, of this class, in addition to from 50 to 200 a month for ordinary water supply. This output calls for about 3,000,000 ft. of lumber, mostly Louisiana cypress and Georgia pine, and 300 tons of steel bands per year. The advertising bureau of this company is a particularly busy one and it sends out between 50,000 and 60,000 catalogs a month.

NEW PUBLICATIONS.

PROCEEDINGS, Street-Railway Association, of the State of New York. The proceedings cover the twentieth annual meeting of the association, held at Caldwell, Lake George, N. Y., Sept. 9th and 10th, 1902. The volume contains 220 pages devoted to the discussions of street railroad topics, reports of committees, list of officers and members, and constitution and by-laws of the association.

PROCEEDINGS OF THE ILLINOIS STATE ELECTRICAL Association convention, held at Rock Island, Ill., September 24, 1901, has just been published. The book is chiefly devoted to two subjects, one being the insurance of electrical plants and the other, the method of heating from exhaust steam from electric light plants. Extended discussions of both of these subjects are given containing considerable valuable information.

MACHINE SHOP NUMBER of Cassier's Magazine, published by the Cassier Magazine Co., New York, price 50 cents. This special number contains 272 pages of choice reading matter illustrated with 236 half-tone engravings. There are twenty articles written by men well known in engineering circles and who are specialists in their lines of work. The subjects include compressed air, electric power, cranes, portable tools, foundry appliances, milling and grinding machines, tool room, shop floors, tool design, limit gages, shop heating, a new system of rewarding labor, piece work, progress and education, apprentices, factory depreciation, and fire prevention.

"WORK DONE" is the title of a handsomely illustrated pamphlet published by Westinghouse, Church, Kerr & Co., and contains descriptions of a number of the prominent electrical railways and other engineering works installed by this company. The book is excellently illustrated and the descriptions of the various plants are given in great detail. It includes the construction of the Grand Rapids, Grand Haven & Muskegon Ry., the Detroit & Port Huron Ry., the Detroit, Ypsilanti, Ann Arbor & Jackson Ry., the Toledo, Fremont & Norwalk Ry. and the plant of the American Car & Foundry Co.

POSSIBILITIES IN AMERICAN LOCOMOTIVE DESIGN, reprinted in pamphlet form from the Railroad Gazette of Oct. 17th, 1902, is an address at the Deer Park convention of the Baltimore & Ohio Railroad officers, September 20th, by Prof. W. F. M. Goss, of Purdue University, Lafayette, Ind. In the address Prof. Goss comments upon changing conditions and influences at work in the development of the American locomotive. He calls attention to a very general disposition to employ a false standard, based upon the idea of complication, in estimating the value of proposed improvement in locomotive design. The advantages and disadvantages of compound locomotives are discussed at some length, particular reference being made to the de Glehn type which is so much used in France.

A MANUAL OF DRAWING, by C. E. Coolidge, assistant professor of machine design, Cornell University, 92 pages, 10 full-page plates, paper, \$1.00. The object of the Manual is to put into permanent form a single and standard drafting-room system which will tend to alleviate unnecessary burdens upon the student and teach him one good system well. The system embodied in the book is intended to be the average system in use at the present day and is fully substantiated by data and information received from one hundred and thirty of the largest manufacturing concerns in the United States. The writer has discussed in detail the salient points in the selection and use of instruments and materials commonly used in a commercial drafting room. Each alternate page is left blank for the purpose of notes to be made by the student. The final chapter deals with Patent Office Drawings.

The Jersey City, Hoboken & Paterson Street Railway Co. has added John D. Crammins and John J. Waterbury to its board of directors.

An electric car on an outlying line of the Memphis (Tenn.) Street Railway Co. was held up November 8th by four men who secured \$42 from the car crew.

ADVERTISING LITERATURE.

"RECORD OF RECENT CONSTRUCTION NO. 38" under the title of "Motor and Trailer Trucks" issued by the Baldwin Locomotive Works, of Philadelphia, treats of the recent development and extension of electric motor car service and shows how the Baldwin works has kept pace with this progress, as it has built both motor and trailer trucks for the heaviest electric cars in service up to this time. A large number of trucks are illustrated and a list of detailed information given concerning each.

"ELECTRIC LOCOMOTIVES FOR SURFACE HAULAGE" is the title of a handsomely illustrated catalog issued jointly by the Baldwin Locomotive Works, Philadelphia, and the Westinghouse Electric & Manufacturing Co., Pittsburg. The catalog presents in a very conclusive manner the numerous advantages of electricity as a motive power applied to locomotives for heavy surface haulage as well as for mining service. The engravings show a number of electric locomotives in use at some of the leading industrial establishments in the United States. The standard types and classes are enumerated, and a general description of their construction is given, together with tables of weights and characteristics of each class.

"IT BEATS THE SUN" is the title of a new illustrated catalog issued by the Pittsburg Blue Print Co., Pittsburg, Pa., describing its patent cylindrical electric copier. The machine consists of two half glass cylinders suitably mounted and having a strong canvas cover to hold the tracings and paper in place. An arc lamp of special design descends in the cylinder from an escapement mechanism for regulating the speed of the lamp. Among the advantages claimed for the machine are absolute independence of weather conditions and a reduction in the cost of prints. The company states that over one hundred machines have been installed in the offices of some of the largest concerns in the country. The catalog also describes a blue print wringer placed on the market by the company.

THE CHRISTENSEN ENGINEERING CO., Milwaukee, Wis., has issued catalogs Nos. 53, 54, and 55. Catalog No. 53, "Straight Air Brake Equipments," describes the various devices that comprise the Christensen straight air brake equipment for electric cars and explains the function of each part of the apparatus with instructions for its operation and maintenance. No. 54, "Christensen Air Brake, Where Made and Where Used," is a handsome souvenir issued for distribution at the Detroit convention of the American Street Railway Association, and shows a large number of views of the company's works, together with illustrations of various types of cars equipped with Christensen brakes and a list of names and addresses of roads using them. "Ceco Electrical Machinery" is the title of No. 55 which illustrates and describes various types of electrical machinery, including direct current motors and generators, alternating current generators and transformers. Copies of these catalogs will be sent on application.

MESSRS. DICK, KERR & CO., Ltd., 110 Cannon Street, London, E. C., are distributing the following handsomely illustrated pamphlets: "The English Electric Manufacturing Co., Ltd." is the title of a description of that company's plant and is illustrated by 15 full page engravings. Some idea of the size of the works may be had from the statement that in the eighteen months since the completion of the works electrical generators aggregating 100,000 h. p. capacity and 3,000 tramcar motors with all their attendant equipment have been sent out. "Continuous Current Generators" illustrates the various parts and the process of manufacture of the Preston generator which embodies features of extreme simplicity in design and construction. "Rolling Stock for Electric Traction" represents the most modern practice in electric car building in England by 42 pages of illustrations showing the latest types of cars in various stages of construction at the plant of the Electric Railway & Tramway Carriage Co., Preston, Lancashire. "Electric Traction on Railways" deals principally with the advantages of electricity over steam for suburban lines due to the higher acceleration made possible by the former. "Electric Traction at the Cape" is a description of the Campas Bay, Cape Town & Sea Point Tramways in South Africa and points out the numerous engineering difficulties which were considerably enhanced on account of the work being carried out during the progress of the Boer war.

Creaghead Flexible Brackets

ARE STANDARD

CREAGHEAD ENGINEERING CO.
ENGINEERS and MANUFACTURERS
OVERHEAD LINE MATERIAL.

For Single and Double Wire.



West End Cap and Cone and Solid Types of Insulators.



Ears for Round Figure 8, and Groove Forms of Trolley Wire.



Solid Type Insulators.



Type D. For Single and Double Wire.



Complete Equipment for Overhead Construction.

THE CREAGHEAD ENGINEERING CO.

ENGINEERS AND MANUFACTURERS

WRITE FOR CATALOGUE

CINCINNATI, OHIO.

TRADE NOTES.

THE CHAMPION TROLLEY HARP CO., of Philadelphia, has been incorporated with a capital of \$130,000 to manufacture improved trolley harps.

THE C. W. TRAINER MANUFACTURING CO., Boston, Mass., has closed a contract for covering all steam heated surfaces of the new power plant of the Berkshire Street Railway Co., Pittsfield, Mass., described on page 813 of this issue.

THE UNITED STATES COAL CO. has purchased from the Westinghouse Electric & Manufacturing Co. two 150 kw. 550-volt direct current generators and two 10-ton electric mining locomotives, for use at its soft coal mines at Dillonvale, Ohio.

THE BILLINGS & SPENCER CO., Hartford, Conn., is sending out a new price list of drop forged lathe dogs manufactured by it. These dogs are drop forged from steel and fitted with hardened steel set screws and are especially designed for heavy work.

THE STANLEY ELECTRIC MANUFACTURING CO. has recently opened a sales office in Atlanta, Ga., to take care of the increasing demand for S. K. C. apparatus in the South. The office is in the Empire Building and is in charge of Mr. George P. Hardy.

HARTSHORN'S ROLLER, published by the Stewart Hartshorn Co., East Newark, N. J., for October, contains a description of some new brackets to be used in connection with the Hartshorn shades, and the pages are also well filled with choice humorous matter.

THE CENTRAL ELECTRIC CO., of Chicago, has recently issued a new general catalog dated 1903, and has distributed it to the trade throughout the country. Any buyer of electrical supplies who has not already received a copy can do so by addressing a request to the company.

THE BILLINGS & SPENCER CO., Hartford, Conn., has issued its Circular A illustrating new automobile parts which the company carries in stock for filling orders promptly. The company is prepared to furnish drop forgings of every description in iron, steel, copper and bronze.

THE GREEN FUEL ECONOMIZER CO. is building an addition to its machine shop, 50 x 150 ft. Among recent orders received for economizers are equipments for the Albany St. plant of the Boston Elevated, and for the Newark and Secaucus plants of the New Jersey Traction Co.

PERRY HODGES, of Boston, announces that owing to the increased business and the consequent necessity for more commodious quarters he has taken offices in the Board of Trade Building, 131 State St., Boston, where he will have charge of the business of the Pittsburg Reduction Co. in addition to his regular supply business.

THE OTIS ELEVATOR CO. has recently received the contract for the elevator and dumb-waiter equipment of the new Astor Hotel, Long Acre Square, 44th to 45th Sts., New York. The plant consists of seven electric passenger elevators, two electric servants' elevators, eleven electric dumb-waiters, and three electric sidewalk lifts. Messrs. Clinton & Russell are the architects and John Downey is the general contractor.

ADAM COOK'S SONS, 313 West St., New York City, the only makers of "Albany" grease, receive many letters testifying to the satisfactory results obtained where this ideal lubricant is used. The J. Sullivan & Sons Mfg. Co., of Philadelphia, writes: "We have our engine and main shafting fitted up with your grease cups; they are working to our entire satisfaction. Albany grease is certainly more economical and cleaner than oil."

THE H. P. CAMERON ELECTRIC & MANUFACTURING CO. has recently been organized under the laws of Connecticut with a capital stock of \$30,000. This company has purchased the interests of the old company which was organized under the laws of New York State and will move into its new factory, which is now

STANDARD 17 YEARS

P & B

P & B Electrical Compounds
P & B Armature and Field Coil
Varnish.
P & B Insulating Tape.

ALL ARE ACID AND ALKALI PROOF.
 Write us about them.

The Standard Paint Company

NEW YORK	CHICAGO	HAMBURG
100 William St.	189 Fifth Ave.	Dovenhof 93.
PARIS	LONDON	
50 Boul. Haussman	59 City Road S. W.	

being built, about the first of December. The factory will contain a complete line of new machinery for making all kinds of motors, armature coils and electrical supplies in general.

H. E. OVERSTREET is meeting with great success in introducing the "Climax" stock guard on the interurban lines throughout the country. Last month he added to a long list of customers: the Massachusetts Construction Co., 75 guards; the Chicago, Milwaukee & St. Paul Railway Co., 100 guards; the Chicago & South Shore Ry., 50 guards.

THE PITTSBURG SPRING & STEEL CO., which was mentioned in the "Daily Street Railway Review" as organized with Mr. D. C. Noble as president, is progressing rapidly with its new works in which elliptic and coil springs of every variety will be manufactured. It is expected that the company will be in a position to fill orders for delivery after January 1st, 1903.

THE KENNICOTT WATER SOFTENER CO., of 3577 Butler St., Chicago, has found the demand for its water softeners so great that it has been obliged to secure additional manufacturing space. The main building of this new plant is 120 x 50 ft. in area and is equipped with all the modern facilities for building water softeners. The equipment includes traveling cranes, pneumatic hammers, riveters, drills, etc., and will enable the company to fill future orders with great promptness.

THERE IS PERHAPS no better economy to the steam-fitter and the engineer than a perfectly tight joint, yet one that can be easily taken apart if desired, and the Joseph Dixon Crucible Co. claims that it is always possible to have such joints if Dixon's graphite pipe-joint compound is used. Flake graphite is impervious to the action of heat or cold, acids or alkalis. Hence the value of a graphite compound when properly prepared. The Dixon company will send booklet and sample free of charge.

THE PENNSYLVANIA STEEL CO. now has at its office, 210 Western Union Building, Chicago, open for inspection the models of frogs, switches and switch stands, etc., that were placed on exhibition at the American Street Railway Association Convention in Detroit, October last. These models are both typical of interurban, city and steam railroad work and it would especially repay those interested to drop in their office to examine them.

THE LINK-BELT ENGINEERING CO., of New York and Chicago, reports among recent sales of the Renold silent chain, nine line shaft drives from motors for the new works of the Patton Paint Co., Newark, N. J.; eight drives from motors to line shafts and elevators in the new plant of Crompton & Knowles Loom Works, Philadelphia; eight 60-h. p. drives for induced draft blowers in the new Waterside station of the New York Edison Co. There are now 61 Renold silent chains in use in the new building of R. H. Macy & Co., varying in capacity from one to 90 h. p.

THE WESTERN ELECTRICAL SUPPLY CO., St. Louis, has recently taken the western agency for the "Parker" ball-bearing trolley stand. The stand is simple in construction, weighs less than 75 lb. and embodies a number of new features. It is claimed to be one of the lightest, cheapest and most sensitive stand on the market, and that by its use trolley wheels will wear about four times as long as usual. It can be easily and quickly adjusted for tension, follows curves in the wire easily and rain cannot enter its bearings. A catalog giving full description will be sent on application.

THE ADVANTAGES of Albany grease, the well known lubricant, are well stated in a letter recently received by Adam Cook's Sons, the sole manufacturers, 313 West St., New York City, from M. D. Roche, engineer at Caney's granite quarry, Lanesville, Mass. In summing up his experience the writer says: "I find Albany grease to be more durable, cleaner, cheaper and superior to any grease or oil that we have used, and shall certainly recommend it when placing our next order."

THE BROWN CORLISS ENGINE CO., of Corlies, Wis., reports that its business has increased rapidly during the last six

"Superior Graphite Paint"

ESPECIALLY ADAPTED FOR USE BY STREET RAILWAYS BECAUSE IT
Offers a positive protection for all exposed surfaces. Makes Metal, Brick or Wood proof against the ravaging effects of weather, smoke, water, steam, etc. We manufacture special paints from special formulas to meet special requirements.
Our booklet will interest you—shall we send it?

DETROIT GRAPHITE MFG. CO.
Detroit, Mich.
NEW YORK BOSTON CHICAGO

L. L. CLINE

THE LIFE OF A MOTOR IS PROLONGED BY USING.....

ALBANY GREASE

Has Never Failed to Reduce a Hot Journal Where Used.

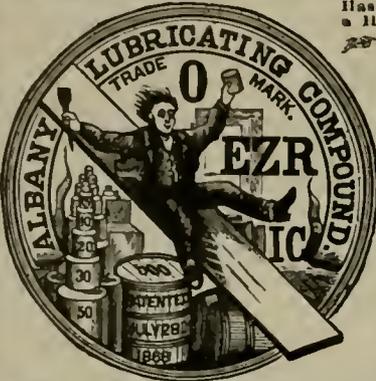
The Albany Electric Motor Grease is the only grease used from Maine to California that gives universal satisfaction. Why? Because it does the work required, has proven itself cheaper than any of the motor greases on the market today, and is always uniform in quality.

Will send a keg (100 lbs.) of our Grease for trial on approval at our regular barrel price.

If it does not prove satisfactory after an impartial test, will make no charge for keg. We know the result: you will want more.

ADAM COOK'S SONS
313 West St. N. Y. City, U. S. A.
Branch: 81 S. Canal St., Chicago.

This Trade Mark on Every Package



months that the company has found it necessary to erect a foundry which it is expected will be completed within 30 days. This addition to the plant is an entirely modern structure with concrete foundations and steel framework, 350 ft. long by 116 ft. wide. The company is about to undertake the construction of mining machinery, hoisting and pumping engines, compressors, etc., and rolling mill work, and intends to increase its agencies throughout the South and middle West.

THE COLUMBIAN CONSTRUCTION CO., which has been engaged in making extensive improvements on the Metropolitan system in Kansas City, completed its work in the latter part of the summer. In all about 11 miles of very heavy construction was built for the Metropolitan Street Railway Co., including the rebuilding of the 15th St. and Brooklyn Ave. line, which was formerly a cable and now an electric line; the rebuilding of the Prospect Ave. line, which was an old electric line with light rails laid on ties, and is now constructed with 9-in. 106-lb. rails laid on concrete beams; the 10th St. line, which was an old cable line, was also rebuilt with concrete beams.

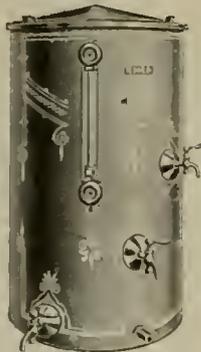
AT THE RECENT Dusseldorf exhibition Arthur Koppel was awarded the silver medal for his exhibit of industrial railway equipment, dump cars, inclined planes, self-discharging ore cars, electric railroads, etc. This is the highest medal given for industrial railway equipment at this exhibition. It will be remembered that the firm of Arthur Koppel also received the gold and silver medal at the Paris exhibition, which was the highest award given there for similar material. Arthur Koppel, whose offices are at 66-68 Broad St., New York City, carries a large stock of all standard goods ready for immediate shipment, and will be glad to send catalogues to all interested parties mentioning this publication.

THE LIBERTY MANUFACTURING CO., of Pittsburg, has purchased from the Sherwood Manufacturing Co., of Buffalo, N. Y., all of its patents and trade marks pertaining to the manufacture of the turbine type of machine for cleaning boiler tubes. This purchase settles amicably two suits involving patents which were pending in the United States courts. The Liberty company will in future manufacture and sell the "Niagara" tube cleaner as well as its standard "Chicago" tube cleaner which has been its specialty for several years past. This purchase was made to give the company control of the basic patents on tube cleaners of the turbine type, and the company's plant will be greatly enlarged. There are now over 8,000 cleaners of this type in successful use.

WESTINGHOUSE, CHURCH, KERR & CO. report extensive sales of the Roney mechanical stokers for the past month among which are mentioned the following: Carnegie Steel Co., Homestead works; Juniata Steel & Iron Co., Greencastle, Ind.; Lackawanna Steel Co., Buffalo; Continental Tobacco Co., St. Louis, Mo.; Atlanta Rolling Mill & Tinplate Co., Atlanta, Ind.; Woodward & Lothrop, Washington, D. C.; Merchants Heating & Light Co., Indianapolis, Ind.; The J. L. Mott Iron Works, Trenton, N. J.; American Locomotive Works, Schenectady, N. Y.; Pennsylvania Railroad, Altoona, Pa.; United States Lighting & Power Co., Washington, D. C.; National Tube Co., Pittsburg, Pa.; Pressed Steel Car Co., Pittsburg, Pa.

EUGENE MUNSELL & CO., of New York and Chicago, have recently begun the manufacture of mica chimneys for incandescent gas burners which are known as Warren's folding interlocking chimneys. These chimneys are packed and shipped flat like sheets of paper, but can be formed into cylinders by joining the interlocking edges which are provided. This makes it possible to clean the chimney easily and thoroughly, which can not be so easily done with the ordinary chimney. It is claimed that it will transmit more light than any other mica chimney and in addition to these qualities there is a further advantage to the dealer as their shipping weight is considerably less than that of others and they take up but little space on the shelf. A gross of these chimneys covers less space than two dozen of the old-fashioned kind. A descriptive price list will be sent upon application.

THE BRIDGEPORT BRASS CO., of 19 Murray St., New York, and Bridgeport, Conn., is issuing a dainty brochure, containing a



Filters for Oiling Systems

It is important that the Filter selected shall meet all requirements as regards filtering capacity, perfect cleansing of the waste lubricating oil and ease with which the Filter may be operated.

Cross Oil Filters

are in use in a large number of power houses in all parts of the United States. Our experience in furnishing Filters for oiling systems is at the command of companies having such work in prospect. Write for particulars.

The Burt Mfg. Co.,

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very practical talk on the construction of telephone and telegraph lines with "Phono-electric" wire. The little pamphlet is more than a catalog, and gives in simple and concise language the theory and general principles upon which the modern telephone is constructed. The story begins with an explanation of the form and character of sound waves produced by the human voice, and goes on to tell how these waves are collected, transmitted and impressed upon the receiver. The importance of the transmission line in the operation is pointed out, and the advantages of "Phono-electric" wire over other materials is demonstrated by numerous statistics and tables, derived from actual experiments and tests made on this well-known composition. In addition to its qualifications for telephone lines there are claimed for "Phono-electric" wire many advantages for electric railway work.

THE ELECTRIC STORAGE BATTERY CO. has acquired the business of the Chloride Electrical Storage Syndicate, Ltd., which was formed in England soon after the incorporation of the Electric Storage Battery Co., of Philadelphia. The electrical development in this field has been very slow in Great Britain so that the English company only recently reached a paying basis. A large amount of electrical work however is to be accomplished in Great Britain in the next few years. This is indicated by the large works recently erected by the British Westinghouse Co., and the British Thompson-Houston Co. The Electric Storage Battery Co., seeing the opportunity for a large and profitable business in England and other countries, decided to purchase control of the English company and will now be able to sell batteries in foreign countries and have shipments made from England. It will thus be in a position to handle business all over the world.

THE LUDLOW SUPPLY CO., of Cleveland, states that it has had very gratifying results from its exhibit at the Detroit convention, especially on the Johnson trolley retractor, which not only catches the trolley when it flies off the wire, but pulls it down 15 in.; on the "Milwaukee" trolley pole, the Gore track drilling machine and the Garry pneumatic car and pit jacks. These articles are all new and were exhibited at Detroit for the first time, and attracted a great deal of attention at the convention. The Ludlow Supply Co. is now in correspondence with some of the largest electric railways in the country, with a view of equipping their lines with these various devices. The company has had such a demand for the Gore drilling machine that the makers have been unable to fill all orders promptly; arrangements have therefore been made with H. Gore & Co. and hereafter the Ludlow company will manufacture the drills and carriages complete at Cleveland, which will enable it to make prompt shipment in every instance.

PAWLING & HARNISCHFEGER, Milwaukee, Wis., report that the demand for cranes and hoists is excellent and advise us of the following orders which have been recently booked: Baldwin Locomotive Works, two 10-ton cranes; Manitowoc Steam Boiler Works, Manitowoc, Wis., one 35-ton crane; Consolidated Railway, Light & Power Co., Wilmington, N. C., one 10-ton crane; Pennsylvania Lines West of Pittsburg, Ft. Wayne, Ind., one 1½-ton hoist; Lorain Steel Co., Johnstown, Pa., one 7-ton crane; American Sheet Steel Co., Cambridge, O., one 5-ton crane; Berlin Machine Works, Beloit, Wis., one 1½-ton hoist; The Lorain Foundry Co., Lorain, O., one 5-ton crane; Allis-Chalmers Co., Chicago (for export), one 30-ton crane with 4-ton auxiliary hoist; Colean Implement Co., Peoria, Ill., one 10-ton crane; Allis-Chalmers Co., Frasier & Chalmers Works, Chicago, one 30-ton crane with 8-ton auxiliary hoist; Gruson Iron Works, Eddystone, Pa., one 20-ton crane; Isaac G. Johnson & Co., Spuyten Duyvil, New York, one 3-ton hoist; Allis-Chalmers Co., Chicago, one 5-ton crane; American Bridge Co., Milwaukee plant, Milwaukee, Wis., one 5-ton special crane.

THE CLIMAX STOCK GUARD CO., 714 Marquette Bldg., Chicago, reports that the exhibit of a full-size cattle guard located at the main entrance of the Exhibition Hall at the Detroit Convention, together with its smaller display inside the hall, resulted in numerous inquiries from street railway men who are looking for a cheap and efficient cattle guard. The company during the four months ending Aug. 1, 1902, sold over 1,600 guards, and among

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STREET RAILWAY PATENTS.

Patents furnished by F. Reed City Patent Attorney, Washington, D. C., from whom all information copies of patents etc. can be obtained.

No. 710,423. Oct. 7, 1902. Wm. H. Caley, Denver, Colo. Automatic safety device for cars.

No. 710,432. Oct. 7, 1902. J. D. Cottrell, Providence, R. I. Automatic switch mechanism for street railways.

No. 710,472. Oct. 7, 1902. Wm. H. Kidley, Cranston, R. I. Mechanism for operating street railway switches.

No. 710,530. Oct. 7, 1902. Max Straus, Denver, Colo. Hand strap for street cars.

No. 710,877. Oct. 7, 1902. Carl Metterhausen, Chicago, Ill. Brake mechanism for vehicles.

No. 711,051. Oct. 14, 1902. Thomas Kendrick, Glenwood Springs, Colo. Car step.

No. 711,081. Oct. 14, 1902. Jos. Toner, Pittsburg, Pa. Car brake.

No. 711,107. Oct. 14, 1902. W. S. Hill, Hyde Park, Mass. Electrical traction system.

No. 711,280. Oct. 14, 1902. H. F. Brown, Wilkesburg, Pa. Brake for street railways, etc.

No. 711,368. Oct. 14, 1902. J. C. Hane, Greencastle, Ind. Derailing switch.

No. 711,753. Oct. 21, 1902. Chas. E. Baltz, Rahway, N. J. Protecting rail for open cars.

No. 711,861. Oct. 21, 1902. R. H. Hornbrook, Canton, O. Truck for street cars.

No. 711,878. Oct. 21, 1902. Frank B. Nims, Lake Odessa, Mich. Car starting device.

No. 711,899. Oct. 21, 1902. L. C. Johnson, Detroit, Mich. Car brake.

No. 711,935. Oct. 28, 1902. F. W. Brooks, Brooklyn, N. Y. Automatic photographic detector device for passenger cars.

No. 712,011. Oct. 28, 1902. J. S. Sheets, Pittsburg, Pa. Car brake.

No. 712,074. Oct. 28, 1902. F. W. Keyes, Syracuse, N. Y. Railway switch shifting mechanism.

No. 712,200. Oct. 28, 1902. G. F. Chapman, Marlboro, Mass. Adjustable headlight for street cars.

No. 712,281. Oct. 28, 1902. H. Farr, Winchester, Mass. Device for lessening the noise of vibration in vehicles.

No. 712,433. Oct. 28, 1902. Geo. F. Chapman, Marlboro, Mass. Headlight operating mechanism.

WHAT TO SEE IN NEW YORK.

The New York Press on the New Show Places in New York.

What are New York's show places? It would be right hard to enumerate them on short notice. Perhaps the following question and answer may appeal to some: Resident to New Arrival—"Now tell me what you would especially like to see." New Arrival—"Oh just show me New York." I think that very good. But it is no easy matter to show New York. To our list of show places, whatever they may be, we must add the new waiting room at the Grand Central Station. When strangers go there they cry "Enchanting!" "Grand!" "Palatial!" "Prettiest thing I ever saw!" "Finest thing in the world!" "Amn't it splendid!" etc. Mr. Daniels has reason for the new elasticity in his step. "On the Tip of the Tongue" in the New York Press.

The Northern Texas Traction Co., of Fort Worth, Tex., contemplates extensions from Fort Worth westward to Weatherford, 31 miles; northward to Defton, 35 miles; and southward to Cleburne, 28 miles.

The Indianapolis Northern Traction Co., which is obtaining rights of way for its proposed road from Indianapolis to Noblesville, has begun condemnation proceedings for a strip of farm land in Washington township.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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Under a law passed at the last session of the Massachusetts Legislature savings banks in that state are authorized to invest in the bonds of street railway companies in the state that have paid 5 per cent dividends for five years or more. This action will give the street railway securities of Massachusetts a wider market than they have heretofore enjoyed and the fact that such investments are authorized by the state cannot fail to have a marked effect upon the attitude of the public towards street railways.

The plans of the Indianapolis Traction & Terminal Co. for erecting a huge terminal station in Indianapolis may be considered epoch-making. It is the intention that this station shall serve not only to bring cars of all of the many interurban electric railways entering that city to a common meeting point, but also to concentrate the various interests allied with these roads in an office building. The advantages of such an arrangement on the score of convenience and economy of time are readily appreciated and the effect upon electric railway building in the state will be an important one.

It is difficult for us on this side of the border to appreciate the reasonableness of that deep-rooted opposition which prevents the operation of street railways in Canadian cities on Sundays. The city of Winnipeg voted upon the question of Sunday street cars on December 9th, and notwithstanding the company had agreed that in event of being permitted to operate it would arrange that none of its employees need work Sundays save of their free will, the proposed by-law was defeated by a narrow margin. Doubtless the result would have been different were the territorial of extent of Winnipeg greater, as residents of larger cities better appreciate the boon that a trip on the trolley is to the great number of people who find on Sunday their only opportunity for relaxation.

The announcement has just been made by the management of the Louisiana Purchase Exposition of the organization of World's Congresses to be held in St. Louis during 1904. The chief of the Department of education will be director of Congresses, assisted by an advisory board comprising Nicholas Murray Butler, president of Columbia University; William R. Harper, president of the University of Chicago; R. H. Jesse, president of the University of Missouri; Henry S. Pritchett, president of the Massachusetts Institute of Technology, and Herbert B. Putnam, Librarian of Congress. It is the intention to make the series of congresses a co-ordinate part of the exposition, its work supplementing the exhibits, and having a scientific value that will attract the attention of scholars and practical experts in all parts of the world, making the congresses truly international.

It is to be hoped that these plans will be fully carried out and in view of the position which the electric railway holds in America, and the fact that by reason of the development of alternating-current apparatus for traction purposes we are just entering upon a new field, nothing would be more appropriate and opportune than an International Congress of Electric Railway Engineers.

We believe the transfer law enacted in 1902 by the Rhode Island Legislature covers the transfer question better than the transfer laws in most other states, and is just, both to the company and the public. As has been pointed out at convention banquets during the past several years, the word transfer, from "trans" meaning "across" and "fer" to "bear," signifies to bear across, and the transfer will always be at the best a heavy cross to be borne by the general manager along with his other troubles and tribulations. But as long as transfers must be, some such regulations as are provided by the Rhode Island law ought to be stipulated for the protection of the company. The sections providing a penalty of not less than \$5 nor more than \$20 to be paid by every person who gives or sells or purchases or receives a transfer ticket, except in a legitimate way within the spirit of the law, is admirable and should operate to prevent trafficking in transfers.

The extract of the Rhode Island transfer law which appears on another page, will probably recall to a number of our readers the decision of the Supreme Court of California, reported in the "Review" for July, 1900, page 406, sustaining the validity of an ordinance designed to prevent the misuse of street railway transfers and imposing a penalty of a fine of not more than \$500, or imprisonment in the county jail not exceeding six months, or both. In the Rhode Island statute care has been taken to avoid the loose phrasing which

made it necessary for the court to read the words "with intent that it shall be used by some other party" into the California ordinance.

The Supreme Court of Illinois, as noted in the "Review" for November, has recently decided that the Chicago street railways have some extraordinary duties in the matter of issuing transfers, and having in mind the abuses of the transfers against which the Chicago companies have had to contend, it would be no more than just for the Illinois Legislature to pass an act similar to that of Rhode Island, which will adequately protect the companies.

From its first issue the "Review" has urged the advantage of street railway parks and pleasure resorts as a means of creating traffic, and in the last twelve years has described a large number of successful enterprises of this nature, but the subject of parks has by no means lost its interest, for at this time there are more electric railways considering this question than ever before. The greater proportion of new companies in the field are operating interurban lines and to these the pleasure resort particularly appeals because of the longer haul to the park, and the higher fare; and in fact we know a number of instances where the promoters of roads now under construction have taken the precaution to get options on park sites at the same time they secured the right of way for the road.

To managers who are contemplating opening parks for the first time next season the experience of others in this direction will be particularly helpful, and with the idea of assisting the newcomers and at the same time affording an exchange of information among those who already operate parks, we have undertaken to collect the most recent data on the subject. On another page will be found the first installment of the reports from park managers, the information being especially useful in indicating what attractions have proved to be most popular and remunerative.

An important point for the consideration of those who intend to open a park is the location of the park with reference to the municipality served. Other things being equal the shorter haul to the park, the better for the company, but an interurban line should not get too close to any of the large towns on its route. An instance is in mind where a city council extended the municipal limits to within a block or two of the railway's amusement park, and as the franchise provided for a 5-cent fare within the city limits, the company's receipts from park travel were cut practically in half.

The operation of a street railway pleasure resort falls within the maxim that "what is worth doing is worth doing well," and a great many companies find that to follow this course leads first to the employment of a park manager, or to leasing the park to an amusement company or park specialist. The latter plan has its advantages for roads of medium size, where the superintendent of the railway has too much to do to take the park management in addition, and yet the company feels it cannot afford to employ a manager solely for the park. It is, however, always prudent where the park is to be operated by a lessee or when the park manager has no other duties during the resort season, to incorporate an independent park company. This would relieve the street railway of liability that might arise because of accidents at the park, and also often deprive a hostile press of some of its "talking points." Doubtless many of our readers can recall instances of street railways which entered into the park business and found it necessary later to sell their resorts to independent companies.

There can be no question but that vaudeville and light opera are the most successful of theatrical entertainments, but smaller roads may find an entire week to be too long a period for presenting the same bill; in such cases companies favorably situated can solve the problem by building a second theater and alternating the attractions presented, as was done by the Indiana Railway Co., operating the interurban road between Goshen and South Bend, Ind. Experience also indicates that band concerts are always good, the fare to the park being 10 cents.

For the younger patrons the well-known merry-go-round, roller coaster, scenic railway and "chutes" have perennial charm; dancing is a drawing card both summer and winter and would seem to become more popular each season; where water is available boating and bathing facilities usually insure a good attendance, and especially is this the case where a water toboggan is erected, and in winter skating will bring out large crowds. Athletic contests, baseball and football are also good attractions in their proper seasons.

On one point all successful railway park managers are agreed—the entertainments must be devoid of vulgarity.

During the past few months we have made references to the attention now being given the matter of discipline by street railway men, as shown by the number of papers on this subject read at the recent street railway conventions and the activity of the committees on standard rules of the American and the New York associations. In the "Review" for November we published the first part of an interesting article by General Bancroft, president of the Boston Elevated Railway Co., which described in detail the careful methods used by that company in examining applicants for employment and instructing the men whom it was considered had the making of competent street railway employes, and in this number appears the second part of General Bancroft's article in which the author elaborates some of the methods of instruction and of keeping records. The "school for employes," which is perhaps further developed in Boston than in the other cities where it has been adopted, is the natural result of the introduction of more complicated apparatus, and will be recognized as a most efficient means to the desired end—the practical instruction of a large number of men in their duties. A school of this character and especially the "manual training" equipment of course appeals to the popular interest far more than do the underlying principles adopted by the company, which make the school desirable, and aside from the practical utility of the institution its effect upon the public is an excellent one. The layman is impressed but little by the statement that a company "uses great discrimination in selecting employes and men must be familiar with the rules before taking out cars," and respect for the industry, for the responsibility confronting the management, and for the trainmen themselves is increased by knowledge of what the motorman must know and do in order to fit himself for the position.

Briefly stated the principles governing the system of discipline of the Boston Elevated Railway train service, as may be gathered from General Bancroft's article, are to make careful preliminary examination before a man is accepted as a candidate; to give thorough drilling in his duties before letting him assume responsibility; to try and make every man accepted perfect in his duties; to promote the best men in the service to higher positions; to keep accurate records and to discharge only for good cause; to pay wages that will attract desirable men to the service, and to deal justly by all.

In connection with the concrete statement as to the practice of the Boston Elevated Railway Co., it will be found interesting to read the paper entitled "Efficient Discipline," presented before the New York Railroad Club by Mr. Thomas E. Mitten, general manager of the International Railway Co., of Buffalo, and published in this issue. Mr. Mitten is a member of the committee on Standard Rules for the Government of Employes, appointed by the A. S. R. A., and also a similar committee of the New York state association.

Mr. Mitten in addition to the matters of careful selection, thorough instruction and subsequent training, promotion on merit, good wages and fair dealing, makes three other points: First, a new man who has satisfactorily passed the examination and instruction periods, should be kept on probation for a longer term than is commonly done, and in event his record is unfavorable he should be promptly removed for the good of the service; this on the theory that having been given an opportunity the record shows he cannot or will not make a satisfactory man. Second, that the system of merits and demerits on a paper record is preferable to one under which men are suspended for minor breaches of discipline. Third, that pensions for superannuated employes would give a most satisfactory solution of a perplexing trouble, lax discipline and inefficiency of service arising from men being carried on the active list when infirmities prevent them from performing their duties properly.

There are probably many managers who are far from satisfied with the rules under which their men are operating, and who hesitate to make the changes which they consider desirable mainly because of the injustice that would be done to individuals who had acquired vested rights, so to speak, under the old system.

The importance of a satisfactory system of discipline is constantly increasing, or what amounts to the same thing the need for a personnel of the first class is becoming more pressing, and we believe that the means to accomplish the result desired may be put in two rules—get the right kind of men; then keep them. And to this end we believe pensions for superannuated employes will go a great way.

New Lighting and Power Plant of the Galveston City Railway Co.

The City of Galveston, Tex., is located on the extreme easterly end of Galveston Island and Galveston Bay, about two miles in width, separates the island from the coast of Texas.

The Galveston City Railway Co. operates 35.35 miles of track laid to standard gage with 40 and 60-lb. T-rails, and owns 63 motor cars and 8 trailers. The officers of the company are: President and general manager, R. B. Baer; vice-president, W. G. Oakman; secretary and treasurer, A. Dronilhet; assistant secretary and treasurer, G. R. Turnbull.

The station of the Galveston City Railway Co. described in this article was built to replace the one which was completely destroyed by the storm of Sept. 8, 1900, which also damaged other property in the city to the extent of \$20,000,000 and caused the death of from 10,000 to 12,000 people. An interesting account of the damage suffered by the street railway was given in the "Review" for October, 1900, page 610. The power house which was destroyed was a substantial and handsome building, located at the corner of Avenue I and Twentieth St., and covered a space of 85 ft. by 120 ft. The immediate cause of the destruction of this plant was the collapse of the brick stack, which was 153 ft. high, circular, and with a 5-ft. inside diameter. The firm sand foundation on which it stood, carried a weight of 2,800 lb. per square foot. The breeching connection was made with the stack about 14 ft. from the floor level, the opening for which weakened the stack at the point of connection.

During the storm, the wind blew in gusts, which attained an estimated velocity of 120 miles an hour at times. These gusts, it is believed, caused vibration in the stack, brick crumbled at the breeching opening, and the stack fell diagonally across the building, crushing in the roof, and destroying much of the machinery and equipment. Later the walls not demolished by the stack were toppled over by the wind, thus completing the destruction of the station.

It is a notable fact that while, in general, the Gulf waters created the most damage, in this particular instance the damage was entirely due to the wind. The illustration herewith gives a fair idea of the destruction occasioned.

The owners of the property retained Messrs. Sanderson & Porter of No. 31 Nassau St., New York, as engineers, to make an examina-



WRECK OF OLD POWER HOUSE MAR. 1, 1901.

tion of the entire property and submit a report in reference to its rehabilitation. This report, which was adopted, advised the rebuilding of the power station and pole line in accordance with the best modern practice, modified by such special features as were required by the local climatic or other conditions. The new station was erected on the site of the old power house, which is centrally located for both the railway and lighting service, the established grade at this point is 7 ft. above mean low tide, being at present the highest elevation of any location in the city.

The work of reconstruction was preceded by clearing the wrecked debris from the site of the power house, which began on Feb. 15, 1901. The actual construction began on July 6, 1901.

Foundation.

The building and machinery were placed on concrete foundations; those for the building being carried to a depth of 30 in. and protected around the outer edge by 4x10-in. splined piling driven to a depth of 14 ft. below the surface, at which point clay was encountered. This sheet piling forms an effectual water-tight bulkhead and will prevent the future shifting of sand from under the foundations. Concrete rests on top of this piling at its outer edge. The earth



EXTERIOR OF GALVESTON CITY RAILWAY POWER HOUSE.

formation consists of a firm layer of sand about 2 ft. in depth, which is underlaid by from 10 ft. to 12 ft. of quicksand. Square sawed piles, 14 ft. in length, placed 2 ft. on centers, were used under the building columns. The foundations for the rest of the building and machinery are entirely on sand, the maximum weight per square foot being about 2400 lb. The piling was driven by means of a water jet.

Engine Foundations.

The concrete for the engine foundations was composed of one part Atlas portland cement, three parts sharp San Jacinto sand and five parts broken brick to a size that would pass through a 2½-in. ring, mixed to a consistency which after thorough ramming showed some water on the surface. After removing the forms, the foundations were rubbed with board and water, which ground the irregularities down, leaving a smooth and neat appearance.

Boiler Plant.

Three Babcock & Wilcox vertical header boilers, 9 tubes high by 14 tubes wide, were installed, each boiler containing 2350 sq. ft. of heating surface. The fronts of the boilers are supported by columns which also carry a coal pocket. The boilers are equipped with Roney stokers supplied from an overhead coal bunker. Each furnace is also fitted for oil burning, oil being used at present, it having been demonstrated in this installation by a complete and careful series of tests, that both coal and oil may be used in the furnace simultaneously or that either fuel may be used separately without any change whatever in the furnace construction and without any perceptible difference in the efficiency of the unit.

Economizer.

The boiler plant is equipped with a Green Economizer, 8 tubes wide and 32 tubes long in the rear of the boilers and which is by-passed both for fuel gases and feed water. The waste gases are discharged by duplicate 130-in. draft fans, direct connected to Westinghouse Junior engines, either fan being large enough to handle the gases from the entire boiler plant. The fans are controlled directly by steam pressure through the medium of a damper regulator and balance valve on the steam line which supplies steam to the fan engines.

The destruction of the former station by the collapse of the stack made the use of a mechanical draft system in the new plant imperative, so as to eliminate the possibility of a similar catastrophe and to increase the flexibility of the boiler plant.

Fuel Handling Equipment.

Coal is received from an alley outside of the building, and by means of a vertical elevator and horizontal conveyor is delivered into a bunker extending along the front and over the boilers. This bunker has a capacity of about 180 tons and is kept stocked with coal in order to guard against shut downs due to shortage of fuel oil



STEAM HEADER ON BOILER ROOM FLOOR.

Beaumont oil is at present being used as fuel, a storage tank and duplicate pumps being provided to store and handle the oil which is passed through a heating chamber and raised to a temperature of 120 or 130 degrees, and thence through a special Worthington meter before it enters the furnace.

Feed Water System.

The pumps are in duplicate, each $7\frac{1}{2} \times 5 \times 6$ in. outside packed plunger pressure pattern, provided with pot valves and placed on

ously and receive their supply from and discharge their contents to separate sources. The water may, therefore, be taken from the city main and delivered to any one boiler by way of the economizer, and the other pump may, at the same time, receive water from the artificial well or cistern and deliver to any other boiler or place. The



NO. 1 AND NO. 2 FILER & STOWELL ENGINE.

water from the pump passes through a Worthington meter, primary heater, auxiliary heater and an economizer before entering the boiler; the average temperatures being from the pump 95 deg., from the primary heater 130 deg., from the auxiliary heater 200 deg., and from the economizer 285 degrees.

Piping.

The boilers are set facing the engine room and the steam header is carried along the boiler room floor directly in front of the boilers, so arranged that any boiler may be cut out of the line from the engine

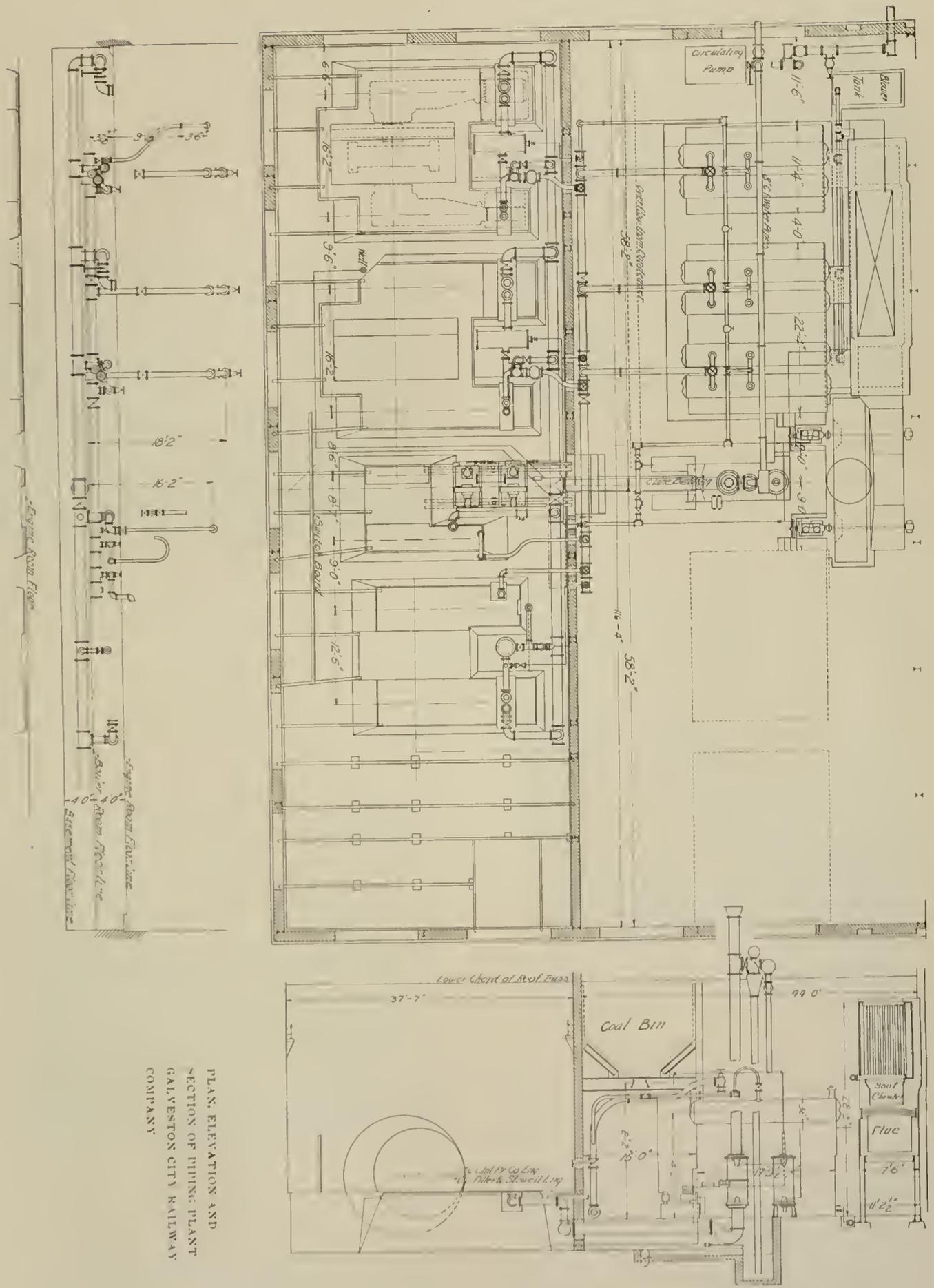


GENERAL VIEW OF ENGINE ROOM.

brick foundations finished off with lipped sole plates arranged to collect any drip from the pumps.

The pumps are connected with double crosses, both in the suction and discharge lines, which permit them to be used simultane-

ously and receive their supply from and discharge their contents to separate sources. The water may, therefore, be taken from the city main and delivered to any one boiler by way of the economizer, and the other pump may, at the same time, receive water from the artificial well or cistern and deliver to any other boiler or place. The



PLAN, ELEVATION AND SECTION OF PIPING PLANT GALVESTON CITY RAILWAY COMPANY

The exhaust header is parallel to the steam header but located in the engine room basement. Exhaust from each engine passes through this header to a primary header and thence to a Worthington central condenser. All steam admission and exhaust valves and stems are carried up through the engine room floor and are supported by stands located for the convenience of the engineer. Extra heavy Crane fittings and flanges were used for all high pressure steam and water piping, and Crane standard weight fittings and flanges for ex-

haust steam and low pressure work. Brass pipe was used throughout for conveying the feed water from the pumps to the boilers. two by-pass valves, making therefore, six delivery adjustments available. With the present load, the pump has ordinarily operated at half speed and supplies sufficient water at 86 degrees to give a temperature of 118 degrees or 120 degrees at the tail pipe and a vacuum of 24 in. To operate the pump requires 5½ kw.

The auxiliary circulating pump is located in the boiler room of the power house, and is by passed. Either pump may be operated directly from the power house without manipulating valves.

Engine Generators.

The station is designed to furnish current for an aggregate of 50 to 60 single truck cars and for lighting and power service for the city of Galveston.

The railway units consist of two 16 and 30 x 42-in cross compound, improved Filer & Stowell corliss engines, designed to operate with a steam pressure of 150 lb. at a speed of 100 r.p.m., each directly connected to a 325-k.w. 550-volt, direct current General Electric railway generator. The engines are guaranteed to develop a horse power on 14½ lb. of steam per i.h.p. per hour with a pressure of 150 lb. at the throttle and 22 in. of vacuum at the exhaust outlet. The beds have a continuous bearing on the foundations and are provided with a lipped edge to prevent oil drippings to the floor, and each cylinder is provided with a sole plate or pan bolted els to either board. The railway generator panels to the bed, thereby making the bed continuous throughout the entire length of the engine and cylinder.

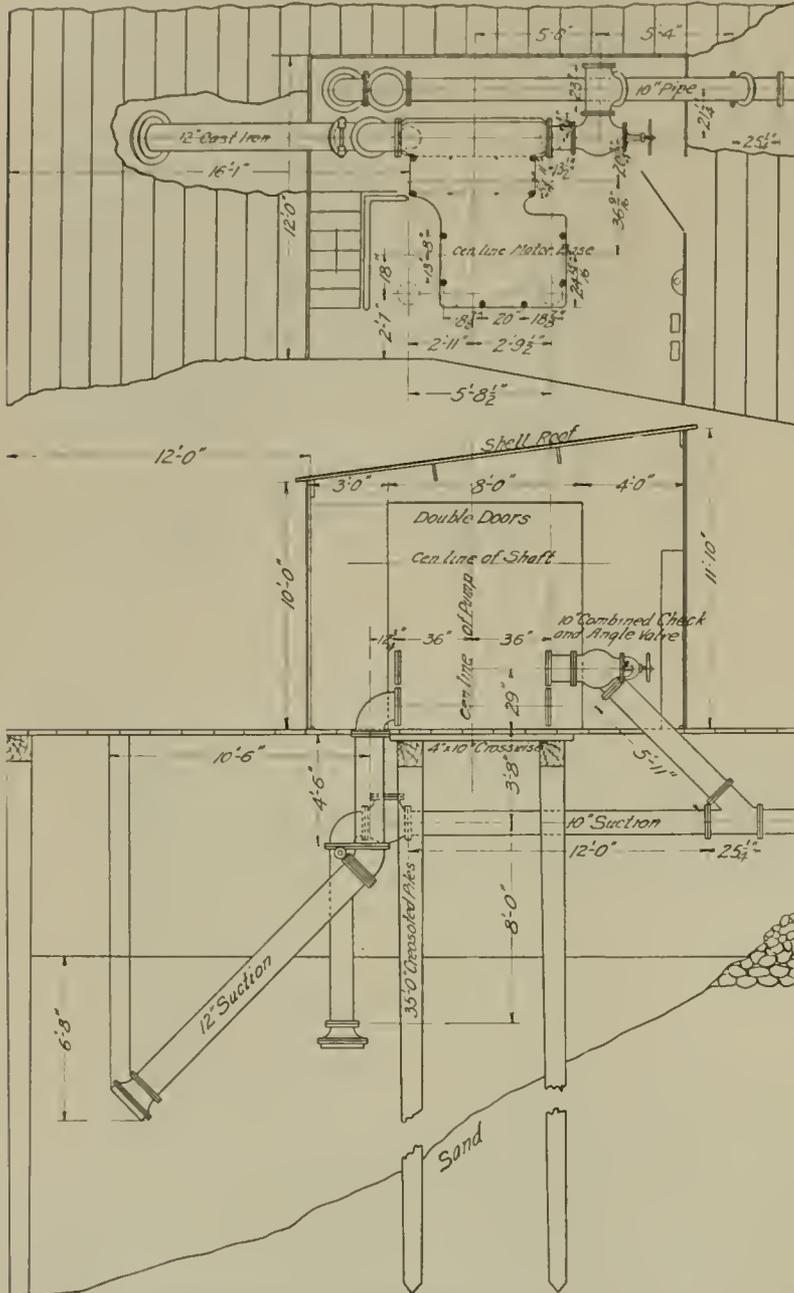
The beds are of the bored guide type, the cross head shoes being adjustable by means of wedges. The connecting rods are solid with side wedge adjustments. The valves of both high and low pressure cylinders are operated by double eccentrics, one for the admission and one for the exhaust valves. All valves are of the doubleported type and are susceptible of adjustment to any desired length. All links and valve rods are provided with solid ends with wedge adjustment instead of the usual bush and set screw. The governor is of the flyball type, and regulates well within the requirements of the service. The main bearings are provided with wedge adjustments on both sides and under the bottom of the main bearing shells, making it possible to adjust the shaft and armature centrally in relation to the pole pieces of the generator regardless of the wear on the bearings. This permits the removing of the bearing shells without raising the shaft.

The alternating current or lighting equipment consists of one 12 and 22 x 14-in. tandem compound standard Harrisburg engine, operated at a speed of 257 r.p.m., directly connected to a 125-k.w. General Electric revolving field, 2300-volt, 2-phase generator. This unit was installed to take care of the day lighting and power load. The second lighting unit is a 13 and 26 x 28-in. Green-Wheelock cross compound engine, operating at 150 r.p.m. and directly connected to a 200-k.w. revolving field, 2300-volt, 2-phase generator. These two lighting units can be successfully operated in multiple when necessary.

Switchboard.

The switchboard panels are of blue Vermont marble, the railway and lighting boards being separated by a space sufficiently large to permit the addition of panels to either of the boards as may be needed. The railway generator panels are each equipped with three single-pole switches, ammeter, voltmeter, lighting switch, double pole, double throw voltmeter switch and laminated type carbon circuit breaker. The load panel is equipped with an illuminated dial ammeter, illuminated voltmeter, recording wattmeter, etc. Each of the six feeder panels is equipped with 600 ampere, single pole, quick break switch, ammeter and laminated type carbon brake circuit breaker. The general arrangement of the rear of this board is shown in an accompanying illustration.

The alternating current switchboard consists of an exciter panel on which are mounted a triple pole double throw exciter switch, ammeter and triple pole fuses for each exciter. One voltmeter, supplemented with a double pole double throw plug device, is intended to



PLAN AND SECTION OF PUMPING STATION, WITH INLET PIPES.

haust steam and low pressure work. Brass pipe was used throughout for conveying the feed water from the pumps to the boilers.

Condensers.

The exhaust from all the engines in the plant is condensed by a Worthington central condenser, having a capacity of 40,000 lb. of steam per hour, which requires the use of a rotative dry vacuum pump, to remove any air that may be introduced into the system. Circulating water may be supplied by a 12 x 15 x 18-in. Dean duplex pump, located in the boiler room or, as it is at present, by a 10 x 12-in. triplex Blake pump, located at the Bay wharf, 3,600 ft. distant, and driven by a 30-h. p. 2-speed, 2-phase, Westinghouse alternating current motor. The triplex pump cylinders are also provided with

be used for either exciter. The exciters are directly connected to General Electric vertical engines and are intended to be operated in multiple if desired, or the idle exciter may be thrown on the railway circuit for the purpose of shifting cars in the car barn when main railway engines are shut down for the night.

Each lighting panel is fitted with double pole oil switches, recording wattmeter, indicating wattmeter, ammeter, voltmeter and synchronizing devices. The field resistance is located in the basement and controlled through a separate floor stand. There are three distributing panels, each of which is controlled by a double pole oil switch and two of the panels are also provided with double pole double throw switches, in order that the two-phase load may be bal-

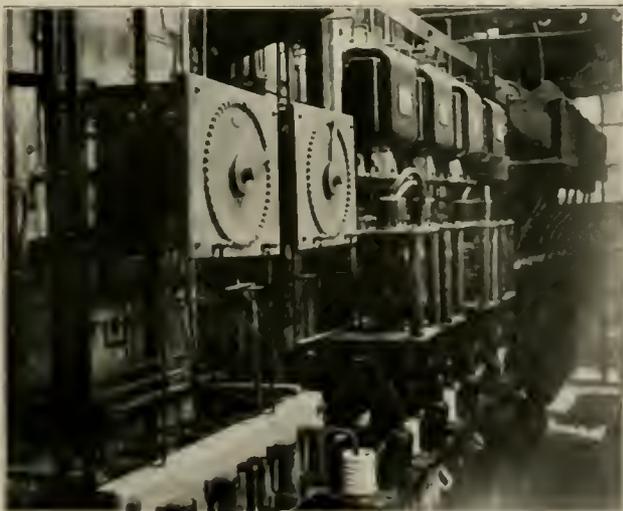


FRONT OF ALTERNATING CURRENT SWITCHBOARD.

anced if necessary. The front and rear of alternating current switchboard are illustrated herewith.

Lighting.

The station lighting is accomplished by 30 incandescant lamps, arranged one at each side of each window at intervals along the center wall. These lamps may be supplied with current either from the exciter switchboard or from the 112-volt alternating current, lighting bus-bars direct. In addition to these incandescant lamps, there are seven arc lamps hung on brackets. These lamps are furnished with alternating current at 112 volts from the lighting bus-bars.



REAR OF ALTERNATING CURRENT SWITCHBOARD.

The gage board is mounted on a glazed tile panel built in the center wall of the engine room, directly above the door connecting with the boiler room, and on which are carried the clock and recording gages.

Building.

The building which is shown herewith was designed with special reference to the local and climatic conditions.

The roof, crane run-way, coal bunker, etc., are supported by a complete steel framework, designed to carry the entire weights, irrespective of support from the brick work. The engine room is 38 ft. wide by 116 ft. long, and the boiler room 45 ft. by 116 ft. inside dimensions. The boiler and engine rooms are separated by a fire



REAR OF DIRECT CURRENT SWITCHBOARD.

wall extending from the basement floor to the top of monitor. A 15-ton hand traveling crane is installed in the engine room.

The building is built of Elgin, Texas, brick throughout, the first 9 ft. 8 in. being of red brick laid in cement mortar, consisting of one part Atlas portland cement to three parts of sharp San Jacinto sand, this being covered with a coating of cement $\frac{5}{8}$ in. thick and molded.



SETTING 60-FOOT POLES BY JET SYSTEM.

This class of work, sometimes called "stuccoing," is well suited to the Southern climates only, and in this particular locality is much superior to native stone.

From a point 9 ft. and 8 in. from the base, and extending up to the top of parapet wall, the walls are of kiln run Elgin pressed red brick, faced on the outside with Elgin buff dry pressed brick, presenting a very fine appearance and which withstands the climatic conditions better than any other local brick.

There were no heading courses laid, but in lieu thereof a woven wire tie made of No. 14 galvanized wire netting cut 2 in. x 6 in. was used. These ties were laid, one tie to a brick, one every fourth course.

The windows throughout the building were designed to resist the most severe storms. The window openings are 11 ft. by 22 ft., the frames being reinforced by steel channels extended through the

transom bar and 6 in. I beams extending down vertically through the center frames and riveted to a 10 in. channel carried from column to column below the window sills. The sash are stationary, with the exception of the bottom row, which are on hinges and are provided with strong and efficient holding devices. The sash are extremely heavy and rigid and are capable of standing a wind pressure of 70 lb. per sq. ft. The window panes are comparatively small and the glass ranges from 1/8 to 1/4 in. in thickness. All glass, except that in the lower case windows is ribbed, in order to exclude the direct rays of the sun and secure a better diffusion of light.

The engine room floor is of I beam and concrete construction laid as follows: False work was placed under the I beams and covered with a layer of single ply tar paper. Three inch mesh expanded metal was laid over this, each end extending from beam to bottom and a lap made at the beam. This was covered with a

layer of concrete 4 in. thick and thoroughly tamped, and was later finished with a finishing coat of from 1/2 in. to 1 in. in thickness, consisting of one part Atlas portland cement and three parts sharp San Jacinto sand.

The wainscoting, which is 5 ft. high, is formed by using buff pressed brick extending out 2 1/4 in. from the face of the wall proper, and finished off at the top with 2 1/4 in. radius round nose brick laid on top. The interior walls above the wainscoting are laid with selected kiln run Elgin brick and are painted white with "Alabastine" water paint.

Ventilation is provided by means of six 36-in. pancoast ventilators placed at intervals on engine and boiler room roof; in addition to which the monitor, which is 8 1/2 ft long, is provided with a continuous row of swinging windows along each side; these are controlled from the engine and boiler room floors. The present

RESULT OF TESTS OF BABCOCK & WILCOX BOILER WITH COAL AND WITH BEAUMONT FUEL OIL, USING DIFFERENT BURNERS, MADE BY SANDERSON & PORTER, AT THE POWER PLANT OF THE GALVESTON CITY RAILWAY.

The boiler had 2,350 sq. ft. of heating surface and was rated by the builder at 235 h. p.; the grate surface was 62 1/2 sq. ft. The fuel used in test No. 1 was Cumberland coal of a calorific value of 12,866 B. T. U. per lb.; the coal contained 0 1/2 per cent of moisture, and the dry coal 10.4 per cent ash. In the other tests Beaumont oil, 27 degrees, was used; this has a calorific value of 19,000 B. T. U. per lb.

	1	2	3	4	5	6	7
Date, 1902.....	July 21	July 22	July 25	July 26	Aug. 1	Aug. 15	Aug. 28
Duration of test, hours.....	8	8	8	8	8	6	8
Burners, name and number.....	Coal	4 Reed No. 2	4 C. M. Billow	2 American	2 Reed No. 2	4 Billow	2 American
Steam pressure, per gage, lb.....	152	147.3	145.4	146.4	152.4	152.7	160
Draft in flue, in. water.....	.4	.6	.8	.21	.3	.3	.19
Temperature of flue gases at breeching, deg. F.....	588	557	416	431	.....	474	499
Temperature of feed water, deg. F.....	212	212	212	212	212	207	210
Total fuel, lb.....	9,200	7,282	6,000	5,502	3,170	3,623	4,418
Fuel (dry coal or oil) per hour, lb.....	1,075	910	750	682	396	604	552
Total apparent evaporation, lb.....	77,863	88,418	70,403	76,585	45,600	49,850	62,190
Total actual evaporation, lb.....	76,140	86,636	68,175	74,053	44,688	48,903	61,061
Steam used to atomize oil, lb.....	.....	13,712	6,264	2,400	2,742	4,602	1,485
Portion of steam used to atomize oil.....	.....	.158	.092	.032	.061	.089	.024
Equivalent evaporation from and at 212 degrees per lb. dry fuel, lb.....	9.68	12.46	11.91	14.11	14.90	14.23	14.55
Net equivalent evaporation per lb. oil (deducting steam used to atomize oil) lbs.....	.....	10.47	10.82	13.66	13.90	12.94	14.20
Horse power, A. S. M. E. rating.....	286.5	263.4	252.0	281.4	170.7	249.0	232.9
Horse power, deducting steam used to atomize oil.....	.....	222	235	272.3	160.3	226.8	227.2
Fuel, per h. p. h., lb.....	3.77	4.1	3.2	2.5	2.5	2.7	2.4
Cost of fuel per h. p. h., cents.....	1.01	.56	.45	.34	.35	.37	.32

RESULTS OF ENGINE TESTS AT GALVESTON CITY RAILWAY. POWER STATION CONDUCTED BY SANDERSON & PORTER.

Engine No. 6 - Greene-Wheelock, cross-compound, condensing, gridiron valve.
 Engine No. 5 - Harrisburg Standard tandem, condensing, special piston valve.
 Engine No. 1 - Filer & Stowell, cross-compound condensing, corliss valve.

DIMENSIONS AND DATA.	No. 6 Greene-Wheelock.	No. 5 Harrisburg.	No. 1 Filer & Stowell.
Date.....	Aug. 1, 1902	Aug. 5, 1902	Aug. 23, 1902
Time, hours.....	8	8	8
Cylinder diameters, inches.....	13 & 26	12 & 22	16 & 30
Stroke, inches.....	28	14	42
Speed at no load, r. p. m.....	155	259	101.5
Speed at full load, r. p. m.....	150	255	100
Piston speed, ft. per minute.....	700	595	700
STEAM:			
Average pressure at throttle, lb.....	152.0	151.4	153.3
Average vacuum at engine, inches.....	23	22	21.8
Total steam generated, lb.....	45,600	33,676	62,190
Dry steam delivered to engines, lb.....	43,051	32,514	59,530
ELECTRICAL DATA:			
Mean output, volt and ammeter, kw.....	209.0	134.6	310.6
Mean output, recording wattmeter, kw.....	216.0	134.3	333.3
Mean output, indicating wattmeter, kw.....	224.0	111.6	260.7
To energize fields, kw.....	8.5	6.7	.....
Electrical h. p. at switchboard.....	289.5	180.0	446.6
Max. load (for 2 hours) kw.....	292.0	189.0	506.4
Overload, per wattmeter, ratio.....	.460	.510	.558
ENGINE OUTPUT:			
High pressure cylinder, h. p.....	169.33	90.0	263.06
Low pressure cylinder, h. p.....	178.12	115.0	255.3
Total h. p.....	347.45	205.0	518.36
ECONOMY AND GENERAL RESULTS:			
Part of h. p. delivered at switchboard.....	.833	.88	.861
Ratio of overload to normal.....	.16	.025	.036
Steam per i. h. p., hour, lb.....	15.84	19.82	14.36
Steam per kw. hour at board, lb.....	26.0	30.7	22.36
Fuel oil per i. h. p., lb.....	1.19	1.48	1.03
Equivalent coal per i. h. p., lb.....	1.82	1.98	1.59
Cost of steam per kw. h. (engine only) cts.....	.250	.302	.211
CONDENSER:			
Temperature, entering water, deg. F.....	86	86	90
Temperature, tail pipe, deg. F.....	118	121	121.8

A practically uniform load was provided throughout the tests by means of water-cooled resistance. Condensation was removed from steam lines by a trap and steam used in the calorimeter was also weighed and deducted. Indicator diagrams and readings were taken every 20 minutes.

The steam for each test was generated by a separate boiler, no steam being used for auxiliary purposes. The steam pressure and vacuum were maintained as nearly as possible at the contract requirements to each test. Vacuum was produced by means of a central condensing system which carried the entire plant, and consequently the cost of producing the vacuum cannot be computed separately.

equipment does not occupy the entire space in the building, there being room for three additional boilers and one large engine unit, should the future requirements demand their installation.

The entire construction was accomplished under the personal supervision of Mr. W. A. Haller, resident engineer, representing Messrs. Sanderson & Porter.

MONORAIL CAR SYSTEM.

An experimental monorail system invented by Howard H. Tunis has been in operation in Baltimore, Md., for several months. The track, which is about one-fourth mile long, is of 30-lb. rail spiked to short ties. There is a light framework above the track through which the car passes and which is designed to maintain its equilibrium. The car has a capacity of 24 persons. The motive power is supplied by a small steam engine geared to the driving axle by means of a chain and sprocket wheels. The engine is located in one end of the car and is about 4 h. p. capacity. Oil is used as fuel. The car weighs about three tons and attains a speed of 8 or 10 miles an hour on the short curved track.

An important feature of the system on which a patent has been secured is the device which maintains the vertical position of the car. Two strips of wood extending lengthwise along the roof of the car are slightly curved towards each other at the ends and pass between spring blocks placed at such intervals in the overhead framework of the track structure that at least two pairs of blocks press against the guide strips at all times. Reduction in friction by the use of ball bearings, a single rail, and greased spring blocks are some of the claims of the inventor. It is said that a 16-mile road will be built in Virginia embodying the features of the experimental road.

The Delaware County & Philadelphia Electric Railway Co., Philadelphia, Pa., has placed vestibules on the fronts of its open cars.

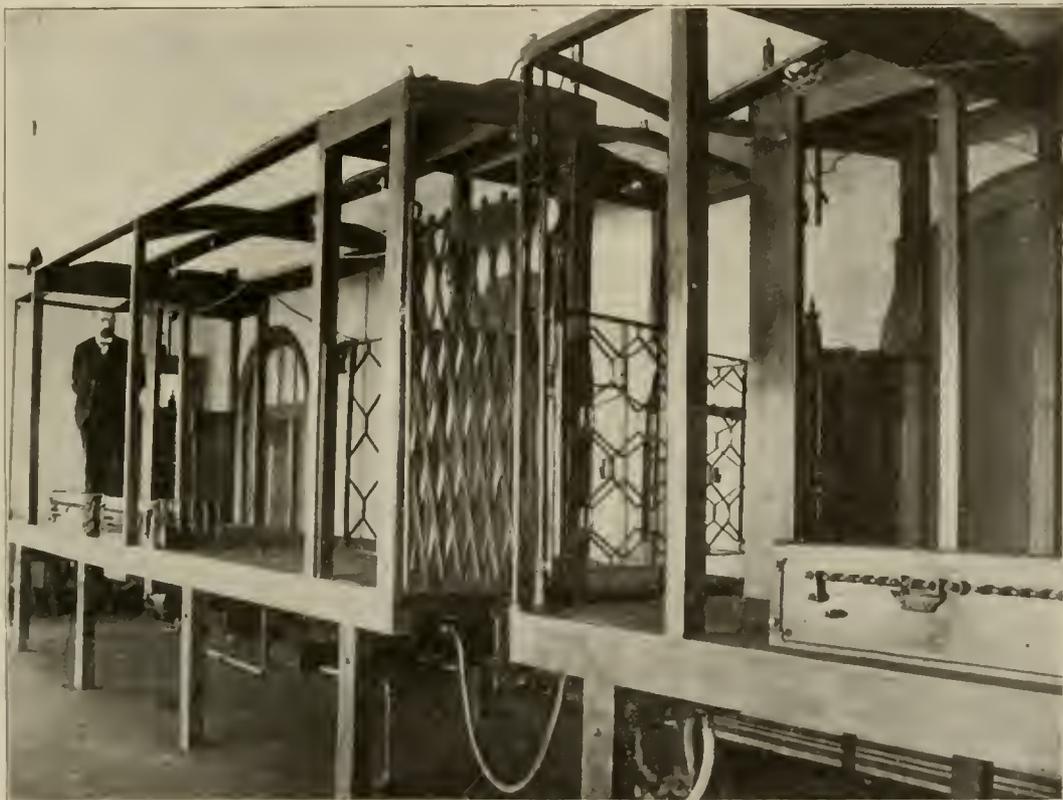
The Employing, Training and Disciplining of Car-Service Employes of the Boston Elevated Ry.—II.

BY MAJ-GEN. WILLIAM A. BANCROFT, PRESIDENT OF THE BOSTON ELEVATED RAILWAY CO.

One of the Boston Elevated Railway Co.'s devices for the instruction of men for the elevated service is a trainmen's school. The little establishment has excited an amazing amount of popular interest. It has been talked about, written about, lectured about, photographed and otherwise portrayed to such an extent that the management itself is now and again in danger of half believing that there is something remarkable about it.

It apparently strikes most persons as singular that men of mature years, of at least average intelligence and of physical soundness should be sent to school to learn the A, B, C's of a business before they are permitted to engage in it. Such, however, is the

ous objects of interest that are intended and expected to teach some extremely practical lessons that will prove useful to the students later in life. Along one side of the long narrow room in the Sullivan Sq. terminal, in which the school is domiciled, is a skeleton, three-car, dummy train fully equipped with every piece of apparatus and equipment essential to the running of an electric elevated train, except trucks. It is no toy model, but is to all practical intents and purposes, an anatomical exhibition of a train with the skin removed. The controlling apparatus, motors, air and hand brakes, couplings, and indeed, every piece of mechanism used on an actual train, is installed and is in working order.



SKELETON TRAIN IN SCHOOLROOM.

practice of this company in the case of men who enter its elevated train service.

The course of instruction for an elevated employe is quite different from that prescribed for a surface-car man for the reason that the duties are very dissimilar. The general principles, described in the November issue of the "Review," such as gradual instruction, thorough drill on the rules, and final examination and demonstration before full appointment, are alike in both branches of the service, but there the similarity ends.

Men assigned to the elevated division begun as brakemen, are in time promoted to be guards, and finally become motormen. For each of these positions in the school and the passing of examinations are required. Thus it happens that the company runs a graded school with pupils in several stages of advancement, and like some other schools, undertake to find immediate employment for all students who pass its examination tests and receive its certificate of proficiency in the prescribed studies.

The school is established in a bare-looking room, lacking the works of art and adornment that seem to be a usual part of the equipment of most educational institutions, but it contains numer-

Upon this train new men and candidates for promotion are shown the location, use and operation of the various devices. They learn how to connect and put a train in order to take out of the yard, how to operate it, how to give and how to respond to the various signals, what to do in emergencies, and how to lay up a train when it is hauled off the main line. It is not merely a matter of going through the motions. There is no make believe about anything except the motion of the train. When switches are cut in, the electric current is turned on. When the pumps are worked air is pumped into the reservoirs. When the air is thrown into the brakes they are set.

No man is permitted to assume the responsibilities of his position until he has been thoroughly drilled on the dummy train. It is not enough that a man knows all the duties, rules and general orders pertaining to his work, he must show that he understands their application. All instruction in the school and all examinations are given by the trainmaster, who is held accountable for the proficiency of every trainman appointed to the service. An absolutely perfect examination must be passed before the trainmaster certifies that a candidate is qualified for the service.

The examinations of brakemen, guards and motormen, are all dif-

ferent and consist of prescribed questions that are answered orally or by demonstration. The examination blanks now in use are substantially those adopted at the opening of the elevated lines last year. They are, however, considered somewhat unsatisfactory and are soon to be revised.

They are as follows.

EXAMINATION OF BRAKEMAN NO.
(FIRST EXAMINATION.)
Give all bell cord signals. (306 to 311.)
Where are light switches located, and what used for? (272)
Give all whistle signals. (312 to 320)
Give all hand, flag and lantern signals, and where you are liable to find them displayed. (321 to 330)
What would you do if you found red flag or lantern on cable box between tracks?
Explain what is meant by a yellow flag or lantern placed to right of track. (326)
What is DANGER signal? (321)
What is CAUTION signal? (322)
What is CLEAR signal? (323)
Whose duty is it to see that proper tail lights and lanterns are put on train when pulling out of yard in the morning?
Whose duty is it to see that all tail lights and lanterns are removed from train when train is laid up for the night?
If you found white light displayed what would it signify and what would you do?
In case of an accident, however slight, what is your duty? (172 and 204)
What are the rules regarding use of liquor? (1)
What are the rules regarding use of tobacco? (1)
When should you announce which way passengers should leave car? (G. O. 233)
What are the guard's and brakeman's positions on car? (205)
How should information be given to the public?
How many persons will a car seat?
What tail lights should be carried on a train? (211)
What instructions have you received relative to civility to passengers?
What would you do with articles found on the train or platform? (200)
On what part of train are passengers forbidden to ride?
What does the Board of Health require relative to spitting? (121)
What action would you take if you observe passengers spitting?
Where can parcels and bundles be carried on train? (197)
What duties devolve upon the guard and brakeman at stations? (113 and 190)
Are dogs allowed on train? (176)
If train line hose burst, what effect would it have on train and what would you do? (302 and 303)
When should full regulation uniform be worn? (181)
Are peddlers allowed to sell articles on train or platform? (201)
How long should you continue to flag a train? (179)
What is a tardy miss—a three day miss? (185)
How should stations and destination of trains be announced? (190)
If reservoir hose burst what effect would it have on train and what would you do? (304)
How should chains between cars be handled?
When should the heaters be used?
Where is the emergency valve and what is its use?
Give the markers for all routes?

EXAMINATION OF BRAKEMAN NO.
(FOR PROMOTION TO GUARD.)
If train line hose burst, what would you do? (302 and 303)
If reservoir hose burst, what would you do? (302 and 303)
Give all bell cord signals. (306 to 311)
Where are light switches located, and what used for? (272)
How would you call in north bound flagman? (317)
What is an alarm? (319)
Give all whistle signals. (312 to 319)
Give all hand, flag and lantern signals, and where liable to find them displayed. (321 to 330)
What would you do if you found red flag or lantern on cable box between tracks?
Explain what is meant by yellow flag or lantern displayed to right of track. (326)
How would you cut out brake if triple failed to act? (305)
What is DANGER signal? (321)
What is CAUTION signal? (322)
What is CLEAR signal? (323)
State difference between automatic block and interlock signals; position of arms and color of lights. (22 and 55)
In case of an accident, however slight, what is your duty? (204)
What would you do if block signal was at danger? (55)
What would you do if your train parted? (33-A)
What would you do if a signal failed at a station? (57)
When should you announce by which way passengers should leave train? (G. O. 233)
What are the guard's and brakeman's positions on train? (207)
What instructions have you received relative to civility to passengers? (G. O. 235)
What would you do with articles found on train or platform? (200)
On what part of train are passengers forbidden to ride?
When should the heaters be used?
What does the Board of Health require relative to spitting? (121)
What action should you take if you observe passengers spitting?
What are the markers for the different routes? (331 to 356 inclusive)
Where can parcels or bundles be carried on train? (197)
How should chains between cars be handled?
What would you do if you had to make an adverse movement? (216)
Where is the emergency valve and what is its use?

EXAMINATION OF GUARD NO.
(FOR PROMOTION TO MOTORMAN)
Where is platform switch and what is its use? (265)
If train starts in rocking or jerking motion, what would you do? (287)
In case main motor or reversers become disabled, what would you do? (287)
On leaving platform, what would you do? (292 and 293)
What would you do if you lost control of train? (295 and 312)
If air compressor fuse blows on train, what would you do? (273)
If air brakes failed to release what would you do? (305)
If train line hose burst, what would you do? (303)
If train reservoir hose burst, what would you do? (304)
Where is the five-point switch and what is its use? (305)
What are the RUNNING and OFF positions of handle of platform switch? (261)
How would you prepare a train for operation? (221 and 276 to 281 inclusive)

Where and what are the three important switches with which you should be familiar? (265)
Where are, and what, are pump governor and equalizer switches used for? (257)
Where is train line fuse located, and what is the effect if blown? (271)
Where and what is pilot motor switch used for? (268)
How do you test relays and controllers on one or more cars? (290)
How would you lay up a train? (295)
Give all bell cord signals. (327 to 330 inclusive)
In what position must brake valves be in cab? (298)
What is LAP position? (264 and 281)
Where is COAST position? (264)
When would you reverse car? (255 and 280)
What is relay line switch used for and where located? (267)
Where are light switches located and what used for? (272)
Where is train line switch located, and what is it used for? (269)
How would you call in north bound flagman? (317)
What is an alarm? (319)
Give all air whistle signals. (312 to 319 inclusive)
Give all hand, flag and lantern signals, and where liable to find them displayed. (321 to 330)
When and to whom would you report defects or any unusual occurrence? (204)
What would you do if you found red flag or lantern on cable box between tracks?
Explain what is meant by a yellow flag or lantern displayed to right of track. (326)
How would you cut out brake if triple failed to act? (305)
If EMERGENCY valve were applied, what would you do?
What is DANGER signal? (321)
What is CAUTION signal? (322)
What is CLEAR signal? (323)
State meaning of different positions of signal arms and different colors of signal lights.
In approaching junction of bridge, how should your train be moving? (364)
Where stops occur at steep grades, what precautions are necessary? (300)
In making station stops, describe proper use of air. (300)
What have you been taught regarding automatic stop appliances.
How do you distinguish an interlocking from a block signal, and why should you know the difference?
What are the speed limits allowed at different points? (370 to 378)
Where is the emergency valve and what is its use?
With green flag or light ahead, how would you proceed? (323)
If you found white light displayed what would it signify, and what would you do?
If you found signal light out, what would you do? (244)
In case of an accident, however slight, what is your duty? (204)
What should you do in order to save power?
Are you allowed to talk with any one while running your train? (232)
What are the rules regarding use of liquor? (1)
When leaving train at end of route what should you do with handles? (237)
What would you do if block signal was at danger? (55)
What would you do if your train parted? (33-A)
What would you do if a signal failed at a station? (57)
What are the markers for the different routes? (331 to 356)

When the "happy school days" are over the man who has been awarded a diploma, in the surface-car service, dons a blue uniform and becomes a part of the regular operating force of the company. He feels very sure that he knows how to perform his duties perfectly—and why should he not? His instructors, his examiners, and his own judgment have all pronounced him competent to handle a car, and yet the chances are that as between his clean new uniform and his clean new record the latter will undergo the earlier disfigurement. By the time the uniform becomes a little dingy its owner ordinarily does not need to consult a plan of the building in order to locate the office of his division superintendent, and when the time comes for the purchase of a second uniform we shall have a pretty fair railway man or he will have no need of a uniform.

When a man has passed the instruction period no pains are spared by his superiors to make him of the greatest possible value to himself and the company. If he fails to be successful it is because he either cannot or will not develop into one. The company does its utmost to thoroughly instruct new men, and it is equally painstaking in their subsequent development. It aims to perfect every man as fully as possible in all the details of the business, not only because it must have reliable men on the cars, but because it must find its future superintendents, inspectors and other officers among the men who today manipulate the controller and bell cord.

Every man brings a new problem to his superintendent. The problem is to make a capable operative out of the particular individual under consideration. The superintendent and his assistants are expected to find a solution, and not to "give up the answer" because it presents hard questions. It is their duty to see that all accepted men are made into good men, to see that good men are made better, and to see that the best men are recommended for promotion.

No two men are treated alike, except that they are treated fairly. Some men need only to be shown their error, others require severe lecturing, while still others need the infliction of punishment before they completely grasp the hard facts that rules are not mere suggestions but are orders to be obeyed implicitly. A man who is at fault because he did not know what to do is instructed. A man who knows what to do but is too indifferent to do it has his duty impressed upon him by the superintendent in language calculated to

make a lasting impression. A man who knows what the company requires in a given situation but chooses to do otherwise for reasons of his own is suspended for one or more days without pay. Suspension is a severe form of discipline and is imposed only for grave offenses.

The work of every man is watched and studied from the day he begins to run a car until his connection with the company is severed. It is no slight task to keep a watchful eye upon the conduct of 5,000 men who are performing their duties far from the observations of those who are held responsible for what they do, say, or omit, and yet the company manages to keep itself informed of what is going on most of the time. This is accomplished mainly by its inspection forces—in the surface division by the uniformed division street inspectors and the uniformed headquarters inspectors.

Each division is mapped off into districts and a street inspector is assigned to duty in each district and is held responsible, so far as possible, for the correction of mistakes, violations of rules and for report of defects that occur within the district. Whenever an inspector observes the slightest error in the conduct of a motorman or conductor he is required to board the car at once, or at the earliest possible opportunity, and to explain exactly what was

mistake or wrongful act pointed out and explained instantly, while every circumstance is in the mind of the offender. Inspectors explain, instruct, correct and report, but all matters of discipline are decided by the division superintendents and their superior officers.

Another corps of inspectors, who wear no uniform, supplements the work of the division inspectors. These men are selected and trained with the greatest possible care to observe and report upon the conduct of the men as it appears from inside the cars, in the same manner that the street inspectors observe from without. The only material difference in the work of the two classes of inspectors is that uniformed inspectors, who wear a badge of authority, are expected to instruct as well as report, while the ununiformed inspectors are expected to report only. The reports of these inspectors are of the greatest possible value to the management and to the men who perform their work well. The same system, so far as feasible, applies to the elevated division.

These two sets of inspectors furnish much of the information that enables the superintendents to deal with every man in accordance with his individual requirements. It is impossible for a division superintendent to be so intimately acquainted with every man under his authority as to know, as a matter of memory, the ten-



GENERAL VIEW IN TRAINING SCHOOL OF BOSTON ELEVATED RY.

wrong and what would have been right, and later to make a full report of the occurrence to the division superintendent for his information and guidance.

No inspector remains in any one district for many days at a time, frequent changes being made to enable the superintendents to compare and "size up" the different inspectors. If a certain inspector habitually finds but one or two things in a day calling for his action and the other inspectors find eight or ten things in the same district, superintendents very soon inquire, and, at least, suggest that the other men have better eye-sight.

Street inspectors are expected to observe and report upon everything affecting the service, but their greatest effort is exerted to prevent accidents due to negligent or otherwise improper conduct on the part of the men, such as the carelessness of conductors in giving bell signals and the failure of motormen to have the cars under perfect control when crossing streets or approaching vehicles or obstructions that prevent a clear view ahead.

As a result of recent efforts to increase the efficiency of the street inspection force in the prevention of accidents, both the number and proportion of such occurrences attributable to motormen and conductors have been greatly reduced. The plan is to have every

perament, merit and capability of each, and for this reason, among others, a ledger account is kept with every man that makes this information available whenever an employee is under consideration for discipline or reward. These records, if properly kept, are of the greatest value in the management of a large company, but they must be both enlightening and trustworthy or they will do more harm than good.

The method of book-keeping followed by this company is as follows: Every report or complaint concerning the conduct of the men is entered in full upon a daily journal with a statement of all pertinent facts bearing upon the incident. These items are then posted upon the ledger records of the men in cipher. These entries state the date, substance of the report, source of information and action taken. In the elevated division the card system is employed but otherwise the practice is uniform throughout.

The accompanying copy of the record of a motorman on the elevated division—which is a genuine record except as to name and number—illustrates the form used. The more common offenses are given cipher abbreviations of one or two letters. They are grouped under general heads, and each general class of misdeeds is assigned to a special column, so that a mere glance at the card, before

car sheds are business establishments and not clubhouses; nevertheless, the company endeavors to provide wholesome, attractive and comfortable quarters for its employes. The company pays the running expenses of two mutual benefit associations organized and conducted by employes. One of these associations pays to its members \$7.00 a week during sickness not exceeding ten weeks in a year, and \$1,000 on the death of a member. All of the payments for sickness and a portion of those for death are met by monthly assessments of 50 cents, and the remainder is raised by assessments of \$1.00 as needed. The annual cost of membership is about \$15.00. The other association is like the first, except that the payment at death is \$100, and there are no assessments except the monthly dues. The company assumes the cost of collecting and distributing the money, of keeping the books and other incidental expenses, so that every dollar contributed by the men is available for distribution. The contribution of the company for this purpose amounts to nearly \$7,000 annually. A very good band of music has been organized among the men and this is also supported by the company. Then, too, the company comes to the relief of men in individual cases of hardship. Efforts are constantly being made to make the men feel that the management is a friend and helper to every man who is loyal to the service and faithful in the performance of his duties. The President is accessible to every individual at all reasonable hours, and no person having legitimate business to present is ever denied an audience. If, for example, the men or any of them, conceive that some unnecessary hardship or inconvenience has resulted from the making of time-tables or the assignment of cars the President is always ready and glad to discuss the matter with individuals or committees, and make changes or adopt suggestions whenever it is feasible to do so.

MOLINE, EAST MOLINE & WATERTOWN RY.

The Moline, East Moline & Watertown Ry. was formally opened November 13th when an invitation trip over the line was made by a party of 150 persons, including the officers of the company, the municipal authorities of Moline, Rock Island and Davenport, and representatives of the Tri-City Railway Co. The party was conveyed in two cars, leaving Moline at 11:45, and an elaborate luncheon was served at the end of the route in the offices of the Union Malleable Iron Works.

The lunch was followed by speeches from the three mayors present, C. M. Stowe, secretary of the Union Malleable Iron Works, J. B. Blood, of Blood & Hale, of Boston, contractors of the new interurban, and J. F. Lardner, general manager of the Tri-City Railway Co.

The Moline, East Moline & Watertown Railway Co. was incorporated June 20, 1901, by Col. U. P. Hord and Frank Y. Keator, of Aurora, Ill., who secured the franchises for the six miles now built, and options on Campbell Island, which it is intended to make a pleasure resort. In April, 1902, the capital stock of the company was increased and Joshua Hale, of Boston, became interested, the organizers retaining their holdings, however.

The new interurban line has been completed for a distance of six miles, and will be extended 25 miles further. It runs from the manufacturing city of Moline, Ill., directly east, along the Mississippi, and with the river on the north and high bluffs on the south the scenery along the route is very attractive. The road is practically level, the only grade being less than 2 per cent. Within the city limits, 73 lb. girder rails, made by the Lorain Steel Co., are used where the track is straight, with 107 lb. rails on curves. The rest of the road is laid with 75-lb. T-rails. The road is single track, standard gage, with but one turnout. White oak ties, 6 x 8 in. x 8 ft. are laid 24 in. between centers; the overhead lines are carried on cedar poles. The work of constructing the track was begun in July and has been delayed by the heavy rain that have affected business in all parts of the State this season, and by the difficulty in obtaining labor.

The overhead wire consists of seven miles of No. 00 copper wire furnished by the John A. Roebling's Sons Co., and five miles of aluminum 76,000 c. m. feeder furnished by the Pittsburg Reduction Co.; the hangers were made by the Morris Electric Co.

The company now has four closed cars built by the John Stephenson Co., two 11 bench open cars from the Jackson & Sharpe works,

and a snow plow made by the Wasson Manufacturing Co. The closed cars, one of which is here illustrated, are 42 ft. long, 8½ ft. wide over the grip rails, and have a seating capacity for 44 passengers each. The cars are mounted on McGuire 39 A double trucks, with four G. E. 67 motors per car, geared for 25 miles per hour. Christensen air brakes and air whistles are used. The seats are of the Hale & Kilburn walkover type of rattan cross seats except in smoking compartment at the front end of each car, where the rattan benches are placed longitudinally to allow a greater aisle space. The cars are equipped with electric push buttons and incandescent electric lights, and are handsomely finished in mahogany and bird's-eye maple. The exterior is painted maroon and cream.

The Moline, East Moline & Watertown Railway Co. rents its power from the People's Power Co. of Moline, for the present, but is preparing to erect its own plant this winter. Plans and specifications have been completed for a new car house which will have a capacity for storing 24 cars, the cars being housed at present in temporary quarters on 2d St., where the general offices are also located. Work on the new car house will soon be under way.

The company's officers are: Charles Deere, proprietor of the Deere Plow Co., of Moline, president; U. P. Hord, of Aurora, Ill., vice-president; Fred W. Rank, secretary; L. D. Taylor, treasurer, and Blake A. Mapledoram, of New York, general manager and chief engineer. The contract for the road was awarded to Blood & Hale, engineers, of Boston, and the road was constructed under the supervision of Mr. Mapledoram as chief engineer, who will continue with the road as general manager. Jerome Applequist, of Rock Island, Ill., was in charge of the engineering corps; F. L.



STANDARD CLOSED CAR, MOLINE, EAST MOLINE & WATERTOWN RY.

Mapledoram was general foreman in charge of construction, and J. C. Hoffman, master mechanic.

Campbell's Island, situated in the Mississippi River opposite Watertown and containing some 230 acres of oak and hickory lands, is owned by the railway company, and extensive preparations are being made to improve this property as a site for a popular summer resort. The island will be rendered accessible by a steel trestle 800 ft. long over the government dam, which latter is 40 ft. in width. The company will build the trestle 6 ft. above the present dam height to avoid high water and will thus be able to convey crowds to the island at all seasons of the year without difficulty. A summer hotel and several pavilions, and a mile race track are projected, as well as the usual attractions such as golf links, tennis courts, baseball grounds, and theater. The company has already secured one of the electric fountains in use at the recent Charleston Exposition and this will be installed at Campbell's Island in the spring. The island is surrounded by shelving, sandy beaches, and bathing and aquatic sports will be among the principal attractions. A considerable force will be employed this winter in clearing the island and accomplishing the preliminary work for the installation of the resort features. The limestone found on the island is of good quality for ballast in track construction, and the company has its stone crusher on the island crushing stone for this purpose.

The rapid growth of Moline as an industrial center and the corresponding development of the contiguous territory is sufficient to assure the success of the new interurban and the company will undoubtedly enjoy a heavy patronage from the three cities to its proposed recreation ground at Campbell's Island.

Street Railway Park Development.

Summary of Street Railway Park Attractions in Various Parts of the Country.—Suggestions to Managers Who Contemplate Opening Parks.—The Most Desirable Kinds of Entertainment.

There is no longer any question as to whether street railway parks and special entertainments are of value in stimulating street railway traffic as the desirability of establishing such parks is affirmed by the large number of street railway companies which have undertaken this branch of business within the last few years and have almost invariably found it to be satisfactory from a financial standpoint. The questions, however, of the manner in which such resorts should be conducted, what style of entertainment should be furnished, whether the park should be managed by the street railway company or by an independent company, etc., are ones not so easily answered for the reason that conditions vary very widely in different localities. With a view of answering these questions the experience of a large number of managers of street railway parks is given herewith.

In the following paragraphs are presented recent data concerning the parks operated by various railway companies, which will prove of interest and value to others who operate pleasure parks or are contemplating having them next season.

THE WESTERN OHIO RY.

This company operates McBeth Park, located three miles from Lima, O., the headquarters of the company. At this park there are a theater with seats for 700 persons, a dancing floor, bowling alleys and boating facilities. The manager of the park, Mr. F. D. Carpenter, advises that the best paying attractions have been a good class of vaudeville and comic opera. Besides dancing, boating and bowling, the park has been popular for society and church picnics. For the coming season the company expects to add other features.

GRAND RAPIDS, HOLLAND & LAKE MICHIGAN RAPID RY.

The company operates a park which is in charge of Mr. Charles Floyd, traffic agent, of Holland, Mich. Mr. Floyd writes us that the company contemplates furnishing complete attractions for the summer months, and is desirous of securing remunerative entertainments for next season. Last season vaudeville, boat races and yachting carnivals proved to be very popular.

PEOPLES' GAS & ELECTRIC CO., DEFIANCE, O.

The company owns Island Park, two miles from Defiance, which is leased to the Island Park Co., W. P. Engel, manager. There is a theater, seating 600 people, at the park, and also a merry-go-round, a 1-3 mile track, ball grounds and facilities for bathing and boating. The best paying attraction is vaudeville, which must be of the first class, however. The Maumee Chautauqua Association meets at the park July 10th to August 10th each year.

CLEVELAND, ELYRIA & WESTERN RY.

The company owns Puritas Springs Park, 10 miles from Cleveland, which is leased to J. E. Gooding. This park is some 30 acres in area and has been operated for two years, the amusements comprising dancing, in both hall and grove, merry-go-rounds for children, etc. No liquor is permitted on the grounds.

ELGIN, AURORA & SOUTHERN TRACTION CO.

This company operates River View Park, three miles south of Aurora, Ill., the headquarters of the company. The park management is in charge of the traction company. While the park has "chutes for shooting," swings, tennis courts and boating facilities, Mr. F. M. Zimmerman, manager of the company, advises us that dancing and base ball are the amusements that have proved to be the most remunerative.

FOND DU LAC STREET RAILWAY & LIGHT CO.

This company has on its railway line Lake Park, 1½ miles from the center of Fond du Lac, Wis., which is a city park under the city park board. At the park various attractions are provided, such as moving pictures, band concerts, "chutes," swimming school, fireworks, etc. When there is something special offered at the park the railway company furnishes a 2½-minute car service.

MADISON (IND.) LIGHT & RAILWAY CO.

The company owns and operates Beech Grove Park, two miles west of the center of Madison, which is under the management of Mr. C. R. Johnson, Jr. There is a theater seating 300 persons, and there are arrangements for base ball, bowling and dancing.

SAGINAW VALLEY TRACTION CO.

The company owns and operates Riverside Park, three miles from Saginaw, Mich., which is managed by Mr. John E. MacCarthy. At the park is a theater seating 1,300; other attractions are roller coaster, boating, shooting gallery, merry-go-round, zoo, swings. Vaudeville is pronounced to be the most remunerative special attraction.

CAMDEN INTERSTATE RAILWAY CO.

This company, with headquarters at Huntington, W. Va., operates three parks which are under the management of the superintendent of the company. These parks are: Clyffeside Park, half way between Ashland and Catlettsburg, in Boyd County, Ky.; Camden Park, four miles from Huntington, W. Va.; Beechwood Park, in Minton, O. At Clyffeside, which has been described in previous issues of the "Review," is a theater seating 2,000 persons. Stock companies are reported to be the most remunerative theatrical attractions. In addition to the theater there are at the parks boats, swings, picnic and ball grounds. Afternoons and evenings orchestras are provided.

TRI-CITY RAILWAY CO.

The parks owned and operated by the Tri-City Ry., of Davenport, Ia., and Rock Island and Moline, Ill., are described elsewhere in this issue. The restaurant and amusement privileges at Watch Tower Park, 3 miles south of Rock Island, are leased to John P. Newburg, and those at Prospect Park, 3½ miles south of Moline, are leased to C. S. Brown. The attractions comprise band concerts, dancing, balloon ascensions, moving pictures and other free shows.

CINCINNATI TRACTION CO.

Three direct lines of cars of the Cincinnati Traction Co. reach the Zoological Garden in that city, which is practically controlled by the Traction company. The garden, by way of additional entertainment, has exhibits of trained animals, fireworks displays, and a concert season from June 1st to September 15th, concerts being given afternoon and evening. The garden is three miles from the center of the city.

Mr. Walter A. Draper, secretary and business agent of the Cincinnati Zoological Co., writes as follows in regard to the operation of the garden: "The Zoological Garden of Cincinnati, operated by the Cincinnati Zoological Co., which is in turn controlled by the Cincinnati Traction Co., was founded in 1873 and opened to the public in 1875. The garden has always been conducted as a public institution, some of the city's best and foremost men having been and still being on the board of directors. Even though it is now practically owned by the Cincinnati Traction Co. it is operated not for profit, a by-law of the company providing that no dividends can be declared from the net earnings of the company, but that all

money made must be expended in improvements and additional animals. The garden has always ranked foremost among zoological gardens of this country and Europe and has a reputation abroad that is quite enviable. Since the present owners took control in the early part of 1902 a large sum of money has been expended in the construction of new buildings, the addition of thousands of dollars' worth of animals and the beautifying of the grounds. The plans are now ready for the building of a new herbivora to cost between \$50,000 and \$75,000. The garden has an area of 45 acres and in addition to the animal buildings and enclosures the landscape gardening and botanical displays are notable, while there are in the garden specimens of practically every tree native to this country or foreign that will grow in this climate. This last feature is an additional cause for the visit to the garden every spring of all the children of the public schools of Cincinnati for the purpose of studying the animals, flowers and trees. The prices of admission to the garden are 25 cents for adults and 10 cents for children."

The other officers of the company are: W. Kelsey Schoeff, president, and S. A. Stephan, manager.

PENNSYLVANIA & MAHONING VALLEY RY.

The Pennsylvania & Mahoning Valley Railway Co., of New Castle, Pa., operates Cascade Park, three miles from New Castle, which is managed by Mr. Perry Barge. There is a theater of 2,000 capacity at this park, and the company reports that high-class vaudeville is the most remunerative of the theatrical attractions. There are also toboggan slides, a "laughing gallery," merry-go-round, etc., and facilities for dancing, boating and bathing. This park was described at considerable length in the "Review" for December, 1897, page 815.

HIGHLAND GROVE TRACTION CO.

This company, which has headquarters at McKeesport, Pa., owns and operates Highland Grove Park, three miles from McKeesport. This is managed by Mr. T. H. Bowman. The car ride to the park is attractive, as the road leads most of the way around the brow of the hill overlooking on one side the Monongahela River and on the other the beautiful Crooked Run Valley. From Observatory Point at the park one can see for miles in all directions, the view including the Monongahela Valley from McKeesport almost to Pittsburg. Homestead, Braddock, Duquesne and McKeesport lie just beneath. Other scenic attractions at this park are what are known as the Diamond Caverns, Old Mines, Brown's Peak and East Duquesne Canyon. Among the improvements are dancing pavilions and refreshment stands.

NASHVILLE (TENN.) RAILWAY CO.

The company operates Glendale Park, six miles from Nashville, which is under the management of Mr. Yeatman C. Alley. The company has built a casino theater seating 700 persons and finds vaudeville and opera to be the most remunerative attractions.

DAYTON (O.) & XENIA TRANSIT CO.

The company owns and operated Lucas Grove Park, which is located on the company's interurban line, 13 miles from Dayton and 5 miles from Xenia. This park is under the management of Mr. A. W. Anderson, superintendent of the transit company. The most popular attractions have been found to be Sunday afternoon band concerts, and the concerts and dancing on certain evenings of the week. Boating is also popular.

CLEVELAND ELECTRIC RY.

The Cleveland Electric Railway Co. operates no park or other pleasure resort. During the past summer the company advertised the city parks on its lines by contributing liberally to the expenses of Sunday concerts and religious gatherings in them, and by means of cloth banners on the fronts of its cars. Mr. H. J. Davies, secretary of the company, writes us that the company made special rates for public school picnics in the parks, provided the special tickets were used on regular cars during certain hours, when travel was light. He also says: "The advertising probably cost us more than we received directly as a result of it, but we hoped to cultivate a

habit on the part of the people to visit the city's parks and boulevards, and to induce the people residing on our lines to get up little family picnics, school picnics, society picnics, etc., in the parks, any of which could be reached for a single fare. The hauls were short, and we tried to direct the business into the dull hours, and to do it without running extra cars."

For the purpose of working up this business, the company employed for six months, from May 1st to November 1st, Mr. J. W. Butler, who has for many years done an excursion business for the steam railroads. No plans have been made for next year.

MARSHALLTOWN LIGHT, POWER & RAILWAY CO.

The Marshalltown Light, Power & Railway Co., operating a 3½-mile electric system at Marshalltown, Ia., a city of 12,000 inhabitants, is making preparations to equip and improve a summer outing park located a mile east of the present terminal of its lines. The tract of 60 acres is practically an island in the river, being connected to the mainland by a narrow neck which will be excavated so that the river will be navigable on either side of the park. The park is not owned by the street railway company, but by a corporation of citizens who have entered into a contract with the management of the electric road by which the latter will extend its line to accommodate park traffic, and will furnish attractions such as concerts, vaudeville shows, etc., in the pavilion which it is proposed to erect on the park site. Communications will be made between the main land and the park by electric boats; bathing will be one of the principal attractions, the island being surrounded by shelving, sandy beaches, and it is also proposed to lay out ball grounds on the island, which during the season should attract many people to the games. The company has practically completed a mile of new track connecting its lines with the island.

At present the street railway lines in Marshalltown are laid with 40-lb. T-rail, but it is expected to double track a part of the line in the spring and to lay 60-lb. T-rail for a distance of several city blocks. The company will also purchase several additional cars. It now operates eight cars.

The company operates a 90-kw. generator which has run daily with the exception of one single day for the last 10 years.

URBANA & CHAMPAIGN (ILL.) RAILWAY, GAS & ELECTRIC CO.

This company operates West End Park, located about a mile from the center of Champaign, at which is a theater with capacity for 1,000 persons. The park manager, Mr. H. J. Pepper, states that comedy and vaudeville have proved to be the most remunerative entertainments.

DAYTON (O.), SPRINGFIELD & URBANA ELECTRIC RY.

The company owns and operates Tecumseh Park, which is located 12 miles from Springfield and 15 miles from Dayton. The park is under the management of Mr. R. Emery, general manager, and Mr. R. K. Howard, general superintendent, of the railway company. The attractions that have proved most popular and remunerative are dancing, baseball, boating and bathing.

OTTUMWA TRACTION & LIGHTING CO.

Mr. J. F. Springfield, general manager of the Ottumwa Traction & Lighting Co., of Ottumwa, Ia., writes under date of December 11th that this company has made some improvements in the line of a park and hopes to have one in operation next season. No decision has yet been made as to the attractions that will be provided.

WHEELING (W. VA.) TRACTION CO.

In reply to our inquiry, Mr. C. E. Flynn, general manager of the Wheeling Traction Co., writes us as follows:

"We have no pleasure park of our own, and the only thing that we have in the way of an attraction is the Moundsville Camp Ground, which is located on the Moundsville division of the Wheeling Traction Co.'s system, about a mile and a half from Moundsville and about ten miles from the center of Wheeling. The camp ground is the property of the Moundsville Camp Ground Co., which

is a Methodist organization, and during the summer months revival meetings, etc., are held, at which there is a large attendance. The company has quite a large building in which the meetings are held. There are also a number of cottages which are used by the members of their company and others during the months the services are held. We make a reduction of fare between Wheeling, Benwood, McMechen and Moundsville, the camp grounds being located between the last mentioned towns.

"The different railway companies that I have been connected with in the past have either owned or operated pleasure resorts to a greater or lesser extent. My experience has been that it does not pay railway companies to operate pleasure resorts, as it takes all or more than the income derived from it to pay operating expenses of the resort, and all there is left is the profit from transportation of persons to and from the resorts. The two resorts owned by the railway company with which I was last connected gave us considerable trouble; I found it better to lease the pleasure resort property to some outsider for a nominal amount, and let him reap whatever benefits he could, and in that way we were rid of the annoyance, disappointments and expense of that work, while we still retained the profits accruing from transportation.

"In my opinion a park is a good thing for street railway companies to let alone as far as the operation goes, but I think it is a good plan for a railway company to own property somewhere along its lines and place a few buildings on it, such as a dancing pavilion, ice-cream pavilion, restaurant and possibly tennis courts and baseball grounds, if the property is large enough. A merry-go-round I consider the best attraction, but these can be obtained at any time from people who own them and want to place them on the grounds on a percentage basis."

THE STARK ELECTRIC RAILWAY CO.

The Stark Electric Ry., with headquarters at Alliance O., has just begun operation and is planning to open next season a park 2½ miles east of Alliance.

PARADE OF ROLLING STOCK AT EVANSVILLE, IND.

The Evansville (Ind.) Electric Railway Co. celebrated Thanksgiving Day by a street parade of its rolling stock, making a display of the various types of cars, ancient and modern, which the company has used at different periods. The object of the parade was two-fold, first to give the public a forcible demonstration of the improvements that have been effected since 1892 when the road was operated by mules, and second, to increase the revenue.

The cars appeared in the following order: Closed car drawn by a single mule, 5-bench open car drawn by a single mule, 5-bench open car with team of two mules, 7-bench open electric car, single-truck closed car, open and closed cars of later equipment, 12-bench double-truck open car, double-truck closed car with vestibules.

The parade was a success in every way, and Mr. H. D. Moran, vice-president and general manager of the company, writes us that in addition to increasing the revenue for the day about \$200 the moral effect was good, giving the public an excellent idea of the improvements made recently and augmenting the general friendly regard in which the company is held.

The parade was freely advertised for several days before Thanksgiving, only one street, for a length of a few blocks, being indicated, and despite the very inclement weather at least 5,000 persons congregated to witness the display. When the company receives the new rolling stock now ordered, it will probably introduce the additional equipment to the public in another parade.

INDIANAPOLIS TRACTION & TERMINAL CO.

It is considered certain that on December 29th the Indianapolis Traction & Terminal Co. and the Indianapolis Railway Co. will act favorably upon the proposition made by the former company to lease the property of the latter for a term of 30 years. The agreement is as follows: "When the agreement is signed a dividend of 1 per cent. will be paid, and after July 1, 1903, the yearly rental will be 3, 4, 5 and 6 per cent. for four years respectively and 6 per

cent. thereafter. The stockholders will receive a bonus of \$1,500,000 in stock of the new corporation. The new company will have an issue of \$5,000,000 stock and \$5,000,000 bonds."

The Traction & Terminal Company has purchased a site at the northwest corner of Market and Illinois Sts. (which is midway between Monument Place and the state capitol, and only one square from each) and will expend \$1,000,000 in erecting a building which will be used as a union station for the numerous electric interurban railways entering the city, with waiting rooms and freight depot and offices for the railway companies and others interested in the railway or railway supply business. The office building is to be from 9 to 13 stories in height. Adjoining the station will be storage yards for cars.

DENVER CONTEMPT CASE.

The conflict between the executive and legislative and judicial authorities in Denver has assumed a serious aspect for the representatives of the first named branches of the local government.

November 14th last the district court issued an injunction to restrain the city council and mayor of Denver from passing or approving a street railway franchise ordinance then pending "unless it should be modified in certain particulars fully set out in the restraining order of the court."

On November 15th the board of aldermen passed the ordinance, which was later approved by the mayor. November 18th the eleven aldermen voting in favor of the ordinance, and on November 20th the mayor also, were cited for contempt of court. By agreement the only answer made was to allege the want of jurisdiction of the court, and on December 6th the twelve defendants were sentenced to four months' imprisonment. A stay of ten days was granted to permit application to be made for a writ of supersedeas.

This action of the court is believed to be contrary to all precedents, which are to the effect that the judiciary in this country may not exercise control over legislative bodies.

OSKALOOSA (IA.) TRACTION & LIGHT CO.

The Interurban Construction Co., Ottumwa, Ia., is engaged in building the electric road and power plant of the Oskaloosa Traction & Light Co., which has acquired the chief interests in the Oskaloosa Light, Heat & Power Co. The officers of the new company have not yet been elected, but it is understood that the officers of the Interurban Construction Co. are principally interested. Since October 15th 4¼ miles of track have been completed and engines and electrical machinery are now being installed. Boilers have been installed and the city wired for electric lights. The alternating system will be used. A heating plant is also being installed. It is expected that a part of the system will be in operation by January 1st. The officers of the construction company are: Harry E. O'Neill, Omaha, president; Samuel Mahon, Ottumwa, vice-president; Calvin Manning, Ottumwa, treasurer; J. B. Sax, Ottumwa, Sumner Wallace, Rochester, N. H., Gurdon W. Wattles, Omaha, directors. John F. Springfield, secretary and general manager, Ottumwa, Ia.

MANHATTAN ELEVATED LEASED.

It was announced November 26th that the Manhattan Railway Co., of New York City, had arranged to lease its property to the Interborough Rapid Transit Co., which is to operate the subway now being built. The lease is for 999 years beginning April 1, 1903. The rental from April 1, 1903, to Jan. 1, 1906, will be the net earnings of the Manhattan company, not exceeding, however, 7 per cent. After the latter date the rental will be 7 per cent per annum on the stock of the Manhattan Railway Co., guaranteed by the Interborough Rapid Transit Co. The Manhattan company will increase its stock at once from \$48,200,000 to \$55,200,000 for the completion of improvements. The ultimate increase will be to \$60,000,000. The Interborough company will pay \$10,000 per annum to keep up the organization of the Manhattan company in addition to the dividend paid to the stockholders.

The Cincinnati, Milford & Loveland Traction Co. has purchased the Cincinnati, Milford & Goshen Traction Co. The stock of the latter road will be retired.

New Shops for the Chicago City Ry.

In the "Review" for April, 1902, page 207, was published an illustrated description of the car house built by the Chicago City Railway Co. at 77th St. and Wentworth Ave. Adjacent to this car house there have been erected extensive shops to which has been transferred the equipment formerly at the 21st St. shops of the company.

When fully equipped this plant will constitute one of the finest street railway shops in the country. We are indebted to Capt. Robert McCulloch, general manager, and Mr. Richard McCulloch, assistant general manager, for data and the accompanying drawings. The plant is in charge of Mr. M. O'Brien, master mechanic, who,

being enameled brick of dark color. The rooms are about 40 ft. high, well lighted and ventilated and very attractive in appearance. The floors of both rooms are on the same level and are of cement. The roof is of terra cotta tile and is supported by steel trusses. The chimney, built by the Alphons Custodis Chimney Construction Co., of Chicago, is 150 ft. high and has an 8-ft. flue. The brick used in the construction are curved to a radius from the center of the chimney, the radii changing at each 16 ft. in height.

Power is generated for operating the shops only, but by suitable emergency switches may be turned onto the car lines, or, power from the lines may be used for operating the shops. The equipment



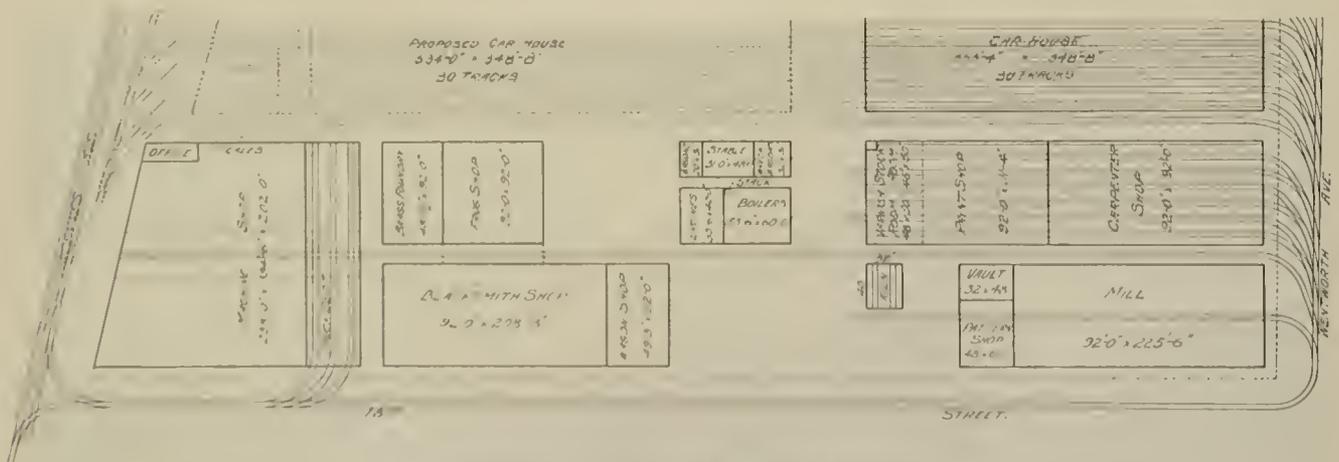
VIEW OF CHICAGO CITY RAILWAY SHOPS.

with Mr. H. B. Fleming, was responsible for many of the features in the arrangement of the tools and power transmission system.

The general view shown herewith is of the southwest corner of the shops at 78th St. and Vincennes Road. The shops extend east to Wentworth Ave., and along Wentworth Ave. to 77th St., occupying the whole block excepting a space at the northwest corner which is reserved for an additional car house.

The buildings are all substantially constructed of red brick with structural work of steel and timber, and are of the most approved modern style; they are of pleasing appearance and well adapted to the purposes for which they were built. The plan of the shops shows the general arrangement of the shop buildings and their rela-

tion to the car barn. There are three Babcock & Wilcox water-tube boilers, each having 144 4-in. tubes 18 ft. long and two 42-in. drums 20 ft. 4 in. long, built to carry 160-lb. pressure and rated at 300 h. p. These are equipped with Babcock & Wilcox automatic stokers. The coal used is run of mine and is received from cars into a storage cellar beneath the power house, from where it is carried by a conveyor made by the Link-Belt Machinery Co., of Chicago, into three large bins having a total capacity of 140 tons located near the top of the boiler room. It is then delivered to the stokers through chutes as shown in the sectional view herewith. Adjacent to the coal bins is a large shavings bin, which receives the



GENERAL PLAN OF CAR HOUSE AND SHOPS.

tion to the car barn. There is one track entirely surrounding the plant, from which all the tracks leading into the various shops and car house branch

POWER HOUSE.

The power house, a longitudinal section of which is shown in one of the line drawings, is located near the center of the plant and occupies a ground space 53 ft. 6 in. wide by 100 ft. long. The building is a fireproof structure of red brick and is divided by a wall into a boiler room and a generating room. The interior walls are finished in pressed brick, the lower courses to a height of 5 ft.

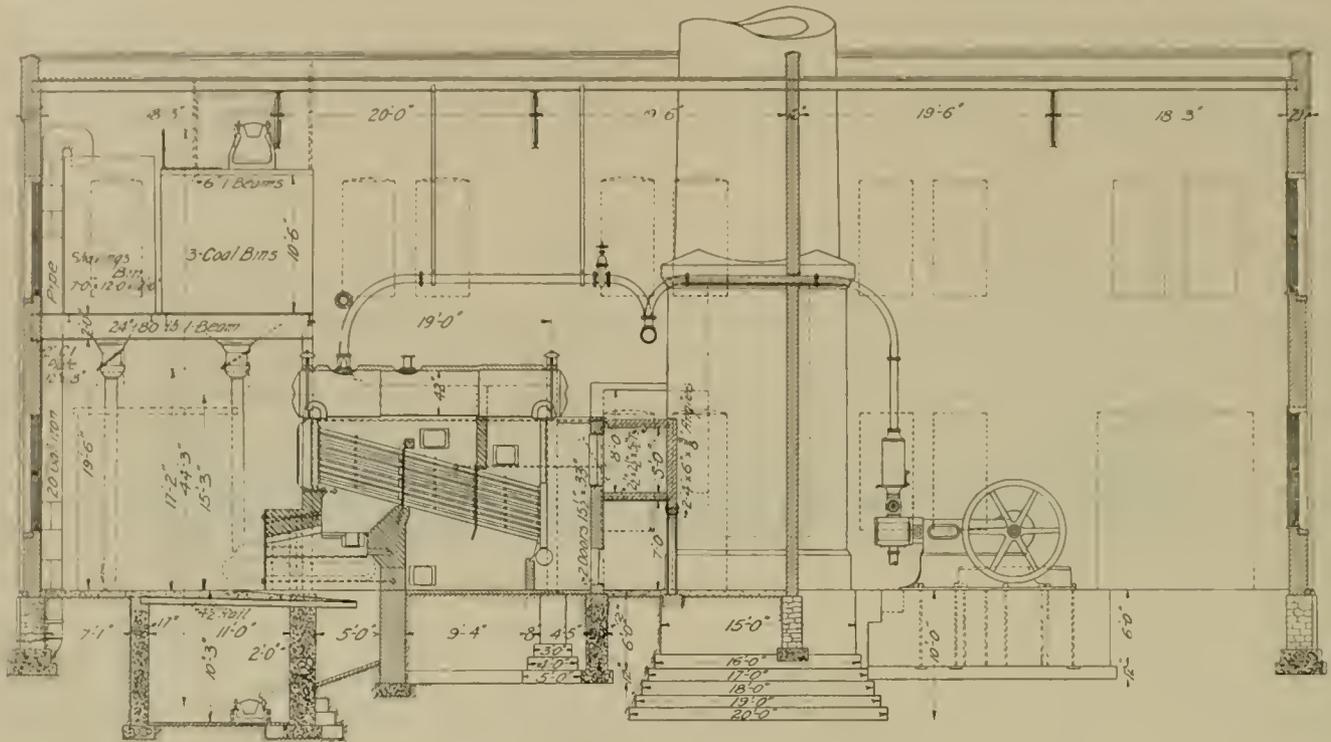
shavings from the wood shop through a 20 in. galvanized iron pipe. The coal conveyor is used to remove the ashes from the ash pit to a suitable tank over the track, from which it is loaded into cars by opening a valve provided for that purpose.

Water is supplied the boilers from the city mains by means of a Worthington Duplex pump. The steam piping is well designed and it will be noted from the sectional view of the power house that the mains are curved to a long radii. Each branch leading to the engine is supplied with a "Direct" separator.

The equipment of the generating room consists of two 300-h. p. Ideal engines, made by A. L. Ide and Sons, Springfield, Ill., and

designed to run at 200 r. p. m. under a steam pressure of 120 lb. These engines are direct-connected to Western Electric multipolar 500-volt generators, type L 734, of 200 kw. capacity. The engine exhaust may be used for heating feed water, or supplying heat to the heating system, or may be discharged into the atmosphere as desired.

main entrance is on Vincennes Road. The offices of the master mechanic and clerks are in the northwest corner of this building on the ground floor. The interiors are handsomely finished in hard woods. Both floors of this shop are of heavy tongue and grooved yellow pine spiked to beveled floor strips imbedded in six inches of cinder concrete. The doors of this shop as well as those of all



LONGITUDINAL SECTION THROUGH POWER HOUSE.

The switchboard, which is of slate, is of neat design, occupying one end of the generating room. The voltmeters are mounted on swinging brackets. The three panels are supplied with the usual meters, circuit-breakers, switches, and other apparatus for the complete control of the current. The feeder panel contains 12 double pole, 300 ampere switches. The feeders, which are all duplex, rub-

the other shops and car houses are of the Kinneer rolling type, furnished by the Kinneer Manufacturing Co., of Columbus, O.

One of the illustrations shows a cross-section through the east end of the shop. The roof trusses and supporting columns are all of structural steel. The second floor is principally of I beams and concrete, upon which the flooring of yellow pine is laid. This



VIEW IN BRASS FOUNDRY.



WOOD-WORKING DEPARTMENT.

ber insulated copper, and encased in lead, run through underground conduits to the various buildings.

MACHINE AND REPAIR SHOP.

The imposing structure in the foreground of the general view of the works is the machine and repair shop. The building is a two-story structure having a ground area 238 ft. 5 in. by 202 ft. The

floor is designed to support a load of 250 lb. per sq. ft. The shop consists of five bays running lengthwise of the structure, each 40 ft. in width, the center bay being open through the second floor and providing for the use of the 5-ton electric traveling crane installed by the Whitney Foundry Equipment Co., of Chicago. The roof over this bay is of the monitor type and is covered with heavy wire glass. The roof over the side bays consists of 2 x 6-in. tongue

and grooved flooring overlaid with five layers of "Cincinnati" wool felt, having 100 lb. of cement to 100 sq. ft., and a cap sheet covered with tar and gravel. The coping is of vitrified tiles. There are numerous skylights, which, together with the large window space, make it a remarkably well-lighted shop.

Suspended from the second floor on each side of the shop is a cement sub-floor about 10 ft. wide and 55 ft. long surrounded by an iron railing. On one of these is located a row of water closets and

needed. An axle rack worthy of note is constructed of a framework of wood, having iron rods across for the support of the rows of axles. A single rack contains 350 axles, any one of which may be removed without disturbing the others.

On the second floor are located the tin shop and the armature department, both of which are fully equipped with the usual appliances necessary for the expeditious handling of these lines of work. There is also a large fireproof vault for the safe keeping of inflam-



INTERIOR OF PAINT SHOP.

BAY IN MACHINE SHOP.

on the other a row of enameled iron wash stands supplied with hot and cold water for the use of the men. The entrance is by the main stairways at the side of the building or by the winding stairs shown in the sectional view. This arrangement is unique.

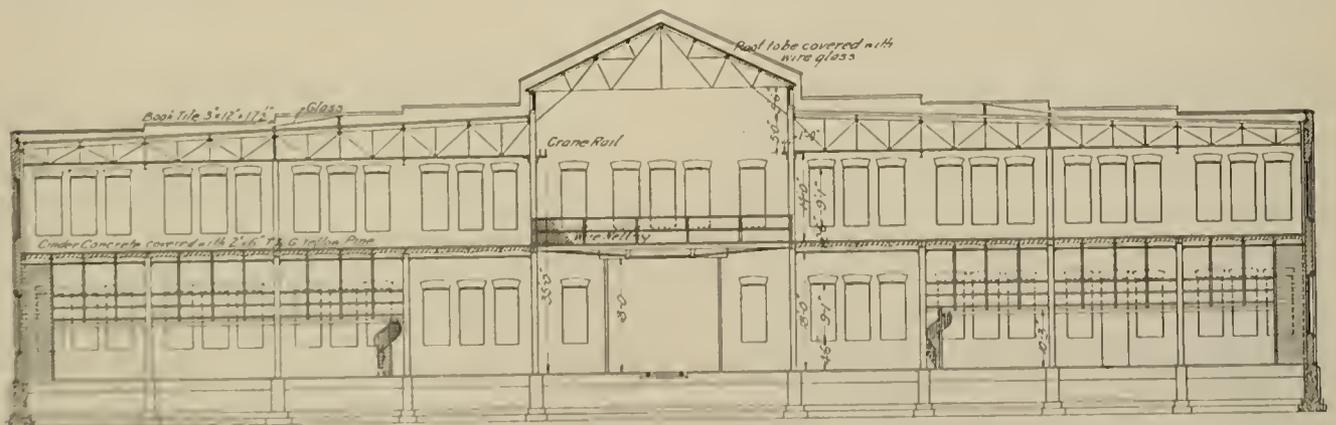
On the ground floor is located the bulk of the machinery, including axle lathes, boring mills, wheel press, etc. In addition to the equipment transferred from the 20th St. shops the following new machines have been added: One 26 x 48-in. 14-ft. McCabe double lathe; one 22-in. x 6 ft. Flather lathe; one 36-in. Bennett & Miles vertical boring mill; one 36 x 36-in. x 10 ft. Gray planer; one 36-in. W. E. Gang radial drill. These machines are driven by counter-shaft belts from three line shafts, which are driven by independent General Electric motors located near the ceiling of the first floor.

The tool room, where all small tools are kept in repair and dealt out, is located near the center of the shop. A new 14 in. x 4 ft.

mable materials. Two of the large heating units to be mentioned later are installed on this floor.

BLACKSMITH AND FROG SHOPS.

Across a 20-foot alley from the machine shop is a large building including the blacksmith and frog shops and the brass foundry. An idea of the general structure may be obtained from the sectional view. The roof trusses and other structural work are of southern yellow pine. The floors are of cinder. The roof covering is the same as that of the machine shop. The blacksmith and frog shops have three bays each; those of one shop being at right angles to the other. The roof of the center bays is of monitor construction and is covered with wire glass. The west end of the blacksmith shop is given up to iron stock and coal. Conveniently located are eight Buffalo down-draft forges, a large combined shears and punch, a 500-lb. steam hammer, a small helve hammer; in addition to these



SECTION THROUGH MACHINE SHOP.

Flather tool room lathe has been added to the former equipment. An up to date system of checking for tools is used.

Two large platform elevators are in operation between the two floors. The east end of the ground floor is provided with three track pits extending across the shop for convenience in making repair to trucks. A section of one of these pits is shown here with. A prominent feature is the systematic arrangement of the machines, allowing ample space between them for the handling of material. Provision is made for the storing in racks and bins of numerous castings and other supplies close to where they will be

are a 1,500-lb. Bennett & Miles steam hammer; a 1½ in. Ajax bolt header; a large Ajax forging machine; a Williams & White punch having a 30-in. throat, and an 80 lb. Bradley helve hammer, all newly installed.

In the frog shop are a large combined shears and punch, a cold saw, a rail bender, and a new 36 x 36 in. x 17 ft. Gray planer.

BRASS FOUNDRY.

The brass foundry, which is located in one angle of the blacksmith and frog shops and under the same roof, is a model for neat-

ness and shows evidence of the production of a large amount of work. Here all brass supplies are cast. Besides the eight crucible furnaces there is in operation a new Schwartz metal melting and refining furnace supplied by the Hawley Down Draft Furnace Co., of Chicago. This furnace is shown in an accompanying illustration. Heat is supplied by the use of oil and a blast of air. It is found to be very economical and efficient in its operation. There is also a large melting furnace for babbit metal, of which a large amount is used for bearings.

At the east end of the blacksmith shop and under the same roof is a shop 43 ft. 3 in. by 92 ft., which is used exclusively for making repairs to wreck wagons and other horse vehicles used by the company.

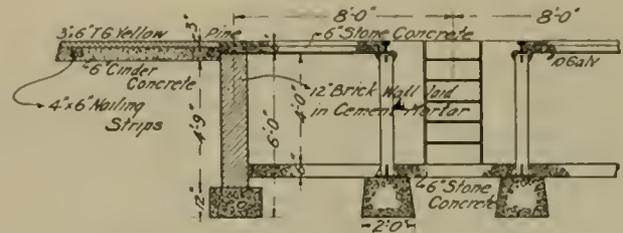
STABLE.

In the rear of the power house already described is the stable and wagon room. This is 31 ft. by 100 ft. and is divided into three rooms. At the east end is the wreck wagon room, which has provision for two wagons and the necessary horses which are in readiness at all times. The room at the west end is for all other vehicles. The center room is the stable, having 12 stalls, each supplied with a window and otherwise of modern style. There is a second story over the stable, where hay and feed may be stored in large quantities.

WOOD AND PATTERN SHOPS.

At the southeastern corner of the works is located the wood and pattern shop. The building has a ground plan of 273 ft. 6 in. by 92

length to the east is reserved for the carpenter shop; the remainder is the paint shop. There are six tracks, 14 ft. between centers, extending the entire length of the shop. The floors are of cement and are slightly raised between the tracks to drain off water used in washing the cars. The west end of the paint shop for a length of 50 ft. is made two stories high, providing two fireproof rooms

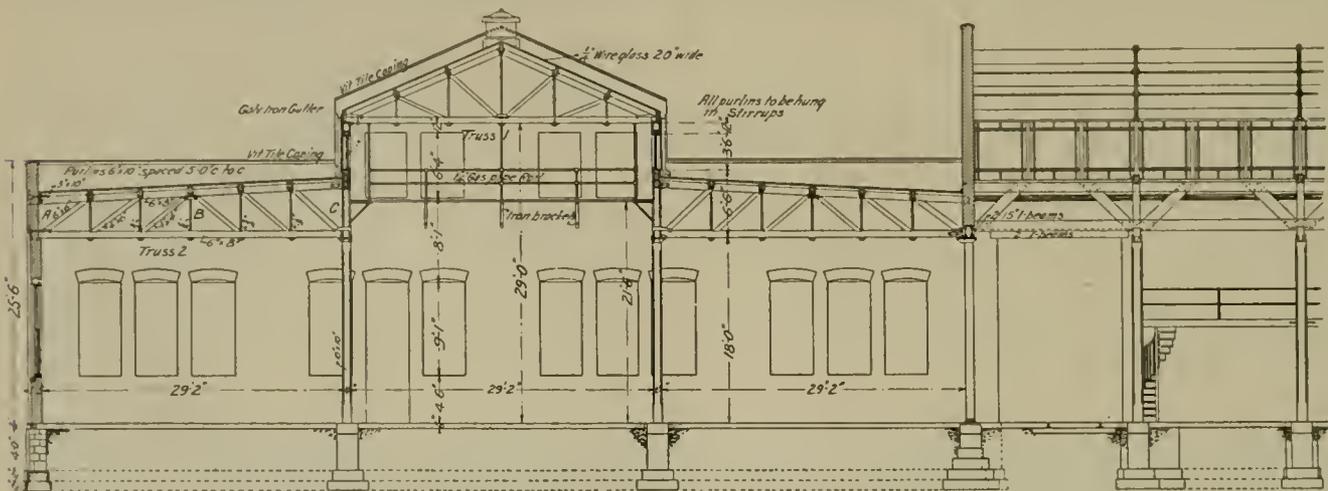


SECTION THROUGH MACHINE SHOP PIT ROOM.

above, one for varnish and oils, the other for stock. The building is high and especially well lighted.

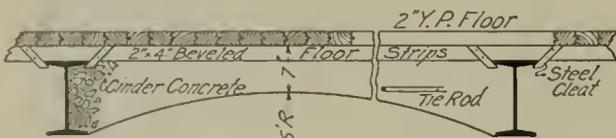
CAR HOUSES.

North of the paint shop and only indicated on the general plan is the car house, which is 353 ft. 4 in. long and 348 ft. 8 in. wide and extends along Wentworth Ave. to 77th St., covering the entire northeast corner of the lot.



SECTION THROUGH BLACKSMITH SHOP AND BRASS FOUNDRY.

ft. and is one story high. The general plan of construction is similar to that of the blacksmith shop already described, the floor being of yellow pine. The general details of this shop are much the same as prevail in the shops of other large systems. A full complement of band and circular saws, planes, lathes and other woodworking machinery is in operation. The power is furnished by two motors driving main shafts from which the counter-shafts of the several machines are driven. An illustration of one corner of this shop is



SECTION THROUGH SECOND FLOOR MACHINE SHOP.

here shown. A special feature is the fireproof vault 32 ft. by 48 ft. for storing patterns.

CARPENTER AND PAINT SHOPS.

Situated north of and parallel with the wood shop is the building comprising the carpenter and paint shops. The accompanying illustration of the interior of this building will give an idea of its construction, which follows the general lines of the other buildings. The ground plan is 92 ft. by 353 ft. 4 in., of which 192 ft. of the

A structure of larger capacity is in contemplation for the northwest corner of the lot. The entrance to this will be on Vincennes Road and the tracks will extend through from the present structure.

The present building, which was described in greater detail in the "Review" for April, 1901, page 207, is divided into six bays, having five tracks in each, spaced 11 ft. between centers. The house has a capacity of 204 of the large double-truck cars used on the Wentworth Ave. line, or of 384 of the smaller single-truck cars. The roof is of tile supported by steel framework, glass tiles being used for lighting. The doors, which are of the Kinnear rolling type, are 27 ft. 5 in. wide at the front entrance, requiring two for each bay; one 10-ft. door is used for each track at the rear of the building. The floors are of concrete. In the pit construction the track rails, which are of 100-lb. T-section, are supported on cast-iron columns spaced 6 ft. apart longitudinally.

There are seven units throughout the plant for heating and ventilating, installed by the Buffalo Forge Co. Four of these have 11-ft. fans and three have 9-ft. All are operated by motors. About 50,000 ft. of 1-in. pipe is used in the coils. Three units are supplied with exhaust steam from the power house, the remainder using high-pressure steam delivered through a reducing valve.

Protection against fire is afforded by three fire plugs on 77th St., four on 78th St., and one at the power house, tapped into 6-in. pipes leading to an 8-in. city main on Stewart Ave. one block west of Vincennes Road. There is also a system of one-inch pipes with reel and hose attachments throughout the shops.

B. E. SUNNY.

Prominent among the men identified with the practical and commercial development of electricity to whom we are indebted for the present commanding position of America in this industry, is Mr. B. E. Sunny, of Chicago, western manager of the General Electric Co., whose connection with the electric field began at a time when it included little besides telegraphy.

Mr. Sunny was born in Brooklyn, N. Y., in 1856, and commenced his business career as a telegraph operator for the Atlantic & Pacific Telegraph Co. in New York City where he was located from 1873 to 1875. In the latter year he came to Chicago in the service of the same company and was made successively night manager and manager of the Chicago office until the Atlantic & Pacific company was merged by the Western Union. In 1878 Mr. Sunny was appointed superintendent of the Bell Telephone Co. in Chicago, and in 1882 was made superintendent of the Chicago Telephone Co. which was a consolidation of the Bell company and the American District Telegraph & Telephone systems. He remained in the service of the Chicago Telephone Co. until 1887 when he resigned to accept the presidency of the Chicago Arc Light & Power Co. in which position he remained for three years during which time the business attained a very satisfactory growth. He then became the



B. E. SUNNY.

western manager of the Thomson-Houston Electric Co. and in 1892, on the consolidation of the Thomson-Houston Electric Co. with the Edison General Electric Co. he became western manager of the new company—the General Electric Co. The territory under his management now includes eleven states, from Lake Superior to the Gulf of Mexico, and from Michigan to Montana.

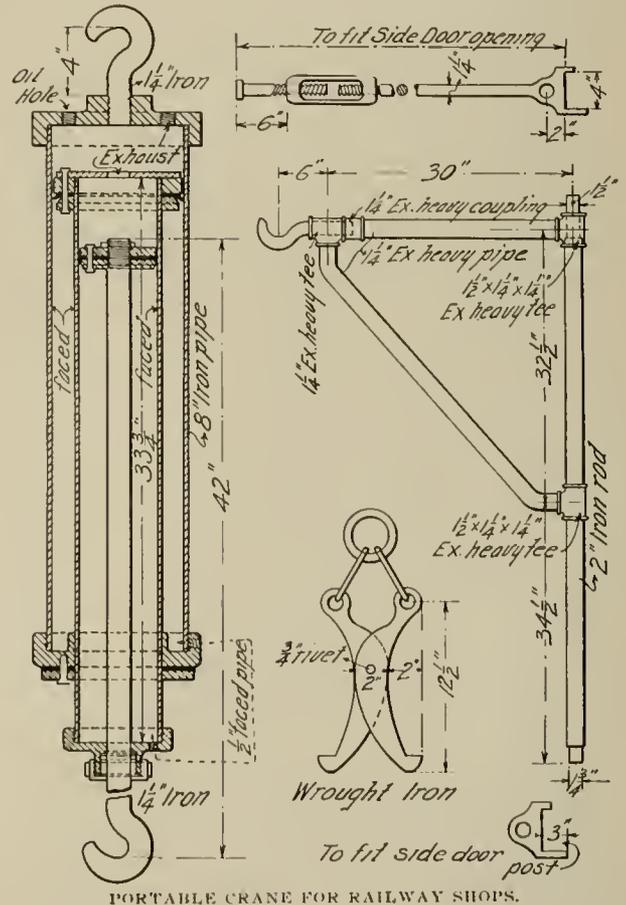
During his connection with telephone work Mr. Sunny was closely identified with the solving of the problem of underground wires for telephone service and later he was instrumental in establishing underground wiring for arc lighting. Mr. Sunny was a director of the World's Columbian Exposition and was president of the company that installed the Intramural railway at the Exposition; this was the first elevated electric railway in this country, and its successful operation led to the adoption of electricity for the elevated roads in Chicago, and later in New York.

Mr. Sunny has been prominent in political reform movements in the city of Chicago. In 1891 he was vice-president of the Union League Club and he is now president of the Civic Federation, which organization is doing hard work in the direction of procuring much needed constitutional modification by the next General Assembly. He has been identified with the movement in behalf of dependent and delinquent boys and has assisted in securing the necessary legislation for creating the State Home for Delinquents. He was also one of the commissioners appointed by Gov. Yates to select a site for the home.

In 1878 Mr. Sunny was married to Miss Ellen C. Rhue, of Brooklyn; he has two children, Helen, aged 16 and Arthur, aged 11.

A CONVENIENT PORTABLE CRANE.

The accompanying illustration shows a special form of hoist which was recently described in the Railway Age, and which is stated to have been found of much assistance in loading and unloading car wheels from box cars and in handling material of various kinds in railroad shops. The essential parts of this device are the swing crane and the air hoists, and the method of attachment is simple and strong and at the same time quick of application. The upright part of the swing crane is set in a socket which is fastened on the door post at the bottom and rests directly on the floor. The upper end of this piece is held in position by the compression exerted by a turn buckle on a rod extending across the



PORTABLE CRANE FOR RAILWAY SHOPS.

doorway and pressing against the opposite door post. The frame is made of extra heavy pipe and fittings and round iron. The hoist is made telescopic, by means of which nearly double the stroke of a single length hoist is secured. The view herewith gives the general dimensions of the device. A special hook is made for picking up wheels, the application of which is apparent from an inspection of the drawings.

MUNICIPAL OWNERSHIP DEFEATED.

The special election held in San Francisco on December 2d, which was announced on page 779 of the October "Review," resulted in the defeat of the movement towards the municipal ownership of the Geary Street Railroad by its acquirement at the expiration of its franchise which expires on November 6, 1903. The proposition was to issue bonds to the amount of \$700,000 for the purpose of better equipment and operation of the road. The vote was 15,120 for the proposition and 11,334 against it. A two-thirds vote was necessary for adoption.

It is reported that the interurban roads running out of Columbus, O., in which Mr. A. E. Appleyard is interested, have purchased a large property at Gay and Broad Sts., for the purpose of erecting a new freight station.

FREIGHT AND EXPRESS.

BY ALTON D. ADAMS.

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Electric railways are rapidly extending to include interstate as well as interurban systems. Starting from Boston, Mass., one may now travel by electric lines to the capitals of three other states. One route passes north to and along the valley of the Merrimac, through Manchester, the metropolis of New Hampshire, to Concord, its capital city, a distance of more than 70 miles. Going south from Boston about 44 miles brings the traveler to Providence, the capital of Rhode Island, and another electric line extends some 25 miles further to Newport, passing through Fall River on the way. A stretch of 100 miles west from Boston connects that city with Springfield in the same state, and thence a run of nearly 30 miles to the south brings one by electric cars to Hartford, the Connecticut capital. From this point the journey by electric line may be continued, one or two short breaks excepted, to New York City.

Outside of New England, the story of long electric lines extending from city to city, and state to state, is repeated. In New York one may travel by electric cars from Troy, through Albany, to Hudson, a distance of over 40 miles. Connecting trolley lines in Ohio offer continuous transit from Newark through Columbus, Springfield, Dayton and Hamilton to Cincinnati, a trip of more than 150 miles. On other electric roads passage may be had from Cleveland to Toledo over a route above 100 miles in length. These extensions of electric lines have carried them out of the list of mere instruments of urban transit, like the horse railway which they displaced, and entered them as full competitors of steam railways for local passenger traffic. As long as electric railways were confined to city streets, almost their entire income was derived from passenger fares, and this condition has been materially changed only in special cases up to the present time.

There are now cogent reasons for the extension of electric railway business to include the transportation of local freight and express matter. First among these may be put the general public interest and welfare. Steam railways, by reason of the infrequency of their stations and the comparatively long distances between parallel lines, have necessarily met in only a very imperfect degree the demands for quick and cheap transportation of freight and express matter. The requirement that freight must be hauled several miles over poor roads to reach the station of a steam railway often holds it on the farm. Even when the station of the steam road is reached, the local freight rate is frequently so high that the products of farms and gardens cannot with profit be sent to market. With local freights, especially those of a perishable nature, time is an all-important element. An entire day is often consumed in the transportation of freight from outlying towns to a city market only a few miles distant. Again, in the delivery of small express packages to short distances over steam railways the public is generally but poorly served. As a rule the local express service on these lines is too infrequent and the rates are too high to encourage the traffic. In many localities the electric railways are in a position to change all of this. Electric cars stop anywhere or at very short intervals, so that all persons along the line have equal access to the service. Moreover, virtually parallel electric railways are frequently so close together that a very short haul by wagon will bring freight to one of them, if not the other. Instead of a single transportation of freight each way per day, electric cars may make many trips in a like period.

Express matter carried on interurban lines may be readily transferred to the local cars in any of the connected cities, and the necessity of wagon collection and delivery thus largely avoided. In the nature of things there seems to be no good reason why every interurban car, at least, should not have a large express box in which small parcels could be safely transported. At sufficient intervals cars intended for freight alone could be run over interurban lines, and often to the original points where freight must be received from shippers or delivered to consignees over city tracks. Electric railways in a very large number of instances have put the passenger rates per mile at not more than one-half of the charges made by steam roads. Power houses, tracks and the entire equipment of electric railways, except the cars, are already adapted to the transportation of freight and express. There is good reason, therefore, to hold that a moderate investment in rolling

stock would enable many electric lines to engage in the transportation of freight and express with mutual advantage to the public and their owners. From the economic point of view it certainly seems desirable that existing electric lines be made to distribute the products of farms and factories. More directly interested than the general public are the owners of electric railways in the possibilities of their freight and express business. Since the historic electric road at Richmond went into operation, the position of street railways as to the transportation of freight has materially changed. Considering for a moment a single state, Massachusetts, the length of street railway tracks has been multiplied by four since 1888. These extensions have not only formed interurban systems, as already noted, but have also connected each city with a large surrounding area of farm and village territory. Within city limits local express companies compete for the transportation business. Between cities and their outlying territory the carriage of both express and freight remains largely in the hands of the steam roads. This business is now large and is capable of material expansion when such service is offered as only the electric railways can give. Farm products are waiting for more rapid and frequent transportation into cities. Fuel in the form of wood must often come in and coal go out. Suburban freight like suburban passenger traffic will turn from steam to electric roads when the latter are ready to handle it. Moreover, in many instances electric railways reach a territory where there is little competition with steam roads because of its distance from their stations.

To the general addition of the freight and express traffic to the passenger business of electric railways there is a single important obstacle. This is the legal one. In some cases the transportation of freight by street railways is expressly forbidden either in their special charters or by a general statute. More generally the charters and the statute law are alike silent on the point. In either event the result usually is that electric railways have no authority to act as common carriers of freight. Such a result is reached by the general rule of construction for corporate charters, that only those powers are granted which are either expressed or may be fairly implied as incident to the expressed powers. Where electric railways lack authority to engage in the freight and express business an appeal to the state legislature should remedy the difficulty. The only serious objection to the extension of the privileges of common carriers to street railways may be expected to come from the steam roads. Such opposition may delay but it can hardly prevent the general transportation of local freight and express matter by electric railways. The great importance of the freight business may be gathered from the report of the Interstate Commerce Commission for the year ending June 30, 1901, which shows that the steam railways of the United States earned \$426,000,000 by the carriage of passengers and \$1,114,000,000 by the carriage of freight in that year. Of course a large share of these freight earnings are derived from through freight which electric roads are not in a position to handle. Another large portion of freight earnings is received for short hauls that may well be made by electric roads. Street railway companies are rapidly coming to appreciate the possibilities of revenue from the freight and express business and are moving to secure it in a number of states. The rapid though recent growth of freight and express business on electric railways is illustrated by the increase in the number of these railways doing such business in Massachusetts and in their incomes from it. The numbers of these railways in each year and their incomes from freight and express are as follows:

1898	Number railways	8,	freight income	.....\$ 5,728.26
1899	"	9,	"	..... 7,040.50
1900	"	8,	"	..... 14,796.49
1901	"	12,	"	..... 15,298.07

Every one of these roads is partially or entirely interurban, connecting small cities and towns, and not one of them enters a city of as much as 35,000 population. Of the twelve roads only two seem to have made a really effective effort for the freight and express business. The names of these two electric railways and their incomes since 1898 are as follows:

Year.	Conway Electric Street Railway Company.		
	Passenger.	Freight.	Express.
1898	.....\$2,398.33	\$3,424.96	\$419.86
1899	..... 2,744.77	3,635.03	480.11
1900	..... 3,057.41	5,638.31	571.63
1901	..... 3,388.17	5,484.67	636.53

These statements of incomes do not include sums received for the carriage of mails, such sums being obviously capable of only very moderate expansion.

Shelburne Falls & Colrain Street Railway.			
Year.	Passenger.	Freight.	Express.
1898	\$6,885.45	\$4,472.31	
1899	7,179.25	5,404.27	None.
1900	7,047.38	5,566.66	
1901	7,223.76	5,760.25	

Figures are for fiscal years ending on September 30 in each case. For the fiscal year of 1901 the income from the carriage of mails by the Conway road was \$369.39, and from like carriage by the Shelburne Falls line \$305.36. Prior to 1898, the carriage of freight and express by electric railways was of such small importance that the sums received from these sources were included with the incomes for carriage of mails in the reports of the Massachusetts railroad commissioners. It is not, therefore, possible to state the exact incomes from freight and express in earlier years. The Conway company owns and operates 5.91 miles of electric railway line from the steam railway stations to the several villages in the town of Conway. Between 1898 and 1901 the income of this company from passengers increased 41, from express 51, and from freight 60 per cent. In the latter year, of the total income from these three sources, express yielded 7, passengers 35 and freight 57 per cent. This shows what can be done with the freight and express business in a small town with a total population of only 1,458 persons. The Shelburne Falls Street Railway extends from the steam railway station in the town of Shelburne to several villages in the town of Colrain, and has 6.53 miles of line. According to the census of 1900, the population of Shelburne was 1,508, and that of Colrain 1,749 persons. Since 1898 the yearly income of this electric line from passengers had increased 5 per cent and the income from freight 29 per cent in 1901. In the latter year passengers yielded 56 and freight 44 per cent of the sum of these two incomes. On the Conway line freight has been the largest source of income during each of the four years. The Shelburne road received four-fifths as much from freight as from passenger business in 1901. Neither of these electric lines compete with the steam railway, but act to a large extent as feeders for it. When electric railways operating in only one or two small towns can derive the revenues above given from freight and express, the opportunities for longer roads connecting large cities as well as towns are evident. The figures show that while the express business is important and should be built up, freight offers the great prize for which, next to passengers, the efforts of electric railways should be directed.

In Massachusetts the street railways are waking up to these opportunities. As yet the majority of these railways lack authority to carry freight and express, but they are rapidly getting it. The legislature of that state during its recent session of 1902 granted the right to act as common carriers of small parcels or express matter to fourteen electric railways. It is significant of the opposition which legislation along this line encounters that only five of these railways were authorized to carry freight or goods in large quantities. Of these five electric railways, two were authorized to carry freight over only small portions of their respective lines, and on another two the freight that might be transported was limited to fuel and farm produce. Of the fourteen electric lines only one was given authority to carry freight of all classes over its entire length. Some of these street railways pass through several towns and cities each. Two have entry to Worcester and two pass through Pittsfield. One end of the line that has secured authority to carry all kinds of freight is at Agawam, a town just across the river from Springfield. Evidently the movement of electric railways in Massachusetts toward the freight and express business is well under way. An amendment just made there to a general law permits any electric railway to transport road material for use along its own or any other line, or on the streets of any town or city, and to contract for this service.

A striking advance in the acquisition of freight and express business has been made by the electric railways of Rhode Island during the past year. On May 27, 1901, the Union and Suburban street railways, both of which center at Providence, began a freight and express service between Providence and outlying towns, making two trips per day. Refitted passenger cars, each 17 ft. long, were used for this freight business. Since the above date five box-cars, each 40

ft. long, have been added to the equipment for handling freight. This freight service has now been extended throughout the length of the state from Oakland on the north to Narragansett Pier on the south. The Union electric road has a total length of 97.3 miles, and the Suburban road a length of 52 miles, all in Rhode Island.

During the year ending June 30, 1901, the income of the Union road from its freight business was \$10,324.78. In the same year the Suburban road earned \$3,582.19 by the carriage of freight. This is just a beginning. Within five years it is probable that the greater part of freight and express transportation that both begins and ends in Rhode Island will be done by electric railways.

Turning to Connecticut, similar conditions are presented. Quite a number of the longer street railways show some earnings from freight or express. One system centering at Hartford derived an income of \$3,000.59 from express and \$8,777.89 from freight business in 1901. Another system entering Hartford earned \$2,161.61 in the same year by carrying express matter. Figures telling the same story, though perhaps less clearly, might be quoted from other states.

Given the low cost and high speed attainable with electric traction, the expansion of street railways into interurban and interstate systems was inevitable. Given this expansion, it also becomes inevitable that the great bulk of local freight and express matter must pass over the electric roads.

In all this the general public, through far better transportation facilities and lower rates, is the chief and ultimate gainer.

RECENT ADVANCES IN WAGES.

When Mr. E. G. Connette became general manager of the Syracuse (N. Y.) Rapid Transit Railway Co. about two and a half years ago he met with the employes and stated that he desired the hearty co-operation of every man and assured them that they should share in the success of the company. In compliance with this declaration he advanced their wages Jan. 1, 1901, and on Christmas of that year presented each employe with a sum in cash amounting to from \$3 to \$5. On November 13th last Mr. Connette met with the Employes' Mutual Benefit Association of the Rapid Transit Co., and after the usual routine business announced that on December 15th there would be a general advance in wages. The announcement was a complete surprise and entirely unexpected and was more fully appreciated on that account. Men who have been with the company a year will receive 16 cents per hour; those in service for a longer period will receive an additional cent per hour for each year of service up to five years, which will be 20 cents per hour.

President W. B. McKinley of the Danville (Ill.) Street Railway & Light Co. issued a bulletin announcing that the wages of motormen and conductors on the city system and the Danville, Paxton & Northern R. R. would be increased 10 cents per day beginning November 16th. Along with the notice the men were asked to send in their addresses for the Thanksgiving turkey. A few months ago the company presented the men with an amount equal to five per cent of their year's wages. About 100 men are employed. In sending out the bulletin Mr. McKinley stated that the company realized that the cost of living is increasing and that it desired to keep pace with these conditions.

The management of the Trenton (N. J.) Street Railway Co. voluntarily increased the wages of its employes five per cent November 14th. Under the increase the men will receive \$2.10 a day, or 17½ cents per hour. This is the fourth increase in wages since Mr. H. C. Moore has been president of the company.

The wages of conductors and motormen on the Wilkes-Barre (Pa.) & Wyoming Valley Traction Co. were increased from \$1.70 to \$1.75 per day November 15th. About 250 men are affected.

November 20th the Portland (Me.) Railroad Co. gave its motormen and conductors an increase of 10 cents, fixing their pay at \$1.85 per day. About 300 men are benefited.

The Philadelphia Rapid Transit Co. raised the wages of its conductors and motormen from 19 to 20 cents an hour December 1st. Nearly 7,000 men are said to be affected by the increase. Since January, 1897, wages have been increased from 16 2/3 cents to 20 cents per hour.

The Chester (Pa.) Traction Co. voluntarily increased the wages of its motormen and conductors from 16¾ to 17½ cents per hour November 15th.

LINE CAR AT ATLANTA, GA.

Shortly after the consolidation of electric railway interests in Atlanta, it was determined to practically reconstruct the line and overhead work on the system. For this purpose the engineering department of the new company, known as the Georgia Railway

wise, and the second crosswise, as designated in the plan of top framing. The sides of the car are covered with 1 x 3-in. ceiling stuff. Double floors are put in, in both car body and vestibules. Provision is made in the side of the car for a doorway, 7 ft. high, and 5 ft. wide, provided with two battened sliding doors arranged to slide on inside of the car. There are also two battened sliding doors at each end of the car, these doors being 7 ft. high and 1 ft. 3 in. wide, and also arranged to slide on the inside.



EXTERIOR OF LINE CAR.

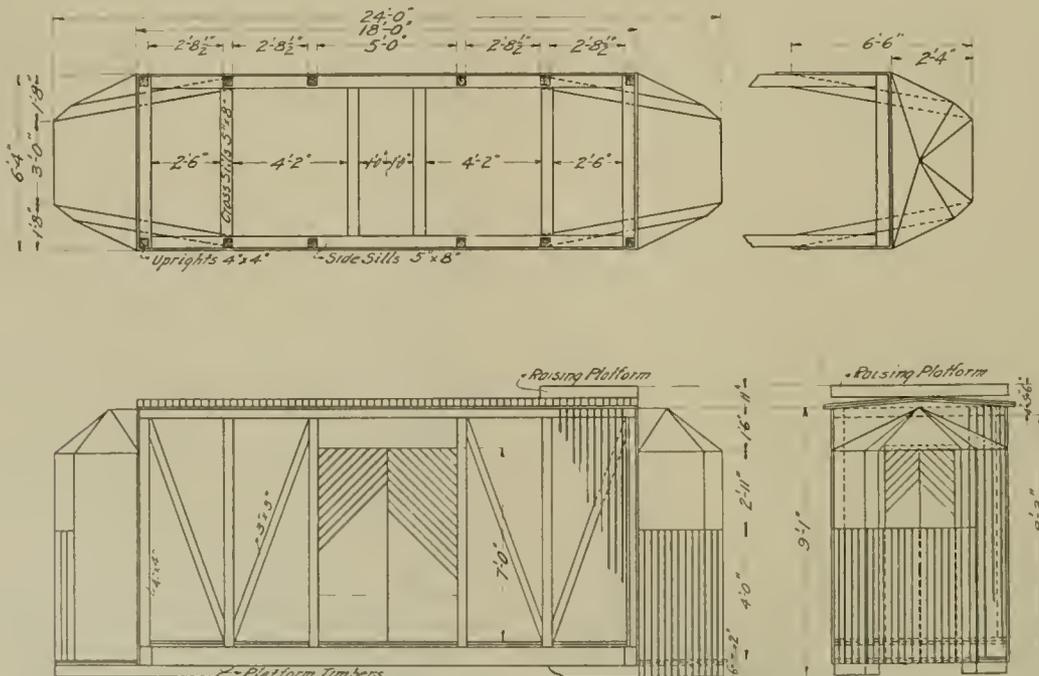


INTERIOR OF LINE CAR.

& Electric Co., designed and constructed the line car herewith described and illustrated. In preparing the plans, it was desired to have a car that would stand rough usage and at the same time particular attention has been paid to securing simplicity of construction.

The vestibules are supported by two 6 x 6-in. platform timbers bolted to the bottom framing. The vestibules are enclosed with matched ceiling stuff to a height of 4 ft. from the floor, and with glass the rest of the way to the roof. The roof of the vestibules is 1 in. stuff put on with as few joints as possible. The uprights supporting the roof of the vestibules are of wood up to the point

The plans comprehend a straight-side box car, 24 ft. long over



PLAN AND ELEVATIONS OF LINE CAR FRAMING.

all and 6 ft. 4 in. wide over all. The body is 18 ft. long. The bottom framing is constructed with side sills of 5 x 8-in. timbers and cross sills of the same size stock, as shown by accompanying plan. The upright timbers are 4 x 4 in., and braced diagonally with 3 x 3-in. timbers, as shown in the side elevation. The top framing is formed of 4 x 4-in. timbers covered with a roof consisting of two layers of 1 x 3-in. ceiling stuff, the first layer put on length-

where the glass begins and 1 1/2-in. iron pipe the rest of the way. Each vestibule has one doorway, these on opposite sides of the car, and each provided with a stirrup step.

Above the top of the car near one end is a platform 3 ft. 6 in. x 6 ft. 4 in., which can be raised and lowered by an arrangement of sprocket chain, wheels and weights. The platform is made of 5 x 5-in. timbers covered with 1-in. flooring, and is supported on

provided with set screw and the shaft carrying the large hand wheel has a ratchet and dog attachment by means of which the platform is prevented from falling and is held at any desired elevation. The chain and sprocket wheel are guaranteed to withstand a working strain of not less than 1,000 lb.

By means of a door in the front dash poles up to 30 ft. long can be carried on the car, as shown in one of the engravings.

CAR SIGN SUGGESTIONS AND CRITICISMS.

The important question of equipping street cars with designating signs so that people who use them may be intelligently informed as to the destination of the cars has always been a very perplexing one. So much information is required to inform the public in regard to the routes and destinations of cars that it requires all of the available space that can be had for signs, and yet a multiplicity of signs only tends to make the situation more confusing. People, and especially strangers, who are able to detect one particular sign in a cluster of eight or ten while the car is progressing at its usual rate of speed are very much in the minority and it therefore seems useless to designate by signs all of the streets and squares that the car will pass en route. The purpose of such a scheme is well meant, but its object is never attained as it is almost impossible to read all the matter upon a large number of signs in the short time that elapses while the signs are in legible sight as the car approaches. The public, whose patronage makes the street railway a success, reasonably demands that the street railway company shall label its cars in the most simple manner possible. All kinds of people depend upon these signs for the selection of the car they require and, as in many cases this selection must be made from a multitude of cars that are passing in an almost endless procession, it is evident that the signs should be distinct and legible; otherwise the public will be put to much inconvenience and the company will receive numerous complaints.

There is evidently quite a waste of time and material expended on the roof signs of cars at the present time. These signs, which should be the principal mediums of information in regard to the route the car is pursuing, are often rendered almost useless either on account of their position, or the style of lettering which is frequently used. Fancy lettering is used presumably to exhibit certain artistic accomplishments on the part of the designer, and he is sometimes liable to indulge his propensity to make the signs appear ornamental instead of making them useful as it is obvious they should be.

The most reasonable way for painting signs is apparently the most economical, for using expensive leaf and color for this purpose, producing a brilliant effect, only contributes to make the signs, under certain conditions, indistinct and illusive. A rational and sensible sign can be produced by using a white ground and lettering it in plain black block letters which for clear and easy reading cannot be improved. Moreover, such a sign shows to much better advantage when illuminated at night owing to the absolute contrast between the ground and the lettering which gives the latter prominence so that they are perceptible at the necessary distance for the proper signalling of a car.

If ordinary window glass could be made malleable, similar to iron, without losing its transparency, then the illuminated glass top sign would certainly be the most popular one, but until a method of molding glass in semi-elastic instead of an absolutely brittle form is devised, the glass top sign must be condemned because of the prohibitive expense involved for constant repairs caused by breakage in their manipulation by the car men when changing them. Whatever method is employed in adjusting these signs, whether by some attachment or by the use of switch bar, makes but little difference, for the result is the same when the sign works hard as it will invariably do under certain conditions, as the battered condition of many signs on the average street car will bear witness. Experience has shown that a long, narrow pane of glass set into a slender frame will not stand the rough treatment that car men are wont to give signs when their time is necessarily limited. But, if the breaking of the glass in these signs could be avoided they would certainly be universally adopted, for their legible qualities both by day and night would insure their success.

The scriptural reference in regard to the arranging of a light under a bushel is analogous to that of placing a roof sign on the

side of a car. Whether stationary or revolving a sign thus located cannot be read from the sidewalk until the car is nearly opposite to the person reading it which, according to the rules laid down by most companies for stopping cars, is always too late as the car would generally pass the stopping point by the time the would-be passenger had decided that it was the one wanted, and before he had time to hail it.

As street cars are operated for the purpose of carrying passengers and not for show it does not require that the vehicle should be decorated with a showy assortment of lettering. It is impossible for any fixed sign on a car to accurately mark its destination at all times, therefore any lettering upon the car body such as the general name of the route the car is used upon, or any name whatever, is not only superfluous and costly, but it compels the company to use the car exclusively on the route designated by its lettering, which it is not always convenient to do.

It is suggested that all of the cars of one company be painted one color and without any lettering whatever on the car bodies. Four-board revolving top signs which can be rapidly removed should be used on the ends of the car only. If the four boards on one sign are not sufficient to mark the route of the car at times when it is used on special runs this sign can be easily removed and portable dasher signs be used for this temporary work, and by this scheme, if a certain car is required on some route other than that upon which it is ordinarily used it can be made ready to transfer in a short time by simply changing the top sign. Again, it is clearly seen that by this scheme a smaller number of cars would be required to operate the street railway system than where the different color scheme is in vogue. The latter requires a number of cars of each color should be idle to replace any that may be rendered useless by accident, or any that may be sent to the repair shops for painting, repair, etc., and a much smaller number would suffice for this purpose if the one-color scheme were adopted. In this case the cars can be used on any route.

Years of experience with street railways makes one hesitate before suggesting a radical departure, as the one here mentioned would be to many roads whose cars are all painted distinctive colors for each route. The principal objector to changing them all to one color would probably be the public, who, having become familiar with the different colors notes them instead of any signs for the selection of the car required. Yet it is safe to say that patrons could be educated to the one-color innovation in a short time if the arrangement of the top signs was made in an intelligent and legible manner. These should state, therefore, with great distinctness, in an ingeniously condensed form, the course and destination of the cars they mark for the benefit not only of the inhabitants of the city where the cars are operated, but also the stranger within its gates.

PUEBLO & SUBURBAN TRACTION & LIGHTING CO.

The Pueblo (Col.) & Suburban Traction & Lighting Co. is the outcome of a merger of the Pike's Peak Power Co. and the Pueblo Traction Co. The new company has been incorporated with a capital stock of \$3,500,000. The property of the new company consists of the Beaver Park generating plant, the lines to Victor, Cripple Creek and through the mining district, and the light and power plant of Pueblo. The new company will continue to furnish electric light and traction power to Pueblo and numerous towns in the Cripple Creek district, but the power will be generated at the Beaver Park plant and transmitted by wires now under construction. The Beaver Park plant is 50 miles from Pueblo and is said to have cost nearly \$1,000,000. The incorporators of the company are: M. D. Thatcher, John F. Vail, Ward Rice, T. H. Devine and H. F. Woods, all of Pueblo.

It is reported that F. M. Haines, superintendent of the Northern Texas Traction Co., has had a survey made for a new line between Dallas and Oak Cliff, Tex.

The Lake Erie, Bowling Green & Napoleon Electric Railroad Co. has completed its line into Pembertonville and has it in operation. The road is owned by the people of Bowling Green and the adjacent country and many of its stockholders will be its regular patrons.

The Concrete Bridge at Herkimer, N. Y., Over West Canada Creek, Now Being Constructed by the Utica & Mohawk Valley Railway Co.

PREPARED EXPRESSLY FOR THE "REVIEW" BY MR. F. C. PHILLIPS, THE COMPANY'S RESIDENT ENGINEER.

That division of the Utica & Mohawk Valley Railway Co.'s line known as the Little Falls Extension is a continuation of the company's tracks east from the village of Herkimer to the city of Little Falls, and will on its completion, make Little Falls the eastern terminus of a system which now extends west to Rome, N. Y. The line from the west enters Herkimer from the direction of Mohawk, and cars now run to the intersection of Mohawk and South Main St. near the New York Central R. R. station on what was formerly the Herkimer, Mohawk, Ilion & Frankfort Electric Ry., a single track road now being changed to one having double tracks laid with 95-lb. 9-in. girder rail. Connection has already been made with the tracks of the Little Falls Extension which is well on its way toward completion.

The Herkimer Bridge, by means of which the company's cars are to cross the West Canada Creek and the right-of-way of the New York Central R. R., is a very important part of the Little Falls Extension now in process of construction. Particularly in that part of the structure which spans the waters of the Creek, this bridge excels in magnitude anything of the kind yet attempted in this country, for while it is true that there are many bridges of concrete-steel construction, and some of them with one, two or even three spans greater than any at Herkimer, yet the boldness of the design which provides for a series of 10 concrete arches with spans from 62 ft. to 66½ ft., and in addition to this, continues the same structure with a 225-ft. steel span, completing the viaduct with three 55-ft. steel spans, and making one bridge 1212 ft. long, puts this work beyond comparison with anything which has yet been done in this line.

LOCATION.

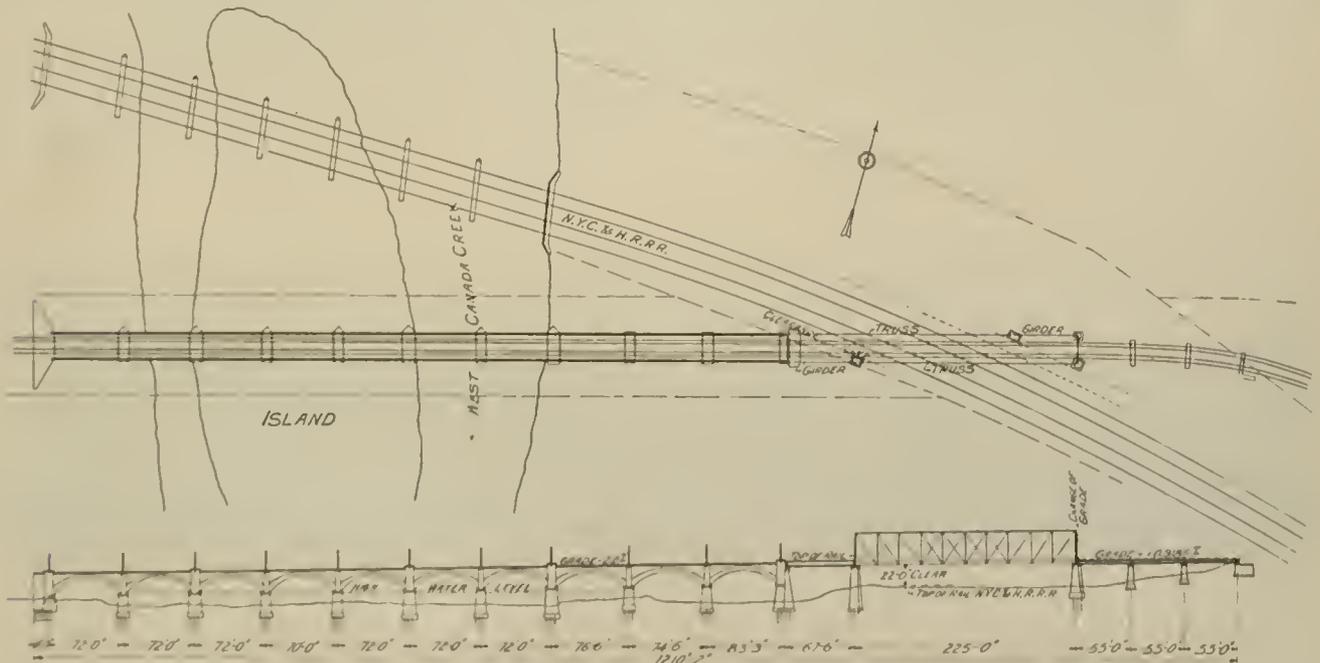
The course of the West Canada Creek is very nearly north and south, and as the eastern boundary of the village of Herkimer passes not far from the middle of the stream, the bridge will be

creek overflows its banks. Protection Ave. is 2,400 ft. east of the New York Central station, and about 1,000 ft. west of the creek, to reach which latter it is necessary to cross a strip of low flat land, which in times of freshet is often several feet under water.



ARCH FORMS READY FOR CONCRETE.

From Protection Ave. east the line of the electric railway is on a private right of way 100 ft. in width. Following the center line, the west bank of the creek is reached at a point about 230 ft. south



PLAN AND ELEVATION OF HERKIMER BRIDGE.

partly within the limits of the village and partly in the township of Herkimer

South of the New York Central R. R. and near the eastern limits of the village the last street extending north and south is Protection Ave., a street well named for the reason that it is really a dike, which protects that portion of Herkimer from inundation when the

of a new bridge now building by the New York Central R. R. for its own use, and as the lines of the electric railway and the steam road rapidly converge at this point, it will be noted if reference is made to the plan showing the general layout of the structure, that when the east bank of the creek is reached the distance south from the New York Central bridge is about 110 ft., and that where the

electric railway company's center line intersects the New York Central's right-of-way, the distance east from the Central's bridge is about 200 ft. Crossing the tracks of the Central, the electric railway company's line is on a tangent, while the Central's curvature is approximately two degrees to the south, the angle between the company's tangent and the chord to the Central's curve being about 23 degrees. The tracks of the Central once crossed, the company's line bends to the east with an easement curve and is soon extending nearly parallel to the Central's line.

As to the grade, the New York Central requires a clearance above

bankment has been provided for by what is known as the "Dry Channel Span" which corresponds in size and location to a similar opening in the New York Central embankment to the north. The concrete abutments, one of which is shown in an accompanying engraving, are of the wing-wall type, and contain together about 610 cubic yards of masonry. They are now ready for the plate-girder bridge which is to carry the electric railway track construction at this point. The length of this span is to be 84 ft. from center to center of end pins.

The normal bed of the creek is to be spanned by a series of 10



VIEW LOOKING WEST SHOWING FORMS IN PLACE.

its tracks of 22 ft., and to attain this elevation, it was necessary to build the electric railway bridge on a 2 per cent grade from the street surface at Protection Ave. to the north side of the Central, at which point the grade breaks to 0.9185 per cent., which is then continued for several hundred feet beyond the east end of the bridge. The total elevation gained from the street surface in Herkimer to the east end of the structure is 41 ft.

FORM OF STRUCTURE.

The striking design from which Herkimer Bridge is being constructed was furnished by the Osborn Engineering Co., of Cleve-

arches which begins where the earth fill ends, a point distant about 100 ft. from the bank of the creek, and which ends at a point about 230 ft. beyond the east bank of the creek. During the ordinary stage of water the distance between banks of the creek is 400 ft., and the stream would be included by six spans. The reason for taking this precaution of extending the bridge beyond the banks was to insure ample room for the passage of high water as it rises above the banks. To one who is at all familiar with the West Canada Creek, and has seen it in times of freshet with the ice piled up in the channel and on the banks, checking the flow of water, the reason for this precaution is not difficult to understand.



ARCHES READY FOR CONCRETE.

land, Ohio, Wilbur J. Watson, bridge engineer. The lines are simple, yet even now before the forms have been removed the graceful proportions are quite apparent from the temporary wooden structures, and as the lines of the plans are carefully brought out in construction, the result is a bridge that is beautiful as well as useful.

The road crosses the flat land west of the creek on an earth fill, the material for which has been taken from a piece of land in the vicinity six or seven acres in extent, purchased by the electric railway company for that purpose. An opening necessary for passing the overflow water at times of extreme high water through this em-

The supports for the arches consist of two abutment-piers with nine intermediate piers. One of the features of the design provides that the intermediate piers shall be of two different sizes, the third, sixth and eighth being larger, so that they may act as abutments in case a portion of the bridge should fail. The second to the eighth inclusive are so constructed at the up-stream end as to act as ice breakers. The faces of the piers have a batter of three-quarters of an inch per foot, and are provided with a molding at the top, having a depth of 2 ft.

The arches will have a thickness at the crown of 21 in., this in-

creasing to 4½ ft. at the haunches, and each will contain 32 pairs of 1¼ in. steel rods of the Thacher patent, which are to be placed 3 in. from the extrados and intrados and to extend down into the piers. The first seven arches will have a clear span of 62 ft. with a rise of 12 ft., the last three, a span of 66½ ft. with a rise of 14 ft. The spandrel walls will extend 2 ft. 9 in. above the arches and will be surmounted by a coping 18 in. in depth.

The pilasters above the piers will project 1 ft. beyond the spandrel walls, and those of the larger piers will be extended a certain distance above the coping. Steel poles for supporting the trolley wire will be placed one in each pilaster.

The arches will be covered with two coats of cement grout to render them water-proof, and this coating will be extended part way up on the spandrel walls; the filling over the arches and piers will consist of sand and gravel forming a good roadbed for the electric railway track. Drainage is provided for by 4 in. vitrified pipes located over each pier.

The east abutment pier is to serve not only as an abutment for the arches but also to support one end of the 225-ft. steel through truss which is to span the tracks of the New York Central, thus making the steel bridge continuous with a series of arches.

That part of the structure following the long steel span, namely, the three 55-ft. girder spans, is on a curve to the right, and the

were carried to a distance of 12 ft. below the surface, not to secure a good bearing soil, for that was excellent at all times, but to provide against any cutting out of the loose water bearing material which possibly might occur when the water should be confined to a narrow channel.

In all other cases the records of the borings showed the creek bed to be made up of coarse sand, gravel and boulders, with the upper surface of the clay at approximately the same elevation, except that perhaps in the main channel it was slightly lower. Nothing in the nature of quicksand was shown by the records, except in case of one of the piers, but when excavation for this pier was made, no trouble was experienced.

Clay having been reached, piles were driven for the reason that the bearing power of the clay was not considered sufficient to support the weight of the structure without yielding. These piles were 30 ft. in length and were driven into the clay from 12 to 16 ft. In this connection it may be said that it was calculated that under certain possible conditions the pressure on the foundations under certain of the piers would reach 5.35 tons per sq. ft. In addition to the bearing piles, a layer of coarse sand and gravel was rammed into the surface of the clay to increase its bearing power. In the case of the smaller piers intended to support the 55-ft. girder spans at the east end of the bridge, no piles were used in the foundations,



EASTERN TERMINUS, HERKIMER BRIDGE.

piers are set radially on this curve. The curvature, however, is not abrupt, being a Searles spiral made up of fourteen 20-ft. chords.

FOUNDATIONS.

The West Canada Creek in times past has given a great deal of trouble on account of its great power in scouring where the limits of its channel are at all confined. This is accounted for by the fact that the material of the creek-bed is a water bearing stratum of coarse sand and gravel, having a depth in mid-stream of 10 to 12 ft., and overlying a stratum of blue clay. Quite recently the stream gave evidence of its power when one of the piles used to support the centering which had been driven into the bed of the creek 6 or 7 ft., was undermined so completely that it swung in the current from its support above.

The Herkimer Bridge will essentially be a heavy structure, and in addition to this fact, it was designed to carry under certain conditions, very heavy loads. For these reasons it was deemed wise to take extra precautions in preparing the foundations for those piers and abutments in or near the creek, and the result of the decision was that the excavation should be carried to the solid stratum of clay. Accordingly a systematic test was made of the foundations for each pier including the "Dry Channel Span," the borings being made by Mr. A. T. Gibson, of West Winfield, N. Y. The apparatus used was a well boring outfit, using a 6 in. drive pipe.

Contrary to expectation in the case of the Dry Channel, borings to the depth of 30 ft. below the surface failed to reveal anything but coarse sand and gravel, where it had been thought that clay existed at a distance of 15 to 18 ft. at the most. The foundations

but a compacted gravel and sand, approximately 2 ft. in thickness, was put on the surface of the clay and the masonry built on this.

The coffer dams employed in the construction of the footing courses were made by piling up bags filled with sand in tiers about the pit, the thickness of the dam being equal to the length of four or five bags. The work was greatly facilitated by building a dam a short distance up stream near the piers of the New York Central Bridge, which turned the water to the east, while the piers near the west side were being built. It was necessary, however, to build one pier amid stream, and in this case the bags were kept together by being placed in and about piles which had been driven to support the centering for the arches.

All foundation pits were sheeted with 2-in. spruce and the sheeting left in place. The pumps not being able to keep the pits entirely free from water, when it came to the laying of concrete, 8-in. vitrified pipe was used to conduct the water to the well where the pump was operated.

For carrying on the work at different piers to advantage, a working roadway built on piles was constructed from the west bank to the end of the series of arches, and the wisdom of putting it on piles has already been several times demonstrated by the havoc worked by high water on other nearby structures not so substantially made.

The general plan of the work was to put in all the foundations and carry them to an elevation above high water before going on with the superstructure at any point. This plan has been carried out with the result that protection from ordinary high water is now insured.

The sand and gravel for the concrete have been obtained from

the vicinity of the work. A crusher plant with bins and a graduated screen from which gravel of graded sizes could be obtained in quantities desired, was set up on an island in mid stream, and for a great part of the work the materials were obtained from the island and in very low water from the creek bed. A track was laid on the island and cars used to transport the material from the bed of the creek to the crusher. From the crusher bins it was again taken in cars and distributed from the roadway mentioned at various parts of the work. Both gravel and sand obtained from the creek were of good quality, but on account of the dampness, it was difficult to separate the sand from the small pebbles. In the foundations this mixture was treated as sand, tests having been made for the percentage of voids and the concrete proportioned accordingly.

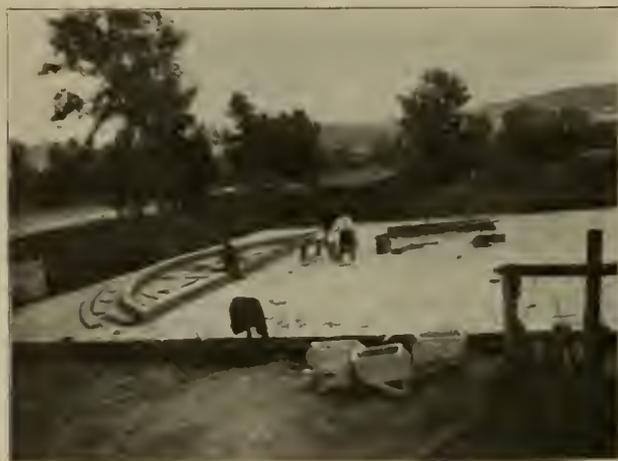
The supply of materials in the creek gave out when the work was about half completed and the crusher plant has been removed to a neighboring gravel bed. Sand is being hauled to the work from a bed a little over half a mile away.

PIERS.

In the construction of the masonry above the footings care has been taken to have the sand screened. The concrete has been continued up to a point where the steel rods of the arches begin, it not having been possible to continue them further in all cases for the reason that the rods have been delayed in shipment.

ARCH CENTERS.

The form of centering adopted was the Warren truss with seven panels. The upper and lower chords were made up of three thick-



PLATFORM FOR LAYING OUT FORMS.

nesses of 3 x 12-in. stuff mostly spruce, but in some cases of hemlock, and in the first ones built, the diagonals were made of 2 x 10 in. timbers, but it was found that the ends sawed from the bearing piles could be squared at the mill, and utilized for the diagonals.

The centering for each arch consists of seven trusses tied together and well braced, the trusses being supported at each end by two pile bents, spaced about 4 ft., this method not allowing any weight to come upon the forms for the skewbacks. The forms were designed to act as trusses, but to render them rigid and to prevent, if possible, any settlement, two pile bents were driven near the center of each span as additional supports. The sections of the chords are held together by 1½-in. birch pins, no bolts being used. The reason for this is to facilitate the taking down of a centering, which can be done by sawing the pins. The lagging for the arches is of spruce, 2½ x 5 in. dressed on one side and joined on both edges.

MASONRY.

All masonry is of concrete and thus far no broken stone has been used, except such as has come from large stones in the gravel, passing through the crusher.

The brand of cement used is "Nazareth," made by the Nazareth Cement Co., at Nazareth, Pa., and sold by the Chas. Warner Co., of Wilmington, Del. The cement has been carefully tested at the electric railway company's laboratory on the work.

In the foundations and in the piers the materials have been mixed

in the proportion of one part cement three parts of sand and seven parts gravel, the only distinction being that in the foundations less attention was paid to the screening of the sand than in the superstructure of the piers. In the arch rings and spandrel walls a proportion of 1 to 2½ to 5 is being used.

On exposed surfaces a facing mortar 1½ in. thick has been used. This mortar was first made 1 to 2, but was afterward changed to 1 to 2½. The facing is placed by means of slip boards and is rammed at the same time with the body of the concrete. On the up-stream ends of those piers which have been sharpened to act as ice breakers, a mixture of 1, 2 and 4 varying in thickness from 6 to 8 in., has been used in addition to the ordinary facing.

The proportioning of the materials in the concrete is on the basis of packed cement, loose sand and loose gravel, and has been determined by tests of the materials combined with the judgment of the inspector on the work.

A word with reference to the method of depositing concrete on the arches may be of interest. The arches are being built in transverse sections, extending the full width of 27 ft. The rods are first placed in position as shown by one of the engravings and the section at the crown deposited first. This section may be in width from 10 to 14 ft. The sections at the haunches are then placed and continued up toward the crown.

By November 1st three of the arches were completed, with portions of the spandrel walls, and it was planned that the rest of the work would be completed December 15th, of the present year.

Work was begun on the earth embankment May 22, 1902; on the abutments of the "Dry Channel Span" June 22d, and on the main structure the latter part of June. Messrs. Beckwith & Quackenbush, of Herkimer and Mohawk, N. Y., are contractors for the masonry, and Messrs. Snare & Trest, of 39 Cortlandt St., New York, will erect the steel work.

The officers of the Utica & Mohawk Valley Railway Co., for which the bridge is being constructed, are: Horace E. Andrews, of Cleveland, president; J. J. Stanley, of Cleveland, vice-president; C. Loomis Allen, of Utica, general manager; Chas. H. Clark, of Utica, chief engineer; Frederick C. Phillips, of Little Falls, N. Y., resident engineer.

NORTHERN CALIFORNIA POWER CO.

The Northern California Power Co., which furnishes power to a great variety of industries in one of the most prosperous sections of California, has recently installed a 4,000 h. p. generating plant at its Cow Creek station, which is situated in the high Sierras and is typical of the many transmission plants recently installed in the state. The ultimate capacity of the station will be 8,000 h. p. The company has already installed 3,000 h. p. at the Battle Creek generating station, thus making the present total capacity of the company's electrical installation 7,000 h. p. Among the industries supplied with power by this company are ore-smelters, the city water works at Red Bluff and Redding, and the operation of large air compressors at the Mountain Copper Co.'s mine at Iron Mountain. For lighting current is also furnished to the cities of Redding, Red Bluff, and Willows, and the towns of Keswick, Cottonwood, Anderson, Corning and Vina, all lying along the Sacramento River. Irrigation is necessary on most of the land in this valley and electrically driven centrifugal pumps are employed to raise water to the irrigating ditches. Many thousands of motors are already in operation in California driving pumps for irrigation work. The recent installation of the company in its Cow Creek station consists of two 1,500-kw. 3-phase alternators, which will be driven by impact water-wheels supplied with water under a head of approximately 900 feet, exciters, switchboard and raising transformers, etc. The transmission will be at 34,000 volts. Both stations are equipped with Westinghouse apparatus.

Senator G. B. Davis, of Detroit, president of the Blue Grass Consolidated Traction Co., and a party of capitalists have been looking over the proposed routes of several interurban railways to be built between Lexington, Ky., and nearby towns. It is understood that work will begin before January 1st, as otherwise the franchises in some of the counties expire at that time. Among those in the party were A. K. Patterson, C. R. Adams and W. Eaton of Boston, Mass., and J. P. Clark, Terre Haute, Ind.

BRISBANE TRAMWAYS RECREATION CLUB.

BY CHARLES E. BADGER.

In July, 1899, the matter of recreation for the motormen and conductors of the Brisbane Tramways when off duty suggested itself to the management and the men almost simultaneously, but by whom the subject was broached is now hardly remembered. Suffice it to say, the matter soon took definite form and on August 8th, the first meeting was held and an organization perfected. The officers chosen were officials of the company. To this the manager, Mr. J. S. Badger, objected, insisting that to attain the purpose of the organization the club should be "of the men, for the men and by the men." Mr. Badger, however, consented to accept the purely honorary office of "Patron" and at a subsequent election officers were chosen from among the men.

Recreation rooms with bath rooms and reading rooms supplied with current literature, illustrated, technical and daily, had previously been provided at the different depots, but as the membership and interest increased, the necessity of larger and more central quarters became apparent and the company offered the use of a building on one of the principal tram lines for the use of the club. The front part of the building was thrown into one large room 54x18 ft. and electric light was installed and the room furnished with punching bag, Indian clubs, dumb bells, quoits, boxing gloves, chess, draughts, etc. The hall is open all day and to a seasonable hour at night, and the men are encouraged when off duty to avail themselves of the privileges of the club. The rear of the building was tendered to one of the married men for living rooms, who assumes the care of the hall in consideration of his rent.

The present membership is about 200 and includes nearly two-thirds of the conductors and motormen, all of those employed being eligible for membership.

The necessary expenses of the club are small, there being nothing for rent or lighting. However, the small monthly due of 6d. (12 cents) is paid by each member from which funds are always available for an occasional "spread."

The government is vested in a committee of twelve, who hold regular monthly meetings, business meetings of the club proper being held annually or upon call of the committee. Frequent formal meetings are held at which guests are entertained, the programmes varying from literary and musical efforts of no mean order, to banquets, at which after dinner speakers are developed. At the latter, the members are their own caterers. No intoxicants nor gambling are permitted under any circumstances. Addresses on topics pertaining particularly to tramway equipment and operation are also presented from time to time. Frequent matches in draughts and chess are arranged, also boxing and fencing matches. Annually a tournament is held at one of the public recreation grounds, at which all forms of outdoor sports (of which Australians are very fond) are contested, medals and prizes being offered by the company, officers and outside parties. The tournaments are usually graced by the presence of state and municipal officials, who have exhibited genuine interest in the club.

As an offshoot of the Recreation Club, a Rifle Club was organized something over a year ago, having now a membership of about seventy. Members of this club are required to take the oath of allegiance to the sovereign, whereupon the state equips the club with rifles, furnishes instructors in rifle practice and the manual of arms, as well as range facilities. Target practice takes place once a week and drills are held twice a week. The Rifle Club by its organization becomes an arm of the State Defence Force and the thoroughness and effectiveness of the drill is shown by the fact that a number of men volunteered for service in the Australian contingents furnished to the Home Government for service in South Africa.

The club has participated in several target matches in which the members acquitted themselves with particular credit.

Another organization of Tramway employes, not exactly an offshoot of the Recreation Club, however, is the Tramway Band. It numbers about twenty members, the company furnishing the instruments and the services of a proficient bandmaster as leader and instructor. Regular practice is held once or twice a week and every Thursday night during the summer, weather permitting, an open air concert is given at a small park on one of the lines where for the purpose of control of the premises the company has leased

some ground and erected a bandstand. That these concerts are popular with the public is attested by the fact that an audience of a couple of thousand is not unusual, nearly all of whom use the trams in going to and returning from the concert. The players are allowed a half day's "time" for each evening's playing at a concert.

More recently, a benefit fund has been established, by means of which employes who are incapacitated through illness receive sick pay while absent from their duties. As a small weekly subscription is all that is required, the majority of the employes are members of this institution, and each branch has been so well managed as to pay all claims in full and have a comfortable fund in bank.

As a result of these organizations the mutual interest of company and men is increased and on the part of the latter has developed the feeling that even a soulless corporation has a desire for the pleasure and contentment of its employes when off duty, as well as for their best service when on duty. A community of interest has thereby been aroused to which may partially be attributable the fact that there never has been any question between the management and employes which has not been readily settled without the slightest friction.

ABOUT AN ACCIDENT.

The following claim, it is said, was presented by a farmer living at Ararat Summit, Pa., to the New York, Ontario & Western Ry., and the reply is from the pen of the railroad's claim agent:

THE CLAIM.

My razor-back strolled down your track
A week ago today,
Your Twenty-nine came down the line
And snuffed his life away.

You can't blame me, the hog you see
Slipped through the cattle gate,
So kindly pen a check for Ten,
The debt to liquidate.

THE ANSWER.

Old Twenty-nine came down the line
And killed your hog, we know,
But razor-backs on railroad tracks
Quite often meet with woe.

Therefore, my friend, we cannot send
The check for which you pine,
Just plant the dead, place o'er his head,
"Here lies a foolish swine."

Ararat Summit is of interest to street railway men as being the scene of the fight between officers and six burglars who had robbed the Carbondale Traction Co's. power house at Mayfield, Mar. 26, 1899. An account of this was given in the "Review" for April, 1899.

BLUE GRASS TRACTION CO.

The Blue Grass Traction Co., Lexington, Ky., has filed amended articles of incorporation which are designed to widen the field of its operation. The articles provide for an increase in capital stock from \$10,000 to \$350,000, and authorize the company to furnish heat, light and power, to purchase and improve real estate at or near the line of its railway for the purpose of establishing hotels, summer resorts, or parks for the entertainment of its patrons, and to carry passengers, express, freight and the United States mail.

The Metropolitan Street Railway Co., of Dallas, Tex., has been incorporated with a capital of \$4,500,000 to build and operate street railway and interurban lines within and near the city of Dallas. This is believed to mean a consolidation of all the street railway companies of Dallas.

CONSPIRACY CASE AT BUFFALO.

About the middle of May, 1902, the claim agent of the International Railway Co. of Buffalo, discovered that a plot was being formed to obtain a large sum of money from the company by means of a fraudulent accident. Mr. A. J. Farrell, general claim agent of the company, informed Mr. T. E. Mitten, the general manager, of what he had discovered regarding the plot, and Mr. Mitten instructed him to give the matter his personal supervision and to lay his plans to unearth the guilty parties, if possible.

Mr. Farrell started an investigation at once and found that the conspirators were Henry Cobb, Adam Willis and George Leonard.



ANDREW J. FARRELL,
Claim Agent.



FREDERICK HALLER,
Assistant District Attorney.

As Mr. Farrell had known Leonard for some time, he was approached and made a party to the scheme and was instructed to get Cobb and Willis to carry it out. Leonard was to assist them and to keep Mr. Farrell informed of all the details of the plot. Cobb and Willis were invited to Leonard's house and the plan was talked over several times.

The night of June 21st was the time selected for the fake accident to occur. Before it was put into execution, however, it was planned to have a final rehearsal at Leonard's house at eight o'clock that night. Three witnesses from the claim department (one of whom was a stenographer) arrived at Leonard's house about an hour before the conspirators. They were placed in an adjoining room where they could see everything that was going on and hear the conversation. Cobb and Willis arrived at Leonard's house at eight o'clock as agreed upon, and the final rehearsal was enacted. The conspirators then left to put their plot into effect,

Willis and Leonard stopped at the corner of Spruce and Sycamore Sts. Willis stood on the northwest crossing or proper stopping place for a westbound car. Leonard stood on the opposite side of the street. Cobb walked one block further east and as a westbound car approached, he walked out from the crosswalk, hailed it, took his handkerchief out of his pocket, and wiped his face. This was a signal agreed upon between them that everything was favorable for their scheme. Cobb walked to the forward end of the car. The conductor followed him to get the fare and Cobb commenced to unbutton his overcoat, which was worn for the occasion. He drew the conductor's attention by asking him which route he would take to get to the depot. As the car approached Spruce St. it was hailed by Willis who was standing at the proper stopping place. The car came to a stop. Willis stepped onto the car, got up onto the platform and into the door. Leonard who was on the opposite side of the street, crossed back of the car and just as it was about ready to start, caught hold of it with his left hand on the dash, his right hand on the body of the car and one foot on the step. As the car started, he fell to the pavement. Willis, who at this time had got to the door of the car, notified the conductor that a man had fallen off. The signal was given by the conductor but the car reached the next street before it could be stopped. Willis, Cobb and the conductor got off and went back and found Leonard lying in the street, groaning and moaning. He was picked up and assisted to the side of the street and his name taken by the conductor. The conductor asked him if he was hurt and he complained of his back and the back of his head being injured. Cobb and Willis gave their names to the conductor but gave fictitious addresses. Leonard was assisted to the police station nearby and taken from there to his home in the patrol wagon. He was carried up two flights of stairs and put to bed. A physician was sent for and when he arrived, made an examination. Leonard, according to instructions, deceived the doctor by claiming a severe pain in the small of the back and also in the back of the head. The doctor made several visits but the improvement in his patient was not noticeable.

Mr. Millard F. Brown was the attorney employed by Cobb and Willis to look after Leonard's case. Mr. Brown called on the claim agent and made a demand for \$500.00 for the injury to his client. The claim agent requested him to submit this in writing so that it could be taken up with the management; he also requested a statement from the doctor in regard to his client's injuries, which statements were furnished.

The time consumed by Leonard's supposed illness was three weeks, and during this time Cobb and Willis were almost nightly visitors at Leonard's house.

The money received from the railway company was to be divided



ADAM WILLIS, ALIAS HAWKINS.

Age, 40. Height, 5 ft. Weight, 190 lb. Build, stout. Hair, black. Eyes, dark brown. Complexion, dark. Mustache, dark. Occupation, canvasser.



HENRY COBB.

Age, 44. Height, 5 ft., 11 in. Weight, 160 lb. Build, slim. Hair, dark and gray. Complexion, sallow. Mustache, gray. Occupation, taker.

closely followed by the witness. They walked to the corner of Michigan and Goodell Sts., which had been the location agreed upon, but to their surprise they found that the cars on this line were of the open type and not appropriate for the purpose. They then walked to the corner of Spruce and Sycamore Sts., the cars on the Sycamore line being closed cars.

as follows: Leonard was to get one-half and pay his doctor bill; Cobb, Willis and the attorney were to divide the other half.

This time was considered opportune for the arrest of the conspirators, the claim agent therefore swore out a warrant and in company with two detectives went to Leonard's house. It had already been arranged that Cobb and Willis were to be there. The

and were arrested and appeared before a police justice next morning. They waived examination, were held for the grand jury and committed to jail. The case was presented to the grand jury and the men were indicted.

On November 17th their trial took place at the criminal term of the Supreme Court, the state being represented by Fred Haller, first assistant district attorney. The trial lasted two days. The defense put on no witnesses. The case was given to the jury which returned a verdict of guilty as charged in the indictment, after being out about two hours. Leonard turned state's evidence and made a good witness for the prosecution.

From the time the conspirators arrived at Leonard's house for the last rehearsal, until the fake accident occurred and Leonard was placed in the patrol wagon, they were never lost sight of by the men from the claim department of the company.

The evidence produced at the trial showed that these men were not new at the business and that they had received money from different street railway companies throughout the country for similar fake accidents. After they received the money for this last accident, they were to proceed to Cleveland and in that city they were to have a double fall, that is, Leonard and Willis were to fall and Cobb was to be the witness. From Cleveland they were to go to Detroit and from city to city doing this kind of work. This was agreed upon before the rehearsal of June 21st took place.

On November 20th, Hawkins and Adams were each sentenced to one year's imprisonment at hard labor.

ELECTRIC POWER ON GERMAN CANAL.

The Tetlow Canal connects the Havel and Spree Rivers not far from Berlin. It is 23 miles long and has one lock. The annual traffic is estimated at 1,500,000 tons. Early in this year bids were invited for the installation of an electric equipment for traction purposes. Twenty bids were received. The proposed installation of Messrs. Ganz & Co. is of especial interest. It proposes to build a tow path on one bank of the canal, although both could be used if desired, with the exception of a short distance where some special arrangement would have to be made. Power is to be supplied in the form of a three-phase current at 8,000 volts and 50 periods. The company claims that, although its locomotive is very light, it will have a high tractive power due to the two wheels of each pair being inclined at an angle to each other and running on a single rail. The locomotive will maintain its balance by means of another wheel running on the roadway. The greater part of the weight, however, is thrown on the inclined wheels. The locomotive is equipped with a three-phase motor having its axle parallel to the rail. The efficiency at full loads for the motors is 90 per cent, for the gearing 94 per cent, and for the worm gearing 80 per cent, or a total of 68 per cent for the locomotive. The current is supplied to a two-wire trolley line at a pressure of 500 volts, the rail serving as a return conductor, and is taken from these wires by a double trolley arrangement. For some distance the canal passes through a lake, where electric tugs are used to tow the boats. They are driven by two three-phase motors of 67 h. p. capacity each. Current is supplied them by means of overhead lines supported by transverse wires. Six tugs and 53 locomotives would be required for the service. A locomotive can draw a boat of 600 tons or two of 175 tons each. The price quoted by Ganz & Co. for the equipment was \$248,400.

The Omaha Street Railway Co. has secured franchises and will begin at once to construct an extension to Florence, a distance of 3½ miles.

As the result of a large blue heron coming in contact with two high potential wires and short-circuiting the current, traffic was recently suspended for five hours on the Utica & Mohawk Valley Ry. A similar accident occurred on the same line about two years ago when a cat short-circuited the current.

All electric cars in East St. Louis except those from Belleville have been run over the Eads bridge since November 15th. The Belleville cars, which now run to the Relay depot, will also run over the bridge as soon as the new power house is completed. They do not now cross on account of lack of power.

KANSAS CITY NOTES.

The Metropolitan Street Railway Co. of Kansas City, Mo., has placed the cars which were bought for the old Heim Lane in service on the North East Division. These cars are of the Pullman type and are particularly handsome in appearance, being finished in mahogany, with plate glass windows, leather upholstery, etc.

The city franchises of the company will expire within a few years and the company has offered the city 8 per cent of the gross receipts and the gift of a 100-acre park for their renewal. It is said that the proposition was favorably considered by most of the city officials and citizens, but certain political aspirants urged amendments demanding so much that the company has stopped work on important improvements until there is some assurance of a satisfactory adjustment. The city officials have made trips with the officers of the company over the proposed route to the park referred to. The Swope Park is 4½ miles out of the city limits. Property owners have offered the right of way for a boulevard to the park 150 ft. in width. The proposed plan is for an elevated strip 20 ft. wide for car tracks, the other 130 ft. to contain a driveway, bicycle path and sidewalks.

It is reported that union organizers have been in the city for the purpose of forming a street railway employes' union. Their efforts were fruitless as the men have been induced to leave their positions several times and go on strike and have lost. The men are satisfied with the treatment of the company and are not willing to assume any risk by joining the union.

The company has under consideration a plan to abandon the Independence Ave. and the Ninth St. cable lines, which are parallel and close together, and build an electric line on a street between them, which it is believed will give a much more satisfactory service.

Mr. S. M. James, formerly superintendent of the 18th Street Division, and later general superintendent, has been promoted to be assistant general manager. Mr. James is yet a young man and has achieved success in the street railway field.

The company is experimenting with an electrically operated switch which, if satisfactory, will be adopted for the entire system.

A man has sued the company for \$1,000 for being put off a car by a conductor who refused to accept a smooth nickel. Another has brought suit for \$20,000 for being arrested and removed from a car by an officer for refusal to pay his fare. He was one of a number who refused to pay fare until a fire was made in the stove of the car. The others were induced by the officer to pay their fares.

The Troost Ave. Line has had the old cable track replaced by a new electric track of heavy construction. This line has also new double-truck cars and other modern equipment. The changes have been made under the direction of Mr. G. B. Tutweiler.

ELECTRIC RAILWAY EXPRESS SERVICE AT UTICA, N. Y.

On December 1st the Utica & Mohawk Valley Railway Co. established an express service between Utica, New York Mills, Yorkville, Whitesboro, New Hartford, Clinton, Oriskany, Rome and Frankfort. Two cars will be operated at the outset and others will be added as the increase of business demands. At least two trips a day will be made to each place and possibly three or four to some of them. The central office is located at the Main St. car barns in Utica. A package of any size that can be put into the cars will be received for transportation. Express wagons drawn by horses are used in Utica, Clinton, and Rome. The cars and express wagons have been painted a conspicuous yellow color. The new service is a great convenience to persons from the villages shopping in the city, as they can have packages sent to the Main St. depot and they will be promptly delivered to the address of the purchaser.

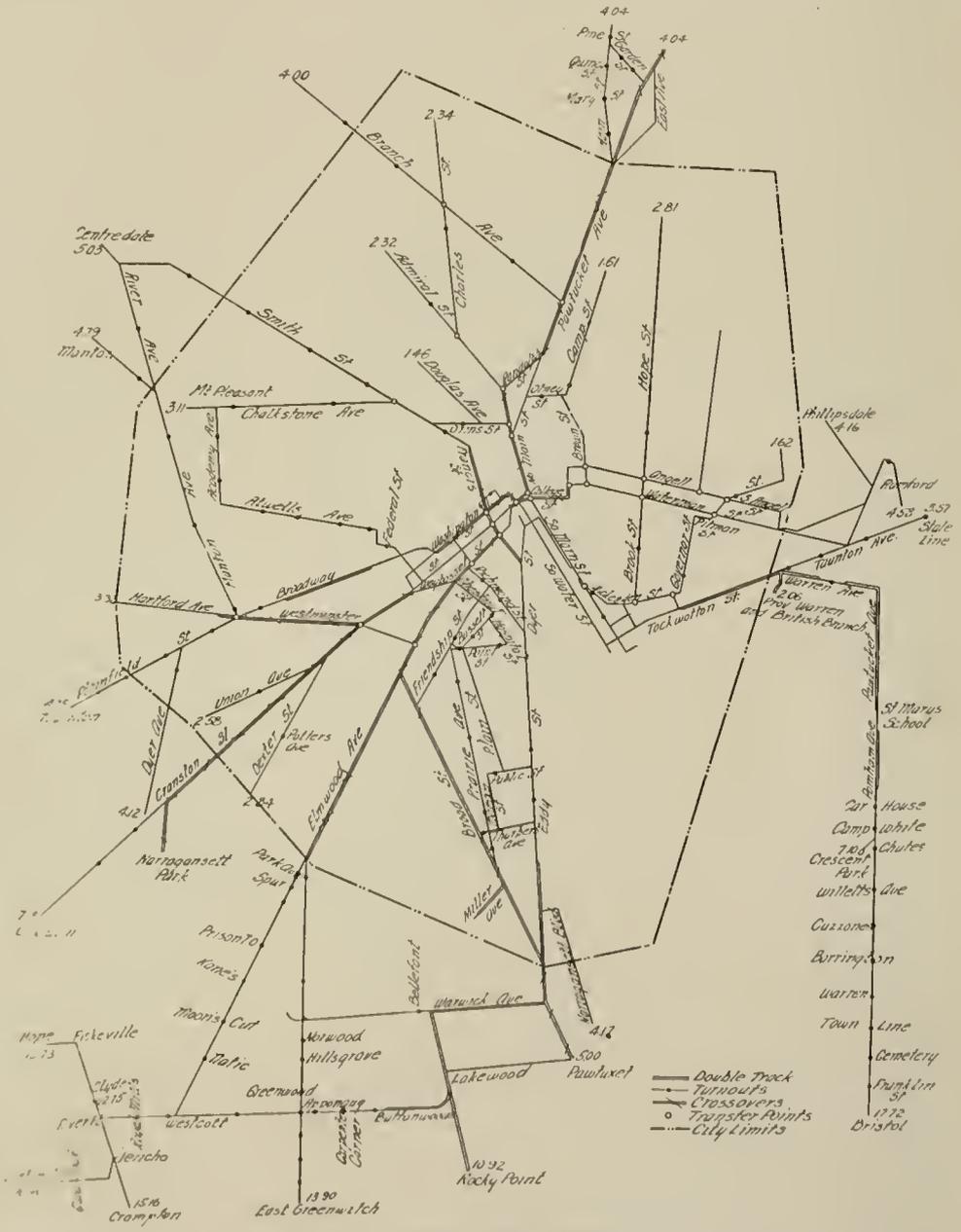
The construction of the Rockford & Freeport Electric Railway was begun in November. The contract for the entire road was awarded to the Northern Construction Co. The price is reported to have been about \$750,000. Contracts for various portions of the work will be sublet. The contract calls for the completion of the line by July 1, 1903.

TRANSFER SYSTEM AT PROVIDENCE.

At its January session, of the year 1902, the General Assembly of the State of Rhode Island passed an act providing for free transfers on street railways in the state. The act which was passed under date of March 28, 1902, forms Chapter 965 of the Public Laws, and is in part as follows:

Section 1. Every corporation operating lines of street railway in this state, accepting the provisions of this act, shall, on or before the tenth day of July, 1902, provide a system of free transfer tickets on its lines, which shall enable any passenger, paying the regular fare of 5 cents on any car operated by such corporation, to ride from the point in any city or town where he enters such cars to any other point in such city or town reached by a second car operated by the same corporation upon a track which physically intersects or connects, at a point toward which the passenger first took passage—the purpose of this provision being to make it possible for one passenger to go, by means of one transfer, from any point within the present limits of any such city or town reached by any line of cars as the same may from time to time be established by any such corporation, by a continuous trip, as near as may be, in the car in which he first takes passage, and by a second car running on any track connecting or intersecting as aforesaid, and used or operated by the same corporation, to any point within said limits reached by such second car, upon payment of a single fare of 5 cents, which fare said corporation is hereby authorized to charge: Provided, however (1), that no passenger shall be entitled to a transfer ticket unless he demands the same at the time of paying a cash fare; (2), that a transfer ticket shall not entitle a passenger to be transported upon any intersecting or connecting track, unless such passenger takes passage, at the point of intersection or connection, on the first car which passes such point after the passenger arrives thereat, and which is being operated over the connecting or intersecting track in the direction in which the passenger desires to go; (3), that such corporation shall not be required to issue any transfer ticket which will enable a passenger to return towards the point where he first took passage, by a line running parallel with or in substantially the same general direction as the one from which he is transferred; (4), that no person shall be entitled to a transfer in any case where he can reach his point of destination on the lines of said company, from the point where he first takes passage, without such transfer, upon payment of a single fare of 5 cents; (5), that transfer tickets shall not be assignable or transferable to any other person, but shall be used only by the person to whom issued; (6) that such corporation shall be required to issue only one transfer ticket for a 5-cent fare, and such ticket shall entitle a passenger to a transfer from the car in which he begins his journey to a second car, but not further; (7) that such corporation may designate upon such tickets the route or routes

upon which, and the direction in which, such tickets will be received in lieu of fare, and the point of intersection or connection at which, and the time within which, such tickets must be presented in order to be so received. And no such ticket shall be valid unless presented at the point and within the time designated upon a car of such corporation operated over the route and in the direction indicated upon such ticket, and by the passenger to whom such ticket has been issued by the company or its agent at the time of receiving from such a passenger a regular fare; and such corporation may establish and print on such tickets all such other reasonable rules and regula-



RAILWAY LINES OF PROVIDENCE, R. I.

tions as may be required to prevent fraud in the issue or use of such transfer tickets, so that the same may not be used contrary to the purpose and intent of this section.

Sec. 2. If any person other than the passenger to whom a transfer ticket has been issued shall present such ticket to the conductor of any car in lieu of payment of fare, or if any person shall present such ticket to such conductor in lieu of payment of fare at a time other than the time when or at a place other than the place where such ticket is by its terms made valid, such conductor may take up such ticket and demand from such person the payment of a regular fare; and if such payment is refused, may eject such person from such car.

Sec. 3. No transfer ticket giving or purporting to give the right

to ride on any street railway in this state, shall be valid unless presented at the point and within the time designated upon a car of such corporation operated over the route and in the direction indicated upon such ticket, and by the passenger to whom such ticket has been issued by the company or its agent at the time of receiving from such a passenger a regular fare; and such corporation may establish and print on such tickets all such other reasonable rules and regula-

A transfer from one car to another car shall be issued, sold, or given to any person except a passenger, nor at any time except when a regular fare is paid, nor by any person except the conductor or other agent of the corporation who receives such fare. Provided, that nothing herein contained shall prevent a passenger or other person who has lawfully received a transfer ticket from delivering the same to any conductor or other agent of the corporation acting in the discharge of his duties.

Sec 4. No person shall purchase or receive any transfer ticket giving or purporting to give the right of transfer from one car to another, except from a conductor to whom such person has paid a regular fare, nor shall any person, except a passenger who has received a transfer ticket upon payment of a regular fare, present or offer any such ticket to the conductor of any car for passage: Provided, however, that this section shall not apply to conductors or other agents of any such corporation who receive transfers in the regular discharge of their duties.

Sec 5. Every person violating any of the provisions of sections 3 or 4 of this act shall be fined not less than five or more than twenty dollars for each offense.

At the same session this act was amended (Chapter 1008 of the Public Laws) to provide that no transfer ticket should entitle any person to ride in the second car a greater distance from the point of intersection or connection than he would be entitled to ride upon such second car upon payment of a 5-cent fare, and providing further that "if any company shall fail to provide for the system of transfers herein required, on or before the 10th day of July, 1902, it shall be the duty of the attorney general to enforce compliance with the provisions of section 1 of this act by mandamus or by other appropriate proceedings."

In accordance with the provisions of this act, the several companies controlled by the Rhode Island Co. instituted general transfer systems in the cities in which the lines are located.

The arranging of a fair and satisfactory transfer system in the city of Providence proved to be an exceedingly difficult matter. The Providence system includes several comparatively short lines radiating from practically one common center to virtually all the points of the compass. The situation was rendered more complicated by reason of the fact that many of these lines converged near their center terminals, and there are numerous instances in which two or more lines are not more than three or four blocks apart in the residential portion of the city. It will thus be seen that anything like a universal transfer system from one line to another would permit a person living between two lines to go to town on one line, obtain a transfer, transact considerable business within the transfer time limit and return home on the other line by the payment of but a single 5-cent fare, a privilege not contemplated in the act requiring transfers.

In order to restrict circuit riding, and acting within the provisions of the transfer law, the company designated some 30 intersecting points on the system as transfer points, and a transfer ticket was adopted which by means of the conductors' punch marks, restricts the transfer privileges to a prescribed intersecting point, direction, destination, and time. The form of ticket adopted is unusually comprehensive in its scope, and at the same time is designed to reduce abuse of the transfer privileges to a minimum. But one form of

ticket is employed on all lines, thus greatly simplifying the work of distribution, issuing and checking transfers, and also reducing the cost of printing tickets. As will be seen from a sample reproduced, the ticket bears on its face, the names of all transfer junctions, and also the names of all the lines to and from which transfers are issued, and the conditions under which the ticket is good are indicated by punch marks. For instance, the sample shown is punched to read, from North Main St. to Olneyville at Market Square going west, and must be used before 50 minutes after 10 in the morning.

The distinction between a. m. and p. m., is made by punching the name of the line in either the light portion or the shaded portion, as the case may be. It will be noted that although the Main St. line and the Olneyville line may intersect at several additional points than Market Sq., this particular ticket would not be good at the other intersections. It will also be noted that the principles on which the ticket is designed, permits any desired combination to be indicated, and by punching one combination the possibility of using the ticket in any other combination is prohibited. The company uses but one color of paper, yellow, and the date is indicated in advance in the printing. This of course gives rise to some waste inasmuch as all the tickets printed for any particular day may not be used, but the cost of these waste tickets is very trifling, and is offset by the greater convenience secured. The design is open to one objection inasmuch as the conductor has to make at least four separate punches in issuing a ticket, but no other scheme could be devised without requiring a multiplicity of forms, and consequent difficulties in printing, distributing and checking. The company is now issuing on the lines in Providence about 2,200 transfer tickets on week days and about 4,200 on Sunday.

MANSFIELD & EASTERN TRACTION CO.

The Mansfield & Eastern Traction Co. of Mansfield, O., was recently incorporated with the object of building two lines of electric railway, one from Mansfield to Ashland, via Millin, and another from Mansfield to Wooster via Hayesville. The president of the company is W. J. Pentz, of Cleveland; secretary Joseph W. Galbraith, Mansfield; treasurer James J. McGuire and vice-president and general manager, Charles Meily, Mansfield. The total mileage of the road contemplated is about 40 miles of single track located as follows: From Mansfield to Ashland 16 miles; from Mansfield to Wooster 22 miles; from Millin to the company's summer resort one mile. The total mileage to be built this season is 17 miles and the company is now ready to undertake construction work and will take advantage of any open weather during the winter. It is desired to have the line from Mansfield to Ashland ready for operation by June 1st if possible, and no work will be done on the Mansfield-Wooster line until the Ashland line is in operation. Eight miles of the Mansfield and Ashland line will be used for the Mansfield and Wooster, and both lines run through a territory not traversed by steam or electric roads.

The route between Mansfield and Ashland is two miles shorter than by the Erie Railroad, and from Mansfield to Wooster is 11 miles shorter than by the Pennsylvania Railroad. The towns en route include Millin, with a population of 300, Hayesville 600, Steamtown 100 and East Mansfield 500. The population along the route is estimated at about 1,580 per mile.

The company has also purchased what is known as the Petersburg Lake Farm which is located midway between Mansfield and Ashland, and it is the intention to make a first class summer resort of this property. There are no other amusement resorts near either of these cities and it is expected this feature will induce a large patronage. The farm covers 163 acres and includes three lakes of deep spring water of 40, 7, and 6 acres respectively, all of which are connected by channels. The large lake has its outlet into the Mohican River which skirts one side of the property.

The Houston (Tex.) Electric Co. began the operation of an observation car November 17th. A fare of 25 cents is charged to view all the interesting points about the city, which are pointed out by a guide.

J. B. Dunn has brought suit against the Memphis (Tenn.) Street Railway Co. for \$10,000 on account of the alleged failure of a conductor in the employ of the company to return 20 cents change due him, and for abuse by the conductor.

THE RHODE ISLAND CO.
 TRANSFER TICKET - Good only on local car leaving transfer point in direction named after time limit shown. - Rules of the Company made thereunder.

99166
 RUDMAN Pat. Aug. 23, 1892

THURSDAY 10 1902
JULY

NORTH EAST		SOUTH WEST		FROM
Adm.-Chas.	Adm. St.	Adm. St.	St.	Adm. St.
Ang.-Brook	Brand	Brand	Av	Brand Av
Ang.-Brown	Bristol	Bristol	Dep	Bristol Dep
Ang.-Elmcr.	BROAD	BROAD	ST	BROAD ST
Ang.-Wylnd	Broadway	Broadway		Broadway
Br. A.-Chas.	BROOK	BROOK	ST	BROOK ST
Br. A.-N. M'n	Brown	Brown	St	Brown St
Br. A.-Sm. A.	Butle	Butle	Av	Butle Av
Broad-Wint.	CAME	CAME	ST	CAME ST
Brook-Water	Chalf	Chalf	Stone	Chalf Stone
Brook-Wick.	Charles	Charles	St	Charles St
Brown-Water	Cranston	Cranston	St	Cranston St
Chalk-Smith	Dexter	Dexter	St	Dexter St
Charles-Band	Douglas	Douglas	St	Douglas St
Coll.-S. Main	DYER	DYER	AV	DYER AV
Crads-Parade	EDDY	EDDY	ST	EDDY ST
Dorr.-Wash.	Elm	Elm	grove	Elm grove
Dorr.-West.	Elm	Elm	wood	Elm wood
Dorr.-Weyb.	Friend	Friend	ship	Friend ship
Cast.-Wick.	Governor	Governor	St	Governor St
Man. A-Biv. A.	Hartford	Hartford	Av	Hartford Av
Market Sq.	Mantol	Mantol	Av	Mantol Av
Math.-Wash.	M Pleasant	M Pleasant		M Pleasant
Math.-Weyb.	North	North	Main	North Main
Mill-N. Main	Ocean	Ocean	St	Ocean St
Orms-Charles	Olneyville	Olneyville		Olneyville
Olneyville Sq.	Plain	Plain	field	Plain field
Prosp-Water	Prairie	Prairie	Av	Prairie Av
S. Main-Wick	Red	Red	Bridge	Red Bridge
Turks Head	Roxer	Roxer	W. Pk	Roxer W. Pk
Union Stat.	SMITH	SMITH	ST	SMITH ST
Wman-Wayl	Tock	Tock	way	Tock way
West.-Winter	UNION	UNION	AV	UNION AV
EMERGENCY	Union	Union	St	Union St

PROVIDENCE TRANSFER.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

BOTH LESSOR AND LESSEE COMPANIES LIABLE FOR INJURIES.

West Chicago Street Railway Co. v. Horne (Ill.), 64 N. E. Rep. 331. June 19, 1902.

The law is well settled, the supreme court of Illinois says, that when an injury results from the negligence or unlawful operation of a railway, whether by the corporation to which the franchise is granted or by another corporation which the proprietary company authorizes or permits to use its tracks, both the lessor and lessee are liable to respond in damages to the party injured.

NO INJUNCTION AGAINST DISPOSAL OF MATERIAL BY CONTRACTOR FOR ROAD.

Orleans & Jefferson Railway Co., Limited, v. International Construction Co. (La.), 32 So. Rep. 218. Mar. 31, 1902. Rehearing denied May 26, 1902.

The mere fact that a contractor who has undertaken to build and equip a street railroad has assembled certain material with the intention of using it for the purposes of the contract gives the other contracting party no proprietary interest in such material, nor does it give him the right to control the disposition of it. Hence, the supreme court of Louisiana holds, an injunction will not lie at the suit of the other contracting party to prohibit the contractor from removing such material or otherwise disposing of it.

FAILURE TO APPREHEND THAT BOY WILL JUMP FROM BACK OF WAGON AND RUN UNDER CAR—DUTY IN PASSING LOADED WAGON.

Baier v. Camden & Suburban Railway Co. (N. J. Sup.), 52 Atl. Rep. 215. June 9, 1902.

A motorman is not chargeable with negligence, the supreme court of New Jersey holds, because he fails to apprehend that a boy who is riding on the back of a wagon will jump from the wagon and run under his car while he is engaged in looking at the wagon in order to pass it without a collision. The car in this case slowed up as it approached the wagon, which was loaded with about 100 sugar and flour barrels giving it the appearance, as to dimensions, like that of a wagon loaded with hay or straw. The motorman, the court says, was under no duty to stop the car. He had a right to pass the wagon, using due care to do so without striking it.

UNEXPLAINED FALL FROM STREET CAR—DOCTRINE OF RES IPSA LOQUITUR NOT APPLICABLE.

Paynter v. Bridgeton & Millville Traction Co. (N. J.), 52 Atl. Rep. 367. June 16, 1902.

A mere fall from a street car, without any evidence to show how the fall was occasioned, the court of errors and appeals of New Jersey holds, raises no presumption of negligence on the part of the operators of the car. Again, it says that a fall while alighting from a street car is not such a fact, standing alone, as to authorize the application of the doctrine of *res ipsa loquitur*, or the matter speaks for itself. The doctrine of *res ipsa loquitur* is applicable only when the thing shown speaks of the negligence of the defendant, not merely of the happening of the accident. If it had been proved that a jerk or jolt of the car had produced the fall, that fact, unexplained, might be said to prove the defendant's negligence, although the defendant might furnish an explanation of it which would relieve from responsibility.

FALL OF PERSON INTO FENDER NOT CONCLUSIVE EVIDENCE OF HIS POSITION WHEN STRUCK.

Hoyt v. Metropolitan Street Railway Co. (N. Y. Sup.), 76 N. Y. Supp. 832. June 6, 1902.

The fact that the party being was thrown into the fender, the first appellate division of the supreme court of New York says, was by no means conclusive of his position at the time when he was struck.

No accurate law of physics can be invoked to determine just how a body ought to fall or will fall when struck under such circumstances. There is the action of the car, the life and movement of the person, and very strange results may and do flow from the operation of both forces. They are not to be accounted for upon any rule which might find application to an inanimate body. The question of this party's position when he was struck, whether, as he testified, he was just leaving the track on which the car was running at the time he was struck, or whether, as the company sought to make out, he could not in any event have gotten further than the center of the track, was therefore for the jury.

\$2,000 FOR INTERNAL INJURY CAUSED TO PASSENGER HOLDING TO STRAP BY SUDDEN STOPPING OF CAR.

Chicago City Railway Co. v. Morse (Ill.), 64 N. E. Rep. 304. June 19, 1902.

The evidence in this case showed that the car upon which the latter-named party was riding was greatly crowded, and he was compelled to stand in the aisle, and hold to one of the straps suspended from the ceiling, provided for that purpose, and that on one occasion the car came to a sudden and violent stop, throwing the passengers forward who were standing, and some of them were violently thrown against him. He testified that, in order to prevent his being thrown off his feet, he held onto the strap, and at the time felt a sharp pain in his right groin, and that after getting off the car and proceeding to the place of his employment he discovered that hernia had been developed. This evidence was corroborated, and clearly tended to support the declaration. The question was therefore, the supreme court of Illinois holds, one of fact, which was properly submitted to the jury. As to the contention that the \$2,000 damages allowed were excessive, the supreme court says that likewise was a question of fact settled by the judgment of affirmance in the appellate court, which judgment the supreme court affirms.

CARE REQUIRED OF STREET RAILWAY AS COMMON CARRIER OF PASSENGERS—TO GIVE WARNING IF STOPPING PLACE IS UNSAFE.

Montgomery Street Railway v. Mason (Ala.), 32 So. Rep. 261. Apr. 9, 1902. Rehearing denied June 2, 1902.

It cannot be doubted, the supreme court of Alabama says, that street railway companies, as common carriers of passengers for hire, are under the duty of exercising the highest degree of diligence and care in conserving the safety of their passengers, and are responsible for the slightest neglect. This duty arises when the relation of carrier and passenger begins, and continues until that relation is ended. The same duty of exercising the highest degree of diligence and care in the carriage or transportation of passengers in law and reason extends to and includes the safe landing of the passenger at the termination of his journey or ride, and this duty is not performed when the carrier lands its passenger at a time and place of such unknown environment to him that, in his first effort to depart after alighting onto the ground, he is tripped and thrown by an unseen pile of lumber and debris. And the court holds that if a car stops where it is unsafe for passengers to alight, it is the duty of the company to give warning.

INJURY TO ONE PASSENGER BY ANOTHER BEING THROWN UPON HER IN CAR ROUNDING CURVE.

Merrill v. Metropolitan Street Railway Co. (N. Y. Sup.), 77 N. Y. Supp. 122. June 13, 1902.

In this case, where a passenger on a cable car was injured by another passenger falling on her, which fall was caused by a jerk in the car rounding a curve, the first appellate division of the supreme court of New York says that the rule would seem to be applicable that the company was only liable for the failure of the gripman to use that skill and care which would be required by an ordinary

car to and prudent man. There was nothing here to suggest that the second passenger, in entering the car when he did, would cause an injury to the other passengers. In the absence of excessive speed or the application of more power than was necessary to round this curve, there would certainly be no evidence to justify the jury in finding that the company was negligent, and, the jury having found that the speed of the car was not excessive, the company was entitled to a verdict. The fact that the person who was thrown upon the other had been talking to the conductor while the car was going through the street from which it turned at the curve would also seem to be immaterial, as this conversation with the conductor had no relation to the accident.

LIABILITY FOR NEW PAVING

Borough of West Chester v. West Chester Street Railway Co. (Pa.), 52 Atl. Rep. 252. June 4, 1902.

An accepted ordinance provided that the company should at all times keep the space between its tracks and eighteen inches outside thereof in good repair and to conform to the macadamizing or paving in the borough, and that whenever the borough should thereafter pave or macadamize any street or streets along the line of the railway, with asphalt blocks, asphalt sheeting or broken stone, the company should at the same time pave and macadamize the street occupied by the railway, that is to say, between the tracks and eighteen inches outside thereof, on each side of the railway, with the same kind of block or material with which the borough paved and macadamized the street or streets. A relief resolution provided that by way of encouraging the construction of an efficient street railway in the borough the company be relieved from the obligation of keeping in repair the street, streets or parts of streets, occupied by its tracks, until such time as it should either earn or pay a dividend to its stockholders on its capital stock. The supreme court of Pennsylvania holds that, under this contract, the company was liable for paving between the rails of its road, and eighteen inches outside each rail where a macadam pavement which was down was removed from the streets in the business portion of the borough and one of asphalt laid in its place.

LIABILITY FOR PAVING PROPORTIONATE TO SPACE OCCUPIED BY ROADBED—ROADBED DEFINED—INJURY TO PAVEMENT IN STRENGTHENING TRACK.

City of Shreveport v. Shreveport Belt Railway Co. (La.), 32 So. Rep. 189. May 12, 1902.

Under a statute making a street railway company liable for that proportion of the cost of paving a street in which it has its track equivalent to the space occupied by its roadbed, the supreme court of Louisiana, which has held that when cross-ties were used that extended to a width of seven feet, the roadbed must be taken as measuring seven feet, now holds that when girders or sleepers are used, the narrower roadbed, which consists of the foundation on which the superstructure rests, is alone to be taken as the width in fixing the company's proportion of costs. The rails are the superstructure. The roadbed does not include part of the adjacent roadway on which rails do not rest. The proportion of the space being limited to the roadbed, the court is without authority to take the outside of the track into account on the ground that the road is benefited by the adjacent pavement. With regard to the statement in the argument for the city that there was already trouble about the superstructure of the track and that in order to build and strengthen the concrete cubes it would disturb and weaken at least a foot of the street on the outside of each bed, the court says that it inferred that the necessity of these changes or repairs was very remote; besides, if it should arise, in its view it would devolve upon the railway company to make the repairs at its costs.

NOT ASSESSABLE FOR PAVING AS OWNER OF LOT OR PARCEL OF LAND.

North Jersey Street Railway Co. v. Mayor, Etc., of Jersey City (N. J. Sup.), 52 Atl. Rep. 300. June 9, 1902.

Where a city street had been paved and improved under a statute authorizing the board or body having control of the streets and highways of any city of the first class of the state to pave or other-

wise improve any street, avenue, or public highway in such city, and to cause so much thereof as should equal the amount of benefits to be assessed by its proper officers upon the property specially benefited thereby, the supreme court of New Jersey holds that an assessment of such benefits made upon a street railway constructed and operated along the street in question under the authority of a municipal ordinance was unauthorized, and should be set aside. It bases the decision upon the ground that the right of the railway company to locate its tracks in the street and operate its railway therein was not a lot or parcel of land, within the meaning of the statute, which, among other things, directed the commissioners, in making their assessment, to make therewith a report and map showing the benefit to each lot or parcel of land specially benefited by the improvement. An ordinance of the city requiring the railway company to pave the space within its tracks and two feet outside the same, the court further holds, gave no authority in support of such an assessment made against the company under the above statute.

STARTING CAR BEFORE INFIRM OR OTHER PASSENGER IS SEATED.

Herbich v. North Jersey Street Railway Co. (N. J.), 52 Atl. Rep. 357. June 16, 1902.

In the case of a plaintiff two years and nine months old, who was thrown down by the starting of a street car, which she had boarded, before she had time to be seated, and while she was for the moment out of the reach of her attendant, who was also boarding the car, the court of errors and appeals of New Jersey holds that it was not error to refuse to charge the jury "that the starting of a car before a passenger is seated is not negligence." It says that, as applied to the circumstances for which the plaintiff contended, the proposition was untrue, or at least it was for the jury, not the judge, to say whether it was true. While usually the proposition may be accepted as true, yet the passenger may be so infirm, by reason of infancy or old age or sickness or lameness, or other cause, that even the ordinary movement of a street car in starting before he is seated would be likely to throw him down. In such cases, if the carrier is chargeable with notice of the infirmity, it cannot be the duty of the court to instruct the jury that the starting of the car is not a breach of the carrier's obligation to exercise a high degree of care for the safety of the passenger. In the present case the infirmity of the plaintiff was evident, and must have been observed by the conductor, who, according to his own testimony, had the mother and child in view from the time when they began to board the car until the accident happened.

WHEN INTERURBAN RAILROAD AN ADDITIONAL BURDEN ON PUBLIC HIGHWAY AND ELECTRIC PLANT ANOTHER ADDITIONAL BURDEN—RIGHT OF ABUTTERS TO INJUNCTION.

Schaaf v. Cleveland, Medina & Southern Railway Co. (Ohio), 64 N. E. Rep. 145. Apr. 22, 1902.

The construction and operation of an interurban railroad laid with T-rails, entirely on the side of a public highway next to the abutting improved farms owned and occupied by the plaintiffs, and entirely between their lands and the traveled part of the highway,—the company having authority to run an unlimited number of cars and trains for the carrying of passengers, and the transportation of freight, express matter, and government mail.—the supreme court of Ohio holds, is an additional burden on the public highway, and obstruction to and interference with the plaintiffs' easements and rights therein, not substantially different from those that are imposed by the construction and operation of steam railroads under like conditions.

The construction and operation of an electric plant in connection with such railway, and on the same side of the traveled public roadway, for supplying heat, power, and light to consumers for profit, constitutes another additional burden, which is an invasion of the plaintiffs' property rights.

The plaintiffs are entitled to injunction, in such case, to prevent the construction and operation of such railroad and of such electric plant, or either, until compensation and damages shall be assessed them in a proper appropriation proceeding, and paid, or secured to be paid.

WHEN DUTY AS COMMON CARRIER ENDS—RISKS ASSUMED BY PERSON WALKING BACK ON RAILROAD AFTER ALIGHTING FROM CAR.

Indiana Railway Co. v. Feirick (Ind.), 64 N. E. Rep. 221. May 27, 1902.

According to the complaint in this case, a passenger on an inter-urban line was put off at the wrong road crossing, on a cold, dark and stormy night. He did not know where he was, except that he was east of the point where he wanted to stop, and did not know of any other route to that point. But all of his averments concerning his taking passage on the car, his place of destination, his want of knowledge of the route, the circumstances of his leaving the car, the supreme court of Indiana says, were merely recitals, as matter of inducement, to show that he was rightfully on the railroad, when, while proceeding with all due care and prudence, he struck his foot against a stake that the company's agents or employes had carelessly and negligently left sticking above the ground four or five inches, and was thrown to the ground, and greatly injured. Under the complaint, as it stood, the court must assume that his discharge from the car was satisfactory to him or justifiable. If satisfactory or justifiable, then the company's duty to him as a common carrier was performed when he left the car safely. And as he stood upon the crossing, after the departure of the car, in the absence of any showing to the contrary, his relation to the company was the same as that of a stranger. This being so, when he took up his journey on the company's private railroad without invitation he did so with no greater rights than an ordinary licensee, taking upon himself all the perils that were incident thereto.

NO IMPLIED CONDITION OF ROAD BEING AUTHORIZED OUTSIDE OF TOWN—VOLUNTARY DEPOSIT OF MONEY CONTRARY TO PUBLIC POLICY NOT RECOVERABLE.

West Springfield & Agawan Street Railway Co. v. Bodurtha (Mass.), 64 N. E. Rep. 414. June 18, 1902.

Where a street railway company deposited \$2,000 with the selectmen of a town, to be turned over to the town treasurer if 10 miles of road was not in operation within a year, and under the location more than 10 miles of railway could have been built in that town alone, the supreme judicial court of Massachusetts holds that there was no ground for implying a condition that the company should be authorized to build outside of that town. Furthermore, it says that it was plain from the facts found by the master that the obligation to pay over the \$2,000 was not one imposed by the selectmen at their own instance, and that such a payment was first suggested and offered by the company itself, in asking for a location, and that the condition, as incorporated in the grant of location, was one drafted by its own attorney, and was more than once accepted by the company. Under such circumstances, the payment was not involuntary or constrained. The company was in this position: If the condition was a proper one, there was no reason why the company should have the money back. If it was against public policy, the company could no more have the help of the courts to recover the money than to recover a bribe. It did not act under any necessity, but of its own voluntary choice; and, in declining to aid in the recovery of money voluntarily paid against public policy, the courts leave the plaintiff where it has seen fit to place itself.

CARE REQUIRED TO PREVENT INJURY TO EMPLOYEES IN RECONSTRUCTION OF ELECTRIC ROAD—SHOCK TO LABORER AIDING IN CARRYING RAIL COMING INTO CONTACT WITH IRON POLE.

Thompson v. New Orleans & Carrollton Railroad Co. (La.), 32 So. Rep. 177. Apr. 14, 1902. Rehearing denied May 27, 1902.

There being great danger of accident in carrying on the work of reconstruction of the overhead lines and the railway track of an electric railway system, as in handling heavy rails, from the falling of pole, danger of wire coming in contact with grounded poles and forming circuits, and other risks attending the reconstruction of an electric railway, the supreme court of Louisiana holds that it imposes a high degree of responsibility on the company, in order,

by every reasonable means, to prevent injury to its employes. Here a laborer, engaged with others in carrying a heavy rail, which came into contact with an iron trolley pole, received an electric shock which killed him. The court, which affirms a judgment for damages, says that it was led to believe from the facts that there was a live wire uninsulated, or defectively insulated, resting on the pole in question, and that companies are liable for accidents due to defective insulation, or to failure to take proper precautions to prevent conductors of electricity from coming into contact with their trolley wires. It further considers it specially requisite to warn the employes of the danger when it is as great as it was in this case. That those in charge expressed some apprehension lest accident, in view of the danger, would occur, could not have the effect of releasing the company from all responsibility. In this case, although the plan of general operations may have been good enough, and the officers mindful of their trust, it did not relieve the company from indebtedness for injury due to some oversight or negligence resulting in a fatal accident to one of a gang of 20 laborers. Whatever special patrol or warning party there may have been, it was not shown that it sought to warn him of the danger by which he was surrounded. The risk was not one assumed by the employes.

INJURY TO CONDUCTOR FROM OVEREXERTION ON TURNABLE OUT OF REPAIR.

Roberts v. Indianapolis Street Railway Co. (Ind.), 64 N. E. Rep. 217. May 27, 1902.

It was the duty of the conductor and motorman in charge of each car to run it onto a turntable and turn it around at the end of the line. The turntable became out of repair, and a conductor in trying with the motorman to turn it strained and severely injured himself internally. But conceding that the company, under the alleged facts, was guilty of negligence in failing to keep the turntable in proper repair, the supreme court of Indiana holds that nevertheless the complaint, under its averments, clearly established that the conductor, in exerting or straining himself in turning the table, was also guilty of negligence which contributed as a proximate cause to the injuries which he sustained; hence the case was ruled by the maxim of "Dammum absque injuria," a loss without a wrong, and he could not recover in this action. It says that the conductor was under no obligation to the company to overexert or strain himself in his effort to turn the table, and certainly, under the circumstances, the company could not anticipate or foresee that by reason of its failure to repair the table there was any necessity to protect him against his own voluntary action in subjecting himself to the overexertion or strain which resulted in the injury of which he complained. He was shown to have known of the condition of the table, and, from his previous experience in the operation thereof, he certainly was aware of the extra effort or force that was required to operate the table. He was presumed to have known his own strength, and in fact he himself was the only one who, under the circumstances, could measure the extent to which he could safely exert himself in his effort to turn the table. The company neither exacted nor had the right to exact of him any overexertion of his strength in turning the table; hence he assumed whatever risk there was due to such overexertion or strain to which he voluntarily subjected himself. If the complaint could be said to show actionable negligence on the part of the company, it also, under the facts, established a defense in its favor, and therefore, under a well-settled rule of pleading, was bad on demurrer.

AGAINST INJUNCTION PENDING LITIGATION OVER LEASE OF ROAD.

Content et al. v. Metropolitan Street Railway Co. et al. (N. Y. Sup.), 76 N. Y. Supp. 749. June 6, 1902.

The plaintiffs, as stockholders of the Metropolitan Street Railway, brought this action to perpetually enjoin and restrain the defendants from delivering or carrying into effect a proposed lease between the Metropolitan Street Railway Company and the Inter-urban Street Railway Company. An injunction was granted pending the return of an order to show cause why the same should not be continued during the pendency of the action. But upon the return of the order the injunction was vacated, and the first appellate division of the supreme court of New York holds that the

tacts justified the refusal to continue the injunction. It says that the lease was executed by the board of directors of the respective companies, and was approved by unanimous vote of the stockholders of the Interurban Street Railway Company, and by over 80 per cent of the stockholders of the Metropolitan Street Railway Company, and whether the board of directors of the latter company had the power to make such lease, as approved by such a large majority of its stockholders, ought not to be determined upon *ex parte* affidavits, or affidavits from or upon one side, but rather should be left to a trial where all of the questions bearing thereon could be thoroughly considered and passed upon, when all of the evidence in relation thereto was presented. Moreover, as it was stated upon the oral argument, and the statement was not denied, that the lease had, in fact, been delivered and that possession of the property leased had been taken, the court says that if the order should be reversed, it would not result in any possible advantage to the plaintiffs, but might be of great injury to the defendants, and that therefore it was of the opinion that the parties should remain in the condition they were until the trial and determination of the merits of the controversy, and if, upon a trial, it should ultimately be determined that the defendants had no authority to enter upon the lease, then the same would be set aside, and the property restored to the lessor, and the plaintiffs' rights thereby would be fully protected.

DUTY OF MOTORMAN WHEN ANIMALS ON HIGHWAY BECOME UNEASY—TAKING CERTAIN HORSES ON STREET-CAR STREET.

Doran v. Cedar Rapids & Marion City Railway Co. (Ia.), 90 N. W. Rep. 815. June 3, 1902.

The injury complained of by the party suing was received while he was riding on horseback, leading a stallion. An instruction was asked stating as a matter of law that it was not the duty of the motorman to stop the car or check its speed unless he saw the horses showing signs of uneasiness or fright, but that it was only his duty to stop the car as quickly as he could, in the exercise of ordinary care, as soon as he saw the party's peril. This, however, the supreme court of Iowa thinks was not a correct proposition of law. It says that much must depend on the rate of speed at which the car is going, the extent to which the person in charge of the animals appears to have lost control thereof, and the imminence of the danger that they will get upon the track, in the way of the car, so as to imperil their own safety and that of the person in control of them. In other words, the supreme court does not understand it to be the rule that the motorman of a street car may run his car at a high rate of speed, even though such speed would not in itself be unlawful, notwithstanding he sees that a person on the street is liable to be dragged or taken upon the track, and is under no obligation to check his car or prepare to avoid a collision until it becomes certain that a collision will take place unless the car is stopped. According to the instruction asked, there is no duty on the part of the motorman to do anything until the animals in such a case actually obstruct the passage of the car. But the rule requiring the motorman of an electric car to do what he reasonably can to avoid a danger which is reasonably apparent seems to the court too elementary to require elaborate citation of authorities. It would certainly not be necessary in all cases that the car be stopped as soon as it becomes evident that animals on the highway have become uneasy and even frightened, but it certainly is his duty to take reasonable steps by way of reducing the speed of his car to avoid an injury which he may anticipate as likely to result from the frightened condition of animals on the street. Persons who are using the public streets on which a car line is operated have a right to the use of the whole of such street, and are not negligent *per se*, or in and of itself, in being on or near to the street car track, and it plainly is the duty of the motorman to be on the lookout for the purpose of avoiding collision with and injury to persons using the street.

Again, the supreme court says that it does not think that it constitutes negligence *per se* to take horses along a street on which a street car line is operated, without knowledge as to what will be the probable conduct of the horses on the approach of a car. It certainly cannot be true as a matter of law that one taking animals upon a street upon which an electric car will pass should have first

tested or made inquiry as to the probable conduct of the animals on the approach of such a car. These are considerations for the jury. There is no reasonable controversy as to the duty of one going upon a street to avoid a known danger, and the court correctly said that, if the party suing knew that it would be dangerous to take the horses along this street, then, if he could without serious inconvenience have taken another street, it was his duty to do so. But that, the supreme court thinks, is as far as the rule goes. It was not for the court to say as matter of law, in the absence of proof of knowledge on the part of the party suing that the horses would probably be frightened by an electric car, that it was his duty to know whether they were likely to be frightened, and to take another street if he did not have that knowledge.

DERAILMENT AT POINT WHERE TRACKS RUN FROM MAIN LINE INTO CAR STABLES—DUTY TO SEE THAT CARS ARE PROPERLY MANAGED AND THAT TRACKS ARE REASONABLY SAFE.

Hollahan v. Metropolitan Street Railway Co. (N. Y. Sup.), 76 N. Y. Supp. 751. June 6, 1902.

Where a passenger on a horse car was thrown from the front platform and it was established by the evidence that the car jumped the track and left the rails at a time when it was going at a "pretty good rate" at a place opposite the car stables, and at a point where there were tracks leading out from the main track into the doors of the stable, the first appellate division of the supreme court of New York holds that, although it might be said that the evidence was not strong and highly satisfactory in support of the inference of negligence which it was within the province of the jury to draw from the facts set forth, still it was sufficient. It says that it is true that the railroad has not a monopoly of that part of the street upon which the rails are laid, nor the right to exclude others from the use thereof, yet it has the paramount right and the exclusive management of its own cars, and control for the purpose of laying and keeping in repair its own rails, and the corresponding duty rests upon it of seeing that the cars are properly managed and that the tracks are at all times reasonably safe. This duty involves the obligation, further, of operating the cars with reasonable care so as to avoid at dangerous points, such as at curves or interseptions with other tracks, accidents which are likely to happen from the negligent operation of the cars. The tracks are constructed for the purpose of having the cars remain upon them, and experience proves that they are well adapted for that purpose; and it would not only be unusual and extraordinary, but highly improbable, that a derailment would occur without some intervening cause. It could not be assumed, therefore, with respect to this accident, that in the ordinary operation of the car over the tracks it would leave them without the car having met with some obstacle on the track, or being dragged or thrown therefrom by some superior force. The proof eliminated the latter, and there was no suggestion in the record that there was any stone or any obstruction which impeded the car's progress, other than the switch rails, which, at the point of the accident, as before stated, ran from the main track into the car stables. The care of these switches was as much under the company's control as any portion of the tracks; and if the further fact had been established that the accident was actually caused by the switch being open so as to change the direction of the car from the main to the branch track, there would be no room for discussion but that with this additional evidence it would be clearly a question for the jury to determine as to whether or not the accident was due to the negligence of the company in not properly looking after the switch track so as to prevent such accident. With that fact out, however, and with no evidence to show that the accident was caused in any other way than by contact with the switches which there existed, was not the company's negligence properly a question for the determination of the jury? Though close, the court is inclined to think it was, and for the reason that, regard being had to the circumstances and the character of the occurrence, the inference that the accident was due to the switch track, as the intervening cause, was both a direct and natural one.

Alderman Foreman, of Chicago, advocates a law providing for a commission to control and regulate the suburban electric lines outside of city limits in the same way that the interstate commerce commission regulates steam railroads.

Engineering Features of the Western Ohio Railway.

BY D. W. PELL, SUPERINTENDENT OF CONSTRUCTION.

The Western Ohio Railway Co., of Lima, O., was incorporated in October, 1900, with a capital stock of \$1,000,000 for the purpose of building an electric line from Lima to Wapakoneta, and eventually to form a link connecting the cities of Toledo, Lima, Springfield, Dayton and Cincinnati. Early in 1901 the company secured rights to construct additional lines from Wapakoneta to Shelby, from St. Marys to Celina and from the latter city to a point on the west line of Mercer County. Its capital was later increased from \$1,000,000 to \$3,000,000. Mr. A. E. Akins is president of the company, L. J. Wolf, first vice-president, J. R. Nutt, second vice-president; H. C. Lang, secretary; M. J. Mandelbaum, treasurer; C. N. Wilcoxon, superintendent; C. S. Thrasher, auditor; F. D. Carpenter, general manager and D. W. Pell chief electrician.

The company operates at the present time 47 miles of road and has under construction 64.5 miles more. The portion of the line now in operation begins at Lima, in Allen County, Ohio, runs south from Lima to Cridersville and Wapakoneta; thence west to St. Marys; south from St. Marys to New Bremen and Minster, and finally west from St. Marys to Celina.

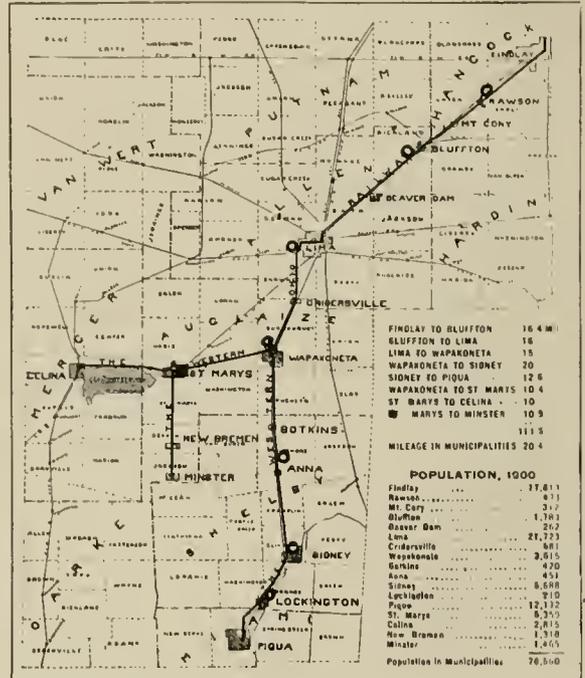
POWER HOUSE.

The main power house is located at St. Marys and is indicated on the accompanying map by a rectangle. It is of brick and concrete, no-building stone whatever being used in its construction. The building is 104 ft. wide, and 248 ft. long; the boiler room is 45 ft. wide and the engine room 52 ft. wide. The floor level of the boiler room is 12 ft. lower than that of the engine room and under the latter there is a 12-ft. basement. This basement is to be used, when the plant is completed, as a stationary transformer room. The engine room floor consists of steel I-beams with brick arches filled in between with concrete. The roof over the entire building consists of flat steel trusses carrying 3-in. tile, with a four-ply asphalt and gravel covering. The engine room is supplied with a 25-ton Chisholm & Moore hand-power traveling crane.

The maximum capacity of this station, according to the present plans, will be 4,000 kw. At present, however, only two 400-kw. machines are installed and foundations have been completed for two

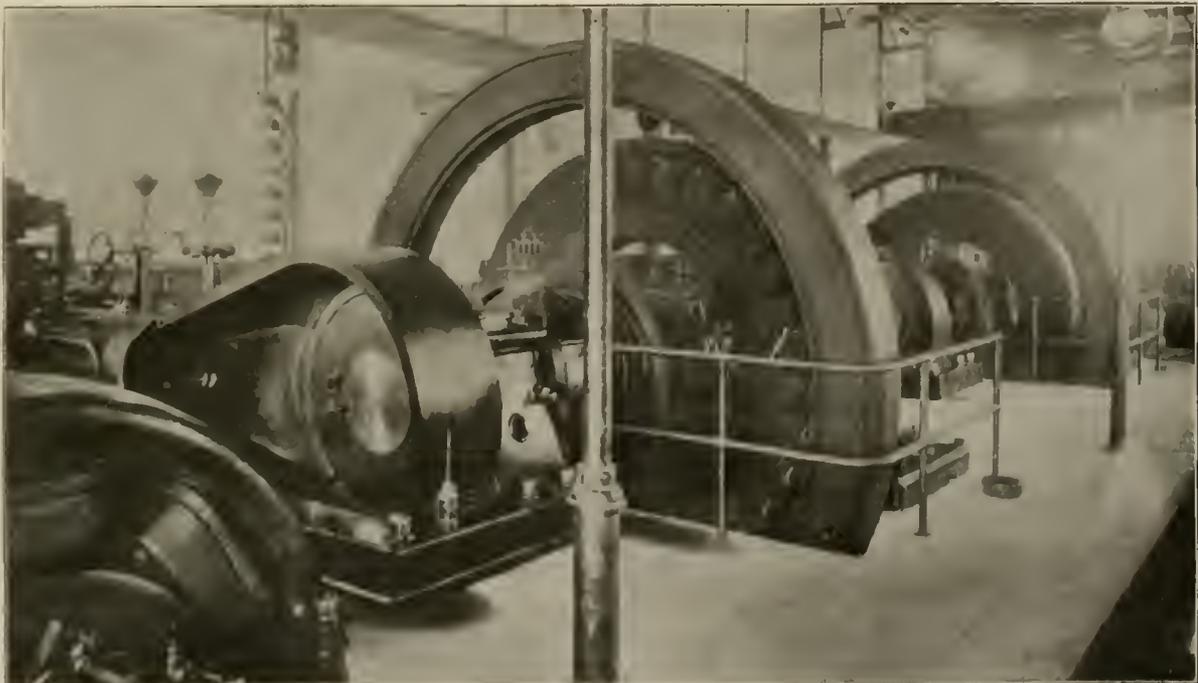
signed for parallel operation on alternating current three-phase work, with a guaranteed regulation within one per cent.

The boiler equipment consists of eight Stirling boilers, of a total capacity of 6,000 h. p. These boilers are equipped with flat grates



WESTERN OHIO RAILWAY.

and are each supplied with independent guyed, steel stacks, each stack being 48 in. in diameter and 80 ft. high. The boilers are all hand fired, coal being supplied directly in front of the fire doors by



ENGINE-TYPE ALTERNATORS IN THE POWER HOUSE.

750 kw generator, which will soon be erected and placed in operation. The engines are of the C. & G. Cooper, horizontal, cross compound, condensing type with corliss valve gear and were de-

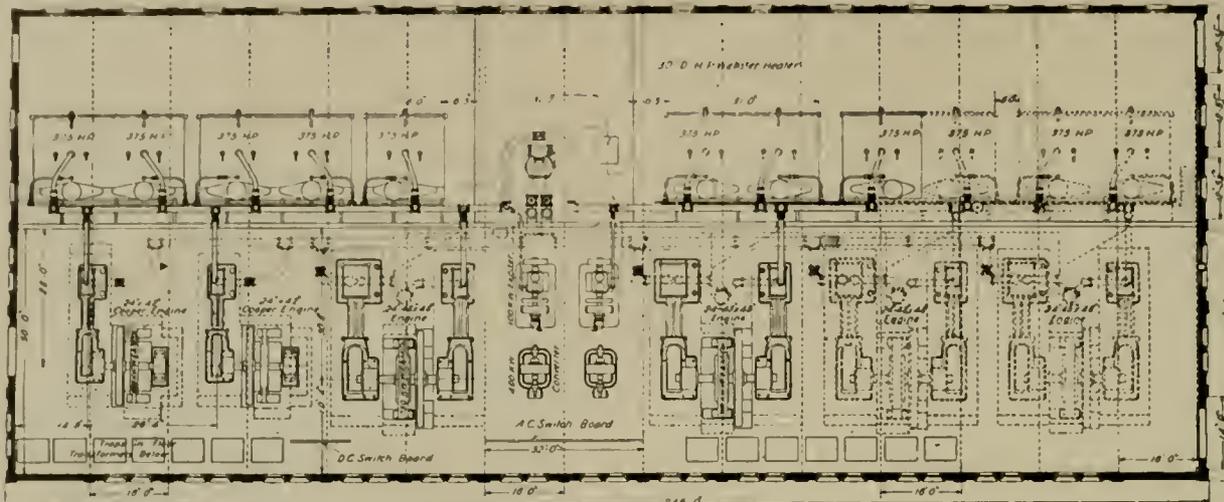
signed for parallel operation on alternating current three-phase work, with a guaranteed regulation within one per cent. The coal is shoveled directly from small cars into the boiler furnaces. The grate bars are all of the well known herringbone type, with 1/2-in. opening. The fuel

burned is West Virginia semi-bituminous "run-of-mine" which has been found to be the most economical for this particular plant.

The pump and condenser room in this plant is located in the center of the main boiler room and contains all of the feed pumps, feed water heaters, circulating pumps, vacuum pumps and condensers for the entire plant. The water supply is taken from the feeder of the St. Marys reservoir and is brought about 3,800 ft. through a 24-in. pipe. The 30 in. Worthington elevated injector condenser includes

GENERATORS.

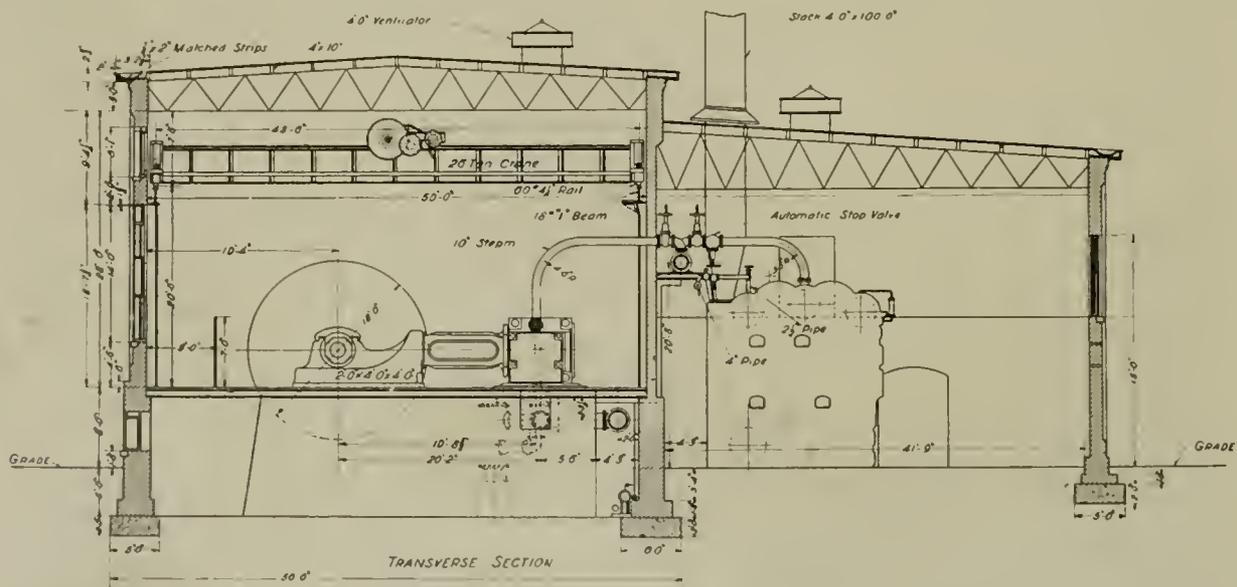
The electrical apparatus is furnished by the Westinghouse Electric & Manufacturing Co. The main generating units are direct connected to their several engines and each of the two units now in operation is of 400 kw capacity. The machines are of the revolving armature type, and since they run at 100 r. p. m. and have 30 poles, they deliver current at 3,000 alternations. The armatures have three-phase windings for a normal out-put of 400-kw., and are



PLAN OF POWER HOUSE.

an 8 x 16 x 12-in. rotative dry vacuum pump and two Worthington circulating pumps, either of which will be of sufficient capacity to operate the entire plant. The main steam header is of 16-in. heavy lap-welded steel pipe made up in sections, with pressed steel flanges shrunk on and then turned and faced. The feed and blow-off pipes, including fittings, are all of extra heavy Crane pattern, as are all the valves. Valves over 8 in. in diameter are by-passed. All valves and fittings over 3 in. in diameter are flanged, the flanges being tongued and grooved. The main steam header is carried on a specially designed, cast-iron roller frame, one end resting on the rear of the upper walls of the boiler setting, and the other being built

guaranteed to deliver 577 amperes each per terminal at 400 volts, with a non-inductive load. These generators are separately excited and require for excitation when the armature is delivering its full rated current, 90 amperes at 100 volts. The 750-kw. generators are designed for a speed of 94 r. p. m. being 32-pole machines of the revolving field type. The normal output of these machines at 750 kw. will be 1,083 amperes per terminal at 400 volts three-phase with a non-inductive load, and at this load they will require 150 amperes at 100 volts for excitation. Throughout the armature spider, core and winding, large ventilating ducts have been provided which permit a free circulation of air during operation. For exciting the



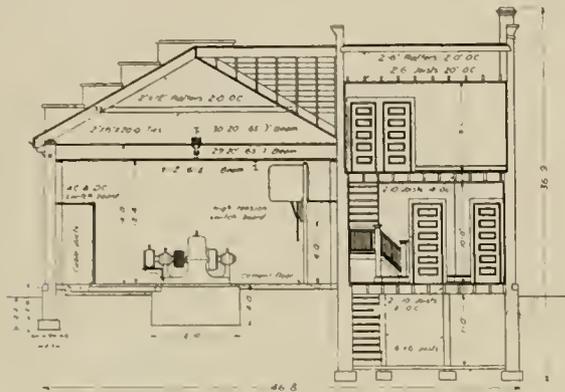
TRANSVERSE SECTION THROUGH POWER HOUSE.

into the brick-work of the division wall between the boiler and engine rooms. The feed piping is suspended from the roof trusses by long eye-bars having turn buckles in them to allow for adjustment and variations of height. All feed valves are arranged to be controlled from the boiler floor line, as are, also, all drips, gage-cocks, water gages, water columns, blow-off pipes and drains around the boilers.

main generators there will be two units, both steam driven and of the Westinghouse type, the generators of 100-kw. capacity and operating at 125 volts and 200 r. p. m., being direct connected to two 13 and 22 x 13-in. Westinghouse compound engines.

The main power house contains, also, a sub-station, that is, a portion of the low potential current from the main generators is carried to two 400-kw. rotary converters supplying approximately 25

miles of the feeder system of the line. The rotary converters in the other sub-stations are all of the Westinghouse type and of 200-kw. capacity. The armature winding of the rotary converters is similar to that of ordinary direct current generators, but it is tapped at certain points from which leads are carried to collector rings at one end of the shaft, while the ordinary direct current commutator is at the other end. The ratio of conversion, alternating to direct current is about 0.62. These rotary converters operate at a speed of 500 r. p. m., and deliver 333 amperes at 600 volts. For starting a small induction motor is permanently mounted on the same shaft with the armature.



SECTION OF SUB-STATION.

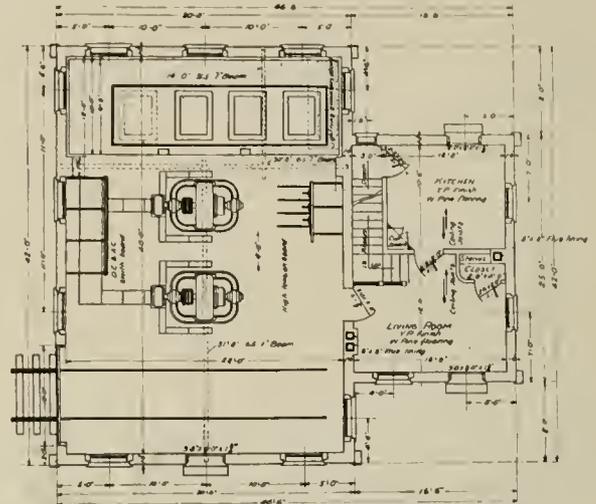
SWITCHBOARDS.

The engine room at the power house will contain two switchboards, a main generating board containing 11 panels and an alternating current board of nine panels, upon which will be mounted the high tension switches for all outgoing transmission lines. These switchboards are all of blue Vermont marble and are equipped with the bus-bars and cables necessary for the proper handling of the apparatus in the station. All instruments on the boards are of the Westinghouse, long scale, dead-heat type.

The step-up stationary transformers, which are located in the basement, are of the Westinghouse oil-cooled type. There will be seven of 400 kw. capacity, transforming the current from 390 to 33,000 volts. From the transformers lead-covered single-conductor

drawing. They will be of brick, with 13-in. walls above the foundation line, the coping being covered with cement. The floors in all sub-stations are to be of concrete, as are also the transformer pits.

In addition to the sub-stations mentioned, there will be a portable sub-station mounted on a car. This car will be 27 ft. long, 8 ft. 10 in. wide and 10 ft. 6 in. high from the top of the rail. The equipment includes one 200-kw. rotary converter; three 150-kw. step-down transformers; three "low-equivalent" lightning arresters;



FLOOR PLAN OF SUB-STATION.

three-fuse switch circuit-breakers with barriers, and one three-panel switchboard, including an a. c. rotary converter panel, d. c. rotary converter panel and d. c. feeder panel.

TRANSMISSION LINE

The high tension line from Wapakoneta to St. Marys is carried on 45-ft. poles, the top of the poles being arranged for three sets of 33,000-volt lines. At Wapakoneta one set turns off south and supplies the sub-stations at Anna, Sidney and Lockington. The other two sets continue north as far as Lima, one set supplying Wapakoneta and Lima and the second set supplying Beaver Dam and Rawson. The transmission cables themselves are all carried



OVERHEAD CROSSING CHICAGO & ERIE RAILWAY.

able will be led up the south wall of the building to the high-potential circuit breaker, of which there will be nine of the Westinghouse type mounted on a wooden framework.

SUB STATIONS.

The sub-stations along the route will be seven in number and will be located as follows: Rawson, Beaver Dam, Lima, Wapakoneta, Anna, Sidney and Lockington. The locations of the various sub-stations are indicated on the map by circles. The sub-station buildings will be of the general construction shown by the accompanying

on steel pins with wooden tops and Locke No. 307 porcelain insulators. The cross arms are of long-leaf yellow pine, fastened to the pole with two 1/2 x 12-in. carriage bolts. All the high-tension lines are completely spiralled every mile, each set being spiralled on a direction opposite to the adjoining one, thus keeping the same phase feeders on the two pins next to the pole on each side.

CARS.

The first eight cars on this road were built by the G. C. Kuhlman Co., of Cleveland, and comprise five passenger coaches and three

combination passenger and express coaches. The cars are 42 ft. 6 in. over all and 8 ft. 8 1/2 in. wide. The car bodies are mounted on Peckham No. 14AX trucks with spoke wheels 33 in. in diameter, 24 in. tread, with 1 1/8 in. flange. The electrical equipment consists of four Westinghouse No. 50 railway motors with K-14 controllers. All cars are geared for a maximum speed of 48 miles per hour with a gear ratio 30 to 52. All axles are 5 in. in diameter and the motors are mounted with nose suspension. Christensen straight air brakes are used and each car is supplied with an independent motor-

ballast is carried out 6 in. beyond the ends of the ties and carefully shouldered and sloped to provide ample drainage for the roadbed proper. The entire line is built upon private right of way. The maximum grades on the line now operating will not exceed 2 per cent, except at points where the line crosses over the main lines of steam roads. The rest of the line, which is now being constructed, will be laid with 70 lb. T-rails in 30-ft. lengths. The bonds are to be the American Steel & Wire Co's. solid terminal type, which are to be placed by a hydraulic compressor. The grades on extensions, as well as curves, are to be carefully looked after and eliminated wherever and whenever it is possible to do so, making the route practically an air line.



45-FT. POLES CARRYING TROLLEY AND TRANSMISSION LINES.

driven compressor mounted in a dust-proof box on the under side of the car. The Niles Car & Manufacturing Co., Niles, O., now has an order from the Western Ohio Railway Co. for 24 passenger coaches each 44 ft. 10 in. long over all and 8 ft. 9 in. wide. These coaches will have standard "I" beam framing for the floor sills and will be equipped and mounted on the same trucks and with the same equipments as those furnished by the Kuhlman company.

OVERHEAD CONSTRUCTION.

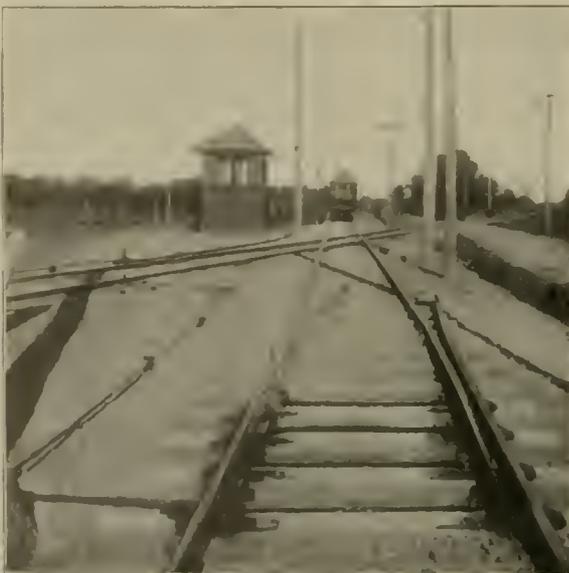
The poles on this line are all of Michigan cedar, 35 and 45-ft. lengths with 7-in. tops. All cross-arms have been deeply gained in the pole and fastened by machine and carriage bolts instead of the customary lag screws. The brackets used are of the rigid type with Ohio Brass Co's. hangers. All cars are of the 12-in. semi-cylinder type, soldered in position. The poles are all thoroughly guyed and braced on all curves and it has been the aim to make the overhead line substantial in order to stand the high speed of heavy railway cars. The trolley wires are circular in section, there being two each No. 00. Above the trolley is strung a 211,000-c. m. feeder, carried on a cross arm 12 in. above the trolley bracket. On these same cross arms over the entire route are carried the telephone lines, there being an iron box telephone in a wooden booth at each turn-out, where all cars must report. This telephone system is carried into the general offices of the company at Lima, where the dispatcher is located, so that he is constantly in communication with all of the cars on the system, as well as with the power house and sub-stations.

The portion of the road now in operation traverses the Lima-St. Marys oil fields, which are among the heaviest oil producing districts in the country. It also traverses a rich farming territory and the prospects for freight on this road are very bright. The rate of fare charged is approximately two cents per mile and the run from Lima to Minster, a distance of 36.8 miles, is being made in 1 hr. and 46 min., including all stops.



TROLLEY EXCURSIONS ACROSS MASSACHUSETTS.

A unique pleasure trip planned by Mr. John W. Ogden, superintendent of the Concord, Maynard & Hudson Street Railway Co., was participated in by about forty railway officials and newspaper men, Saturday, November 22d. The handsome parlor car "Concord," owned by the company, was used by the party over the route from Maynard, Mass., to Hudson, Marlboro, Northboro, Westboro, Hopkinton, South Framingham, Milford, Hopedale, Woonsocket, R. I., and return, covering a distance of about 130 miles. The party left Maynard at 7:30 a. m. and returned at 9:40 p. m., having stopped at Milford two hours and at Woonsocket half an hour. The object of the trip was to show the practicability and ease of running an excursion over connecting lines of electric roads without change of cars. The roads traversed were the following: The Concord, Maynard & Hudson Ry., Marlboro Street Ry., Worcester Consolidated Street Ry., Westborough & Hopkinton Street Ry., South Middlesex Street Ry., Milford & Uxbridge Street Ry., Milford, Attleboro & Woonsocket Street Ry., and Woonsocket Street Ry. A pilot was furnished by each of the systems travelled over in order to avoid possible accidents or delays, and it was with perfect ease that the journey was made. All participants were highly pleased with the success of the trip. The parlor car "Concord" is said to be one of the finest and best equipped electric cars in New England and the success of this trip augurs well for future excursions of this character. It is understood that the company contemplates placing two other similar cars at the disposal of pleasure parties. The "Concord" has already been chartered by private parties for a number of trips and will undoubtedly be in demand during the coming summer season. An illustrated description of the Concord, Maynard & Hudson Street Ry. and a brief biography of Mr. Ogden appeared on page 11 of the February "Review."



INTERLOCKING PLANT.

ROADBED.

The roadbed on the first 47 miles of this property is of standard interurban railway construction, with 60-lb. steel rails in 30-ft. lengths, laid on 5 x 7 in. x 7-ft. ties. The bonds are the American Steel & Wire Co's. "Crown" type. The roadbed is heavily ballasted throughout with rock crushed to pass a 1 1/2-in. ring gage and screened, and is from 8 to 12 in. in thickness under the ties. This

EFFICIENT DISCIPLINE.*

BY THOMAS E. MITTEN, GENERAL MANAGER INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

Railroad service requires men who are steady and reliable in habits. Efficient discipline demands that they be well-trained and prompt in obedience to orders.

In addition to a carefully prepared book of rules it is essential that there be a well-defined policy covering the method by which discipline is to be maintained, the underlying principles of which must be thoroughly understood by those to whom its enforcement is entrusted.

All matters of discipline should be under the general direction of a chief operating head with whom all subordinate officials should be in close touch and accord, and to whom all employes should have the right of appeal.

Much depends upon the selection of new men, and in order that the employment shall be sufficiently attractive to interest the better class of wage-earners, a fair wage, at least equal to that paid for like class of men in other lines of work, should be assured to applicants as soon after they have entered the service as is practicable. The acceptance or rejection of applicants should be entrusted only to those who from their experience have become good judges of human nature and are thoroughly conversant with the requirements of the position for which application is made.

The habits and history of each applicant should be carefully inquired into, his physical condition determined and a conclusion as to his fitness for the service arrived at independent of any outside influence.

Instruction should be given to new appointees only by the most competent men in each branch of the service, who should believe in and be fully familiar with the policy of the management. It should be thorough and systematic in character, and subject to careful review before the final acceptance of applicant is decided upon.

Men who are undesirable do at times secure employment even after the most careful scrutiny of their history and personal appearance, and being on good behavior during instruction are passed as satisfactory, but prove later to be an actual detriment to the service. Such men should not be allowed the latitude and consideration given to old employes, but should be removed by prompt discharge as soon as their unfitness is assured.

Other men, during the early stages of their employment, make mistakes which are due largely to an insufficient understanding of what is required of them; such errors are best corrected by subjecting the offender to further instruction, the logical conclusion being that under these circumstances punishment administered educationally will ultimately correct the man of his shortcomings or prove him unfit for the service.

Men employed for a sufficient length of time to have become thoroughly familiar with the duties which they are required to perform have as a rule acquired a certain pride in their knowledge and skill, and also in the fact of their extended service. Punishment of any character, inflicted upon such men, almost invariably humiliates to such an extent as to leave in their minds a feeling of resentment. More can be accomplished, generally speaking, by a plain, straightforward talk, such as will appeal to their manliness.

A book record should be kept covering the history of each employe during the period of his employment, in which proper entry should be made regarding all matters which have a bearing upon the efficiency of the service rendered.

When accused of shortcomings, men should be notified by written communication setting forth their offense in detail, to which they should be permitted to make written reply, as by so doing they avoid the necessity of being called to the office with consequent loss of time and wage. If the reply is unsatisfactory they should be so informed, and unless they then appear at the office and make a satisfactory explanation an entry, covering the facts in the matter, should be duly made on the record.

For repeated infraction of rules, or in case of serious accident, the party at fault should be given a hearing before the officer by whom discipline is administered, who in rendering decision should

take into consideration the gravity of the offense with which the party is charged, the length of time in service and his previous record. In case of a man's discharge being necessary, the record will show that he has practically discharged himself, having been given every opportunity to mend his ways before being dismissed. As every effort is made to reclaim erring employes before their services are dispensed with, consistency demands that when once discharged they be never again re-employed.

Under this method the number of discharges are reduced to the minimum consistent with the maintenance of good discipline. Employes are made to feel that after having served a company sufficiently long to have become identified with its practice they become a part of its system and are not to be divorced therefrom unless absolutely necessary for the good of the whole. It should be impressed upon them that their employment is of a fixed and permanent character, promotion being open to all, dependent solely upon the faithful performance of duty and fitness for increased responsibility.

The right of appeal to the chief operating head is considered to be of the utmost importance, in that it insures to each employe a review of his case before an unprejudiced judge, who should possess the absolute confidence of his men. Without such a court of appeal employes who feel that they have been dealt with unjustly, having no means of redress, are in some instances almost forced into forming associations for their own protection.

Those entrusted with the enforcement of discipline are also by this method made to be more careful in their rulings, and when in any doubt, will be found to almost invariably submit the question to the chief operating head for decision before taking definite action, realizing that by so doing they avoid the possibility of being overruled.

Subordinate officials should, wherever possible, be selected from the ranks, preference being given to those who have served as instructors. They should be calm and considerate in their treatment of men, and consistent in the enforcement of rules.

Discipline sometimes becomes lax and inefficient owing to superannuated employes being retained in the service, who from no lack of willingness but entirely owing to their infirmities, are unable to properly perform their duties. A most satisfactory solution of this question seems to have been found by some of the larger companies who have set aside a fund for the pensioning of such employes as become incapacitated after long years of faithful service; this not only permits the retirement of those who have outlived their usefulness, but also serves to instill in the minds of all employes a feeling of security and confidence.

Suspension from duty and from pay, which was at one time the generally recognized punishment administered for minor offenses, is rapidly falling into disuse, having proven mischievous in its effects not only by its leaving the man so punished in a disgruntled state of mind but in addition often resulting in his family being subjected to severe hardship by the loss of revenue incident thereto.

Arbitrarily discharging employes guilty of violating certain specified rules, this without reference to previous record, was at one time considered absolutely necessary in order to prevent the increase of certain classes of accidents. While the fear of discharge seemed in some instances to make men more careful, very good men were at times necessarily sacrificed to maintain this principle, the result as a whole being found generally unsatisfactory. The feeling seemed to prevail that as the best and most careful of men were liable to accident on occasion no man could be absolutely sure of retaining his position.

Within the past few years over 57 railroads have abandoned the methods of punishment formerly used and are now relying almost entirely upon the Brown system of discipline by record, either in its entirety or in some modified form, it having become apparent that as the requirements of the service grow more exacting, making necessary the employment of a higher degree of intelligence, men with minds capable of such training are not to be controlled by the arbitrary methods formerly used but respond more readily to moral suasion and appeals to the better side of their natures.

A wedding set for November 27th at Wheaton, Ill., was postponed on account of a collision between an electric train and a wagon driven by the intended groom on his way to secure the marriage license.

*Read before the New York Railroad Club, November, 1902.

System and Parks of the Tri-City Railway Co.

The Tri-City Railway Co., which operates a 50-mile electric railway system in Davenport, Ia., and Rock Island and Moline, Ill., is at present accomplishing much towards the improvement of its properties and the betterment of its service, in the face of a somewhat adverse municipal government and difficult physical conditions. The company serves three thriving industrial cities with an aggregate population of 100,000, its cars running from Davenport across the railroad bridge which is owned by the federal government and the Chicago, Rock Island & Pacific Ry., to Rock Island, and in an easterly direction to the manufacturing city of Moline between four and five miles distant. Three years ago the company obtained a 25-year franchise in the three cities.

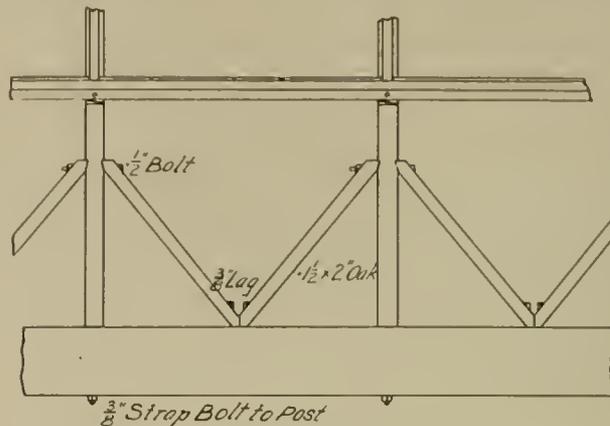
Davenport is built upon a bluff rising from the shore of the Mississippi River, and the street railway lines in traversing its main business and residence districts contend against a grade of $7\frac{1}{2}$ per cent. Owing to the occupancy of the down town streets by some three steam railroads, the grade crossing problem in Davenport has been a most serious one, especially as the principal crossing is made at the foot of a steep incline on a thoroughfare which is always crowded with vehicles and pedestrians. It may be noted to the credit of the Tri-City company that but two grade crossing accidents have occurred on its system in Davenport in the last seven years, and that neither of these resulted fatally. At the present time, the Chicago, Rock Island & Pacific Ry. is elevating its tracks through the city, and this work when completed will obviate to a great extent the danger and difficulty of the down town crossings.

With the exception of the line from Rock Island to the resort at the Watch Tower, $3\frac{1}{2}$ miles distant, and two branch lines, the company's system is double-tracked for nearly its entire length. At present old rails are being replaced with 78-lb., 60-ft. girder rails, and the Columbia bond, which has long given satisfactory service, will be maintained. White oak ties, 6x8 in. are used throughout, being laid 24 in. c. to c. In the experience of the company, white oak ties have excelled all others, and showed to particular advantage compared with yellow pine or cedar. Some of the white oak ties that have been down for 15 years are still in serviceable condition, but are being replaced with new ones for the sake of uniformity. In Davenport, Galesburg brick paving is used extensively, the brick being laid in from 6 to 8 in. of concrete. It is the intention of the company eventually to also lay a double track on the line to the Watch Tower. An ordinance was recently passed granting the company the right to build an additional four-mile loop in Rock Island, and the construction of the loop, which will cost approximately \$75,000, will be begun in the spring. The extensions and double-tracking proposed for 1903 will cost about \$216,000.

Certain franchise restrictions have made it necessary for the company to maintain its machine shops on the Davenport side of the river, while the power house, car house and repair and car-building shops are located in Rock Island. A new car house with a capacity for storing 100 cars is practically completed and ready for occupancy at a point two miles east of Rock Island, and about half way between that city and Moline.

Adjacent to the new car house is the building which was formerly used for storing cars, and which has now been converted into a shop. The company has begun the manufacture of its own cars, and has constructed since May, when the first plans were drawn, three new cars which have just been put in service. Thirty more of

the same pattern will be built as rapidly as they can be turned out. The shop has a capacity for four cars at one time. These cars are of the semi-convertible type, 41 ft. over all with a body 30 ft. 6 in. long, and 8 ft. 6 in. wide over the grip rails. Yellow pine is used



CAR TRUSSES, TRI-CITY RY.

for the side rails; the end sills and platform sills are of white oak. The posts, carlines and ribs are of Indiana white ash; the sashes are of cherry, and the doors are of cherry with mahogany panels. The roof, ceiling and sides are of poplar, and the ceiling of the hood is white pine. White ash is used for the vestibules, with red gum panels.

Cars for the bridge run are being painted green, and others, a



GROUP OF BUILDINGS AT WATCH TOWER, DAVENPORT, IA.

light yellow. The numbering and lettering and the interior decoration is done in aluminum and gold leaf, a combination which, while slightly more expensive than the usual practice, gives a brilliant and rich effect.

The cars have an appearance of greater length owing to their height being only 11 ft. from the bottom of the sill to the roof of the trolley board. This dimension was determined by the clearance of the lowest viaduct on the lines, which is only 12 ft. 2 in. from the rail to the trolley wire. Mr. J. D. Fish, chief electrician of the Tri-City Railway Co., who has had charge of designing these cars and superintending the construction, has strengthened the bodies to meet local grade contingencies by the introduction of a vertical truss

mortised to the sill and secured by strap bolts as shown in the accompanying diagram.

The windows of the cars are designed to be removed entirely in element weather, when protection to passengers will be given by pantasote curtains.

There are between 60 and 70 now in service, none of which is less than 10 years old, and some have been in use for 25 years; these range in size from 27 ft. to 30 ft. 6 in. over all.

The new cars are mounted on Brill No. 27 G double trucks and equipment includes four motors, G. E. 52, 54 or 67, Providence fenders and Christensen air brakes and "Consolidated" electric heaters.

Sixty men are employed in the shops, half of that number being engaged on the new cars, exclusively. The equipment of the shops comprises some 20 wood-working machines, the principal among them being mortising and gaining machines, planers and shapers.

The machine shops, paint shops and storerooms are located in Davenport. The equipment comprises one large wheel press, six grinders, three lathes, drills, polishers, shapers and auxiliary apparatus. The company is considering installing a boring machine which it is estimated would effect an economy of \$1.50 for each replacement; at present lathes are used for boring machines. The axle straightener is an important feature of the apparatus. The company makes its own axles, using low carbon crucible steel for the purpose, and there have not been half a dozen crooked axles in the shop in a year. In the last four years there have been but eight broken axles reported, and this is the more remarkable in consideration of the fact that prior to four years ago, when the company was using cold rolled steel or hammered iron in the manufacture of its axles, there were on an average of 12 broken axles reported each month.

The power house at Rock Island contains seven T. H. 75-kw. and one T. H. 80-kw. machines driven by "Ideal" engines. This equipment has thus far been adequate to the demands of the service, but as traffic is steadily increasing, the company now contemplates increasing the capacity of the power station. It is also proposed to arrange for the removal of the machine shops to Rock Island so that all the mechanical departments may be operated in conjunction. The store rooms and business offices of the company will, however, be maintained permanently in Davenport.

The Tri-City Railway Co. owns two parks at which it has maintained various attractions for several seasons past with very satisfactory results. The principal of these resorts is called Black Hawk's Watch Tower and comprises 22 acres of oak forest at the summit of a high bluff overlooking the Rock River, about 3½ miles south of Rock Island. The view from this promontory includes Illinois farms and forests 20 miles distant and the winding course of the beautiful Rock River from an easterly direction to its confluence with the Mississippi. The windows and the broad verandahs of the Watch Tower pavilion command this pleasant prospect, and here in summer the society people of the three cities frequently give exclusive dinners, dancing parties and other entertainments.

During the season (usually from April 15th to October 15th) several thousands of persons are served daily at the pavilion restaurant which is in charge of an expert chef. One of the attractions in the pavilion is a museum of Indian relics and two antique paintings of exceptional merit, commemorating the Sac chief Black Hawk, who in the early part of the last century made his headquarters on the site of the present park during the war of the Sacs and Foxes. The resort was named in honor of him.

Across a small ravine from the main building is another two story structure, also used for dancing, and as a bowling alley. In the rear of it is a water toboggan down the hill side for the use of bathers. The slide is 400 ft. long. After a plunge into the river the occupants of the coasting cars retain their seats and are drawn back again to the top of the incline, the apparatus being operated by an electric motor of 40 h p.

There is an open-air theater in the valley, and 700 persons may witness the performances from benches which are arranged in a semi-circle on the hillsides fronting the stage, which latter is 40 ft. wide by 35 ft. deep and equipped with all the essentials for

quite an elaborate comic opera production. With the one restriction that the entertainments shall be of a kind which could not offend the most fastidious, the management of the theater is now entirely in the hands of the lessee who is meeting with a fair degree of success despite the fickleness of taste which is characteristic of a cosmopolitan attendance. Public opinion has been unanimous in endorsing the management's efforts to make the other attractions pleasing. A crowd of 10,000 people is not an unusual one at the Watch Tower, although a 10-cent fare is charged from Rock Island.

The bathing facilities, bowling alley, dance hall, etc., are well patronized, and the afternoon and evening concerts by an excellent



TOBOGGAN AT WATCH TOWER, DAVENPORT, IA.

orchestra are fully appreciated. Often there are special amusement features such as balloon ascensions, moving picture shows, and the like. Everything on the grounds is free and the company has even provided shelter and hitching facilities for those who come in carriages to enjoy the pleasures of the park without price. The bicycle rider has, however, been debarred from the Watch Tower resort, as several seasons ago when the bicycle was more popular, the wheel took considerable business away from the road. At the entrance of the park is a storage tank with a capacity of 23,000 gallons, supplied by electric pumping apparatus, and from this is furnished an abundance of water for various uses to all parts of the ground. In summer, cars are run at 10 minute intervals to and from the Watch Tower, and in addition to the regular service many "specials" are hired for excursion parties. During the winter months cars run to the park on a one hour schedule to accommodate those who come to enjoy skating and coasting on the company's property. The pavilion is warmed and lighted for this purpose, and a delectable meal can always be secured by giving previous notice.

Prospect Park, two miles south of Moline, Ill., is also owned by

the Tri-City company, and draws about the same class of patronage as the resort at the Watch Tower. The park comprises 24 acres located just off the Rock River and surrounded by wooded hills. An artificial lake, 400 x 900 ft 4 ft deep, is supplied from an artesian well which is sunk to a depth of 2,700 ft. and cost \$4,000. The bottom of the lake is sand and gravel, and ample bathing facilities are provided. There are two buildings on the grounds at Prospect Park, one of which is used as a dancing pavilion, and the other as a cafe. There is a switch-back railroad which has proved a never-failing attraction, and a portable theater. The latter is 60 ft. long, 40 ft. wide and 30 ft. high, constructed of wire mesh sections which may be taken apart as expeditiously and shipped as compactly as the stage scenery. Even the stage and its equipments are portable. The roof and sides of the theater may be quickly covered with boards for the protection of patrons in the event of unexpected showers. The management of the playhouse here is also in the hands of a lessee, and the company is relieved of all the business of organizing and maintaining theatrical attractions. It provides excellent music, however. Another important feature is the "Zoo" where several docile and well-behaved deer, elk, black bear and alligators are kept. There are also a number of burros



PAVILION AT PROSPECT PARK, MOLINE.

on which children ride through the equestrian paths of the park. An average crowd at this resort on an afternoon or evening in summer is 6,000, and greater crowds are often attracted by the Chautauqua meetings and the gatherings of fraternal and social organizations. Last season there was a large attendance of the Chautauqua society whose occupancy of Prospect Park lasted five weeks. Cars run on a similar schedule to that in effect at the Watch Tower. Both parks are advertised by the company in the 10 newspapers of the three cities and in other minor ways. The expense of maintaining the Watch Tower, inclusive of advertising and music and exclusive of theatrical entertainments, was for last year \$3,340, and that of Prospect Park was \$1,562.

Schuetzen Park, at Davenport, though not owned by the Tri-City company, is a considerable factor in inducing traffic over the street railway lines. The tract of 45 acres is owned by a German association, and the principal attractions are the shooting tournaments of frequent occurrence, and the regular weekly concerts which are attended by the most fashionable society in the three cities. Davenport City Park, a suburban resort owned by the municipality, also attracts large crowds over the company's lines.

The line of the Lake Shore Electric Railway Co. was completed from Lorain to Sandusky, O., and opened for traffic November 15th.

OHIO NOTES.

The Cincinnati, Georgetown & Portsmouth Traction Co. having a route 42 miles in length and extending from Cincinnati to Georgetown, recently ran its first electric car over the line, breaking the record for southern Ohio; seven miles of the stretch being covered in eight minutes. The road was formerly a narrow gage steam road, but was converted into an electric last season. It taps a section untouched by other roads and will prove of great value to Cincinnati merchants.

The Columbus Railway Employees' Beneficial Association held its annual meeting December 1st and elected the following officers for the ensuing year; president, Harry P. Lawson; vice-president, J. W. Powell; secretary and treasurer, L. A. Hambleton; physician, Dr. Frank S. Lott. Fourteen new members were admitted to membership.

Local street car service has been opened at Bellefontaine by the Urbana, Bellefontaine & Northern Traction Co., one of the Appleyard syndicate lines. This is the line that will furnish the connecting link between Columbus and Toledo, when completed. In the spring the line will be pushed to Kenton and Urbana.

The Appleyard syndicate of interurban roads has promised within a short time to establish a sleeping car service out of Columbus, that will equal if not surpass that of any of the steam roads. Of course this is taken as an indication that it hopes soon to get an entrance into Cincinnati, and to complete its other lines to reach all of the important cities of the state. The plans for the new sleepers provide for cars 72 ft. in length, weighing about 30 tons, and to cost about \$25,000 each. They will be geared up to an average speed of about 45 miles an hour. It is also stated that this syndicate is after the Toledo, Bowling Green & Southern road, which would give two lines across the state, one from Cincinnati to Toledo by way of Springfield and the other from Cincinnati to Cleveland by way of Columbus.

A meeting of the officers of the Scioto Valley Traction Co. was held in Columbus recently to hear the report of the engineers as to the plans and specifications for the electrical equipment of the road. This company is building from Columbus to Lancaster, a distance of 33 miles and from Columbus to Circleville, a distance of 25 miles. The roadbed is ready for the rails and the work will be pushed as rapidly as possible. The track will be double for eight miles out from Columbus and the power house will be built at Reese's station. The equipment will be of the very best and a speed of 50 miles an hour between stops will be maintained when necessary, so the officers say.

ROCKFORD & INTERURBAN RAILWAY CO.

The Rockford & Interurban Railway Co. which is a consolidation of the Rockford Railway, Light & Power Co., of Rockford, Ill., and the Rockford & Belvidere Electric Railway Co., has established a fast express service which is meeting with great success. Mr. J. R. Groneman is the general passenger and express agent of the company and he is advertising the company's express service in various ways. One advertisement recently distributed consists of a card illustrating one of the company's new express cars, and another is an attractive calendar giving a view along the route and calling attention to the electric passenger and express service. The road is also especially equipped for excursion and outing parties.

REWARD FOR CAREFUL EMPLOYEES.

On June 1st the Pittsburg Railways Co. advanced the wages of its motormen and conductors one cent an hour and at the same time announced that an experiment would be tried for at least six months at the end of which the company would give a bonus of one cent an hour to every motorman and conductor who did not have an accident during that period. About one-half of the men have clean records and will receive an average of about \$20 each on December 20th. The company is said to be satisfied with the plan and will continue it indefinitely.

MULTIPLE UNIT, VOLTAGE SPEED CONTROL FOR TRUNK LINE SERVICE.*

BY H. WARD LEONARD.

In February, 1894, I read a paper before this Institute describing a system which I considered applicable to the operation of a trunk line electric railway. The essential features of this system were:

1st. The generation and transmission of a high tension single phase alternating current, the power houses being placed as far apart as the insulation of an alternating current transmission would permit.

2d. The entire elimination of sub-stations.

3d. A transformation of the energy upon the locomotive so as to secure a voltage speed control for the electric motors, thereby obtaining smooth acceleration and efficient control of the locomotive at any desired speed and in either direction.

At that time there were no engineers, so far as I know, who agreed with me that these features were essential for the operation of a trunk line railway by electric motors.

In the recent past, however, many prominent engineers both abroad and in this country have declared themselves in favor of these essential features, and I therefore feel warranted in describing an improvement upon the system I originally proposed, by which I can secure the important and now well understood advantages of a multiple control of any desired number of locomotive units.

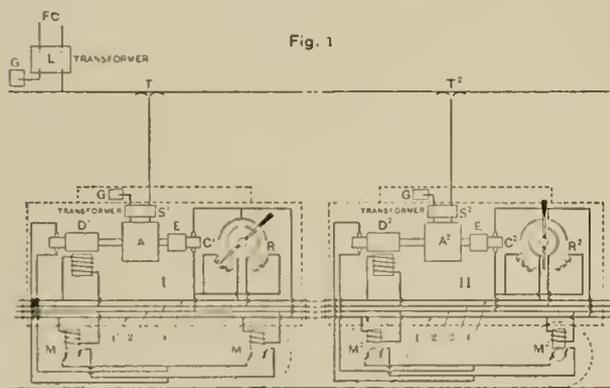


Fig. 1 illustrates diagrammatically one form of my multiple unit voltage speed control as applied to two locomotive units for trunk line service.

The current is generated in the form of a single-phase alternating current at as high an electromotive force as is practicable today, say 20,000 volts. A moving contact leads the single phase alternating current upon the locomotive. If desired, static transformers can be placed at suitable points along the line of the railway which will reduce the initial e. m. f. to any desired lower e. m. f. upon the contact conductor.

In many instances it may be desirable to place upon the locomotive a transformer s' for reducing the tension of the alternating current led to the synchronous motor A^1 .

A single phase synchronous motor on the locomotive receives this alternating current and is driven by it continuously at a practically constant speed; the current after passing through the motor, being led to ground through a moving contact. This single phase motor A^1 drives continually a small exciter E^1 and also a large continuous current dynamo D^1 whose field is separately excited by the exciter E^1 and has in its field circuit a reversing rheostat R^1 . The armature of the propelling motors are connected in multiple directly across the terminal of the armature of the dynamo D^1 . The field magnets of the propelling motors M^1 are separately and constantly excited by the exciter E^1 .

By manipulating the reversing field rheostat R^1 , the current through the armature of the motor M^1 necessary to obtain the required tractive effort, can be obtained at any desired voltage from the lowest voltage to the full speed voltage, and in either direction.

A perfectly smooth and rapid acceleration can thus be obtained with minimum energy from the source of supply.

The simultaneous multiple control of the several locomotive units

is obtained by means of the four small wires, 1, 2, 3, 4, which are lead along the train.

In Fig. 1 the operator is supposed to be upon the locomotive I. The exciter E^1 , which is producing a constant e. m. f., has its terminals connected to the wires 1 and 2. Across these wires 1 and 2 are connected the field windings of all of the propelling motors on the two locomotives, so that they are all constantly and fully excited.

The wires 3 and 4 are also supplied by a current from the exciter E^1 , but the reversing field rheostat R^1 is in the path of this current. The fields of the two dynamos D^1 and D^2 are connected in multiple across these wires 3 and 4 which extend along the train.

It will be evident that by manipulating the reversing field rheostat R the operator can vary simultaneously and similarly the field exciting currents supplied to D^1 and D^2 and that therefore he can cause the voltage of these two dynamos to vary in exact unison from 0 to the maximum voltage in either sense. Thus, the operator can cause the two locomotives to start, accelerate, run at full speed, retard, and reverse in perfect unison, always dividing the load perfectly under these various conditions.

By placing the controller R^1 in its open position and going to the other locomotives, the operator can similarly control the two locomotives simultaneously by means of the controller R^2 .

By the use of this system I expect to be able to secure the following advantageous features:

1st. The haulage over existing roadbeds, grades, bridges, etc., of very much heavier trains than can be hauled by any steam locomotive.

2d. A material reduction in the cost of maintenance of the locomotives as compared with steam locomotives.

3d. A material saving in the maintenance of the road bed because of the absence of hammer blow, shouldering, rocking and skidding.

4th. A material increase in the weight of the train which could be hauled around a certain curve by a locomotive having a certain weight on drivers.

5th. A material increase in the load which could be started upon a certain grade by a locomotive having a certain weight on drivers.

6th. A material reduction in the dead load necessarily hauled by a steam locomotive, represented by the part of the steam locomotive and tender not on drivers.

7th. A very large increase in the number of trains of given weight and speed which could be operated from a given power house compared with the series, parallel or cascade systems. Or, to state this another way: a very much higher rate of acceleration with the same maximum output from the power house, the same conductors, the same weight per train and the same watt hours per ton mile, than is possible with the series, parallel or cascade systems.

8th. As each locomotive unit can be equipped with any desired number of driving axles and any desired number of locomotives can be operated under multiple control, the amount of power which can be applied to a single train and controlled by a single operator is practically unlimited.

9th. Fifty per cent. of the energy now wasted on friction brakes can be saved in the form of useful electrical energy restored to the system.

10th. The first cost of equipment will be very much less than that of any system, for equivalent service, which involves the use of sub-stations.

11th. The cost of haulage per ton mile will be greatly reduced as compared with steam locomotives, especially because of the large increase in the weight of the train which can be hauled.

12th. Difficulties due to electrolysis would be reduced to a minimum.

The Savannah (Ga.) Electric Co. has announced an increase in wages of from $1\frac{1}{2}$ cent to $1\frac{1}{2}$ cents an hour effective January 1st.

The Lonaconing, Midland & Frostburg Electric Railway Co. has accepted the section of the road between Lonaconing and Frostburg, Md. from the contractors. This is a part of the 33-mile system between Cumberland, Md., and Piedmont, W. Va., which is about two-thirds completed.

ELECTRIC TRACTION IN LONDON.

The "Battle of the Tubes" in London now more than ever presents the aspect of a game of chess, played, however, with the rules of the game in abeyance, each party's move being referred to an umpire instead. Mr. Yerkes has just called out "check" to Mr. Morgan, his opponent, but the interested spectators in railway and financial circles must wait till the next session of Parliament to find out whether it is "check mate" or whether Mr. Morgan has only allowed himself to be surprised into what proves to be a tight corner, from which he will emerge to fight another battle.

It is as well to recall the incidents which led up to the present extraordinary conflict which has broken out over the transit of London.

The Piccadilly, City & North East London Railway bill, seeking powers from Hammersmith to the city and thence to Palmer's Green was left over from the last session of the Committee which sat to consider the tube schemes. This bill was the result of an amalgamation of interests of the London United Electric railways bill from Hammersmith to Hyde Park Corner, with Mr. Morgan's scheme from thence to Palmer's Green, providing by means of this alliance a complete through route linking at Hammersmith with the London United Tramways, and having a system of cheap through rates. The bill passed the House of Lords and through the first and second reading in the House of Commons. It contained a schedule of through and very cheap fares, and in a large measure it gave effect to the principal recommendation of the Joint Committee on London Underground Railways; it reached the House of Commons, in fact, as an amalgamated and complete scheme for a through route, with a preamble otherwise meaningless. In the House of Commons it was saddled with an "Instruction" intended to emphasise this point and to secure by guarantees that it should be sanctioned only as a complete and amalgamated scheme for giving London a through route. After the bill had been before the committee of the Lords, the two companies hopelessly disagreed about the working of the lines, and during the recess, Messrs. Speyer Bros. of Lothbury (the proprietors of the Underground Electric Railway Co., of London, Limited, controlling the Yerkes Tubes), having the opportunity, obtained the control of the London United Electric Railways bill (Hammersmith to Hyde Park Corner). The transfer negotiations were completed within twenty-four hours and were kept secret.

The next act in the drama was the action of Sir Edward Clarke who before the committee formally withdrew the London United bill. This bill having passed into the hands of the company interested in the District Railway and the Brompton & Piccadilly Ry. the bill for which latter had passed its third reading but the day before and happened to contain also the expensive section from Sloane St. to Hyde Park Corner, the promoters found they could no longer undertake to carry out the bill to the full extent sanctioned, and they had no alternative, therefore, but to withdraw it, since it now entered into dangerous competition with other railways belonging to their group.

The committee thereupon found that under these circumstances the preamble of the Piccadilly, City & North Eastern London Railway bill was not proved, the conditions imposed by the instruction of the House of Commons not having been complied with. Messrs. Speyer Bros. and their syndicate state that they secured the United Tramways because they believed it to be a splendid property and that at the time the Piccadilly & City bill had become practically defunct by reason of the irreconcilable disagreement of the former allies. Mr. Morgan's scheme, which would have established a line parallel to the District Railway owned by the same syndicate was moreover unnecessary.

The proceeding strikes one as a very pretty and clever piece of manoeuvring on the part of the Yerkes combination, inspired by the dissensions in the enemy's camp. Mr. Yerkes intends to lay before Parliament next session an entirely new scheme for a tube railway in London to cover not only all the ground that the defunct bills intended to cover, but considerably more, and which will be constructed more rapidly and at less cost than the other schemes. Mr. Morgan's syndicate is feeling very sore and indignant at the collapse of their scheme and declare their intention of presenting a new bill for the whole route. The umpire will thus be called upon next session to decide on the "check move."

A great deal of feeling was created by the incident in Parliament and a motion was brought forward in the House of Commons by Mr. Ashton for the re-committal of the Piccadilly & City bill, but after a short but animated debate the motion was withdrawn.

This fresh outbreak of the battle of the tubes only brings before us with greater force the necessity for a permanent Board of Control to sift thoroughly and regulate the question of transit for London. A body of men would be required comprising expert engineers, electricians, and traffic organizers, men versed in the financial, legal and economical aspects of the question, and not possessing interest in any of the sanctioned schemes, nor in London's Tramways. The duties of this board would not be to decide on the respective merits of various schemes promoted, but to reconstitute and complete the map of the "Transit of London" from the point of view of the convenience of passengers, inhabitants and workers. That being done, the plans, subject to amendments would be published, tenders invited and the board would be required to hear all parties and local authorities, railway, omnibus companies, etc., entitled to a hearing on the subject.

How necessary such a board of control has become may be gathered from the fact that although it is now nearly 13 years since the City & South London—the pioneer electric railway of the metropolis—was opened, London's railways have only been increased since by two more tubes, the Waterloo & City and the Central London. The other railways sanctioned have either been abandoned or are still incomplete or not begun even. In the session of 1902, 18 tube bills were deposited, aggregating about 82 miles of new lines. Of these, now that Mr. Morgan's combination has collapsed, not a single new undertaking has survived the Parliamentary committees of two sessions; extensions to existing railways alone were sanctioned. Such a situation would be impossible with a board of control.

However, in spite of this future of the crop of tubes, in a few years' time London's needs of rapid, convenient and cheap transit will be considerably better supplied when the lines of the Underground Electric Railway Co. of London—the Yerkes tubes—are opened for traffic.

Mr. Bryce by his question in the House of Commons as to the urgent need of a Royal Commission to investigate the state of London's transit, appears to have brought matters to a crisis. The Government has practically decided to appoint a royal commission to consider the improvement of London traffic. It is to be hoped that the royal commission may prove but a stepping stone to a permanent board of control; it is some consolation at least to find that the crying need of Londoners has at last been recognised to some extent by the legislative body.

D. N. D.

NEW BENEFIT ASSOCIATION AT MOBILE, ALA.

The Mobile Light & Railroad Co. Employees' Athletic & Benefit Association was recently organized for the promotion of education and a fraternal spirit among its members and to provide a benefit fund for sick or disabled members. The membership is limited to white male employes of the company in sound health. The officers of the company may become honorary members. The officers are elected annually, due notice having been posted previous to election. The board of trustees has general supervision of the work of the association, but the action of the board is subject to appeal at any time. The relief committee consists of the vice-president and three members chosen alphabetically from the roll each month. An investigation committee of three is appointed by the president to inquire into the fitness of applicants for membership. The initiation fee is 50 cents and dues 50 cents per month, with an assessment of \$1 on the death of a member. The monthly dues are deducted by the auditor from the wages of each member and paid to the secretary. The sick benefits are \$1 per day between the fifth and fiftieth day of illness. Medicine is supplied to members free of charge. The death benefit is the necessary funeral expenses of the deceased member. The railway company furnishes the hall, light, heat and bath free. The officers of the association are: Jos. A. Maloney, president; Thomas McCowan, vice-president; Jas. W. Scouyers, secretary; R. P. Priester, treasurer; W. E. Prennett, sergeant-at-arms; S. M. Coffin, J. W. Barnett and R. A. Savage, trustees.

IMPROVEMENTS ON OLD COLONY SYSTEM.

BY JAMES H. CREEDON, MIDDLEBORO, MASS.

The Old Colony Street Ry., which constitutes the southern division of the lines controlled by the Massachusetts Electric Cos., is busy making several improvements for the betterment of the service on its lines.

Chief among these are the additions to rolling stock. At the Campello car house, where is the main work shop of the system, the new open cars have been arriving all summer from the works of the J. G. Brill Co. The new open rolling stock has K. 6 controllers, G. E. 67 motors and Christensen air brakes. The motors are geared to give a maximum speed of 35 miles an hour.

The winter cars which have already arrived, are of two types. One kind, built by the John Stephenson Co., measures 30 ft. over all and is extra heavy, following the general lines of steam railroad coaches. The windows raise instead of lower and the fare register and signal cord depend from the center of the ceiling. The cars are mounted on Peckham 14 B, 3 double trucks and are fitted with four G. E. 67 motors, K. 6 controllers, and Christensen air brakes. The seats which are of the Wheeler type are arranged seven on each side of the aisle and one long seat at each end with accommodations for four passengers each. It is believed this arrangement will give more room for standing passengers. The cars have double trolley bases on monitor roofs. They will be used on the Plymouth, Milton, Neponset and Taunton lines running out of Brockton.

The other closed cars were built by the Laconia Car Co. They are mounted on St. Louis trucks with two G. E. 67 motors to each car. They are fitted with longitudinal seating, covered with red plush. The cars will be used on the East Bridgewater and Brockton lines and also in Fall River. Gold heaters have been placed in all these closed cars.

During the past summer 112 box cars were vestibuled in the Campello car house, men working night and day to complete the work before November 1st, to conform with the Massachusetts state law. About 20 cars were practically rebuilt.

It is of interest to note that the Old Colony management has adopted uniform colors for all rolling stock. The summer cars will be yellow and white and the winter cars will be red and white.

A new illuminated sign has been adopted. On winter cars this is placed on the outside of the vestibule just above the motorman's window. It is of metal, with black background and white lettering, and is illuminated by two 8-c. p., 55-volt lamps.

The company is testing the U. S. automatic block signal system on two single track sections with the end in view of demonstrating its practicability for the company's particular traffic conditions.

The company is putting up a two-mile section of insulated wire for the private telephone dispatching system. The insulated wire will be used chiefly where the line runs through trees and it is believed will do away with the "noisy" line which often gives trouble where the bare wires chafe against trees.

A new 4-ton Christensen compressed air hoist has been installed in the work shop at the Campello barn and it is believed will expedite the handling of trucks and motors.

The work of setting up the new cars as well as the vestibuling and rebuilding of the old ones, and the installation of the air equipment has been under the charge of the master mechanic, Frank Radlett, of the Campello barn.

"COMMUNITY OF INTEREST" IN OHIO.

The reports which have been published recently regarding the community of interest plan between the Mandelbaum-Pomeroy the Wiedener-Elkin people have become interested to a substantial extent in several of the Mandelbaum-Pomeroy enterprises, namely, the Cincinnati, Dayton & Toledo Traction Co. and the Miami & Erie Canal Transportation Co. This, of course, means that the operation in the Cincinnati field between the two syndicates will be harmonious.

TRANSFER CONCLUSIVE BETWEEN PASSENGER AND CONDUCTOR.

In the case of Garrison vs. United Railways & Electric Co., of Baltimore, the Court of Common Pleas of Baltimore City made a ruling upon transfers which is of interest to the public. The action was in tort for wrongful ejection from a street car and for assault and battery.

The plaintiff testified that he boarded a car of the defendant about 3:45 p. m. and the conductor gave him a transfer punched 3:50; that he rode several squares to the transfer point and waited 10 or 15 minutes for a car, and took the first car that came; that when he presented the transfer it was after 4 o'clock. The transfer read "not good after the hour punched in the margin," and had therefore expired. The court ruled that the transfer was conclusive evidence as between the passenger and the conductor as to the passenger's right to ride and that inasmuch as the transfer was bad on its face the conductor had the right to demand that the passenger pay his fare or get off the car and in the event of his refusal that he then had the right to use all reasonable and necessary force to expel him.

Counsel for the defendant argued that the transfer was conclusive evidence as between the passenger and the conductor to whom the transfer was presented, and that if there had been any error by any agent of the company by which the plaintiff had been injuriously affected, the plaintiff's rights were in an action for breach of contract; that it was the duty of the passenger under the circumstances, in the interest of public policy to pay his fare, postpone his claim and not to compel the conductor to eject him. That any other ruling would either compel a conductor to accept the word of every passenger who had a transfer bad upon its face, which would open the door to continuous frauds, or else he would be obliged to eject every passenger who had a bad transfer and who, relying upon the ruling of the court, would compel the conductor to eject him. In other words such a ruling would present an alternative between extensive frauds or breaches of the peace upon the car, which alternative, in the interest of public policy should not be presented to the defendant.

Counsel for the plaintiff cited the Act of 1900, chapter 313, requiring the defendant to give free transfers in the city which should "be good for a continuous ride," but it was argued and so ruled that this did not prevent the company from making reasonable regulations for its own protection, compelling passengers to produce proper evidence of their rights so to ride.

The plaintiff also testified that after the car had gone 7 or 8 squares from the place where the conductor demanded that the plaintiff pay his fare or get off, that the car was stopped and the conductor called a policeman, that thereupon one of the plaintiff's friends with whom he was riding offered to pay his fare, which the conductor refused and attempted to eject him.

The court held that if after the demand by the conductor for payment of fare a reasonable time had been given by him to comply therewith and the car had been stopped for the purpose of ejecting the passenger, the conductor was not at that time obliged to accept a tender of fare by the passenger, but still had the right to eject him.

The plaintiff testified, however, that after he had offered to get off and while so doing, the conductor pushed him from behind against the controller of the car which injured his arm. This evidence was contradicted by witnesses, but the case went to the jury on the question of whether unnecessary or excessive force had been used upon the plaintiff.

The jury found in favor of the defendant company.

STARK ELECTRIC RAILWAY CO.

The Stark Electric Railway Co., which operates the street railway system in Alliance, O., and an interurban line to Sebring, has about completed an interurban line between Alliance and Canton. The sub-station has been completed and machinery will be installed at once. The company has also made surveys for an extension from Sebring to Salem. The route has been decided upon from Sebring to Garfield, and a choice of several routes will soon be made for the remaining distance. Work will begin as soon as possible on the extension.

NEW PUBLICATIONS.

THE APPENDIX TO THE REPORT OF THE BOARD OF REGENTS, SMITHSONIAN INSTITUTION, is a summary of the most interesting scientific events of the year. The volume for 1901 contains 50 articles, many of them illustrated, nearly all prepared by masters of the respective subjects. "Bodies Smaller than Atoms," "The Laws of Nature," "The Greatest Flying Creature," and "The Fire Walk Ceremony at Tahiti" are among the subjects included in the Report. The Smithsonian Reports may be had by purchase at cost price from the Superintendent of Documents, Washington City, and may also generally be obtained free from the applicant's representative in Congress.

POOR'S MANUAL OF RAILROADS OF THE UNITED STATES, thirty-fifth annual volume, 1902. Royal octavo, cloth, 1900 pages, 24 colored plate, state, and group maps and 50 railroad maps, indexes, etc. Published by H. V. & H. W. Poor, New York. Price \$10.00.

Poor's Manual is, perhaps, the most important work of the kind published and with the newly added features and thoroughly reliable information increases in value each succeeding year. The present edition contains interesting data regarding the history, organization, equipment, operation and financial condition, etc., of every railroad company in the United States and Canada, and the leading railroads of Mexico. Every statement was officially revised before publication, which adds greatly to the value of the volume. The Manual shows the total length of railroads of the United States at the time of publication to be about 201,000 miles. The average earnings per mile of road for 1901 are given as \$8,270 gross and \$2,668 net, the average interest paid on bonded debt as 4.24 per cent, and average dividend on total share capital 2.62 per cent. A comparative statement shows also the mileage, equipment, liabilities and assets, traffic operations, earnings, interest and dividend payments, etc., of all steam railroads each year from 1894 to 1901 inclusive. The chief features of Poor's Directory of Railway Officials and Manual of American Street Railways have of recent years been included in the Manual and 240 pages are given to information and statistics for these roads similar to those of the steam railroads. Another department is devoted to miscellaneous industrial corporations, national, state and municipal finances, and fills 110 pages. There are also tables of dividends paid by the railroad and street railway companies, bond lists of leading railroads and finally, a list of railroad officials.

TRAMWAY ACCOUNTS—Gee & Co., 34 Moorgate St., London, proprietors of The Accountant, and publishers of numerous works on accountancy subjects, have announced a volume on Tramway Accounts. This will be, we believe, the first work on this subject, and will doubtless be widely welcomed. It is based on the methods of accounting used in the Glasgow Corporation Tramways Department, and will contain facsimiles of all the forms and books recommended, this being a valuable feature. The entire system of accounts, from the commencement to the published results, will be fully described, the difficulties of those inexperienced in the work being kept specially in view. The standardization of tramway accounts is a subject now under consideration by a committee of the Association of Municipal Tramway Managers of Great Britain, and this fact makes the book a timely one. The author is Mr. Donald Metcalf, chief bookkeeper, Glasgow Corporation Tramways.

PROCEEDINGS of the Purdue Society of Civil Engineering, No. 6, 1901-1902, 52 pages, illustrated. Published by the society at Purdue University, LaFayette, Ind. Price 50 cents. The Proceedings contains a number of the most important papers presented to the society during the year, among which are the following: Foundations, translated by the sophomore class from "Der Grundbau," by L. Brennecke, Imperial Engineer for the German Government; Topographic Maps of the U. S. Geological Survey; Literary Training for Engineers; Water Purification by the Use of Sodium Bi Sulphate; and Earthwork Estimates. A list of the instructors in the School of Civil Engineering and a list of the officers and members of the society are also given.

SUBJECT MATTER INDEX of Mining, Mechanical and Metallurgical Literature for the year 1900. Edited by M. Walton

Brown, secretary of the North of England Institute of Mining and Mechanical Engineers, and published by the Institute, Newcastle-upon-Tyne, England. 222 pages, paper. Price 42s. The volume contains an alphabetical list of the publications indexed, which includes nearly every scientific and trade paper in the world. The table of contents is divided and subdivided in such a manner that it is possible to locate any specific subject at once and by turning to the page reference the headlines of every article pertaining to that subject may be found with the page and number of the publication containing it, and also the name of its author. An alphabetical list of authors is given with reference to the page on which the name may be found in the index.

REPORT of the Twenty-First Annual meeting of the American Street Railway Association, held at Detroit, Mich., October 8-10, 1902. Published by the Association, 2020 State St., Chicago, Ill. The volume contains 344 pages devoted to the discussion of the street railway topics presented at the convention, together with the reports of committees, lists of officers and members and the constitution and by-laws of the association. Secretary Penington is to be congratulated on the promptness with which he has published the Detroit report.

THE ANNUAL REPORT for 1901 made by the board of regents of the Smithsonian Institution at Washington is now being distributed. It is a volume of several hundred pages, containing, in addition to a short sketch of the history and work of the Smithsonian Institution, over 50 articles, many of them illustrated, dealing in language "understood of the people" with the most interesting events and discoveries of the scientific year. The articles are nearly all prepared by masters of the respective subjects, and the volume has been called "the best popular scientific annual published in the world." The subjects treated are diversified in character and include "The Law of Nature"; the "Greatest Flying Creature"; "The Fire Walk Ceremony at Tahiti"; and reviews of the year's developments in flying machines, wireless telegraphy, trans-atlantic telephoning, the telephonograph, automobiles, sun engines, etc. The Smithsonian Reports are distributed by the Institution to libraries throughout the world and may be had by purchase at cost from the Superintendent of Documents, Washington City, and may also generally be obtained free of charge through the applicant's member of congress.

PROCEEDINGS of the Convention of the Street Railway Accountants' Association of America, held at Detroit in October last, have been issued in book form and include a verbatim report of the papers, discussions, etc., of the last convention, together with a list of attendants, the constitution and by-laws of the Association and list of members for the present year. The secretary and treasurer of the Association, Mr. W. B. Brockway, is to be congratulated upon the prompt publication of the proceedings in book form, and upon the handsome appearance of the work typographically.

CAR WASHING AND PAINTING.

Editor "Review": The article on "Car Washing versus Car Painting" in the "Review" for November 20th we are ready to applaud, as in our opinion it hits the nail on the head, only we think the writer might go further if he could look into the material some manufacturers sell under the name of "Compounds for Washing Cars." One in particular which we have in mind is composed of an alkali soap and a mineral oil, and when cars are washed with this compound the oil is never washed off entirely, and as soon as the car has run for a few hours, it is just as dusty and dirty as before, as the oil left on surfaces catches all the dust that is flying. We manufacture a dust-proof car cleaner that contains no alkali or other injurious substances that will eat into the luster of the varnish. In fact, our goods are a varnish protector and hardener. We claim for them economy of money and time. While our car cleaner is more expensive per pound than others there are but 25 to 32 lbs. of it required to make a barrel of the liquid wash. Yours truly,

Delaney Oil & Lubricant Co.

Milwaukee, Wis.

PERSONAL.

MR. HENRY WINFIELD SMITH, general manager of the Harrisburg (Pa.) & Lewisberry Street Railway Co., is a native of Lancaster County, Pa., and is the son of Joseph Smith, a farmer. His mother is a sister of Mr. Collins, a well-known Pennsylvania Railroad contractor. Mr. Smith received a good common school education, and early in life gave his attention to railroad construction, and for some years served in the construction department of the Pennsylvania Railroad. He also held the position of foreman



H. W. SMITH.

in the machine department of the Pennsylvania Steel Co.'s works at Steelton. After spending several years in railway construction work in Illinois and Texas he returned to his native state and gave his attention to the building of electric railways. His first work in this line was the building of an electric railway track across the Susquehanna River at Harrisburg. Later Mr. Smith built the Greensburg, Jeannette & Pittsburg Street Ry., with its park and famous dam, making what is said to be the largest artificial lake in the state. In this enterprise Mr. Smith won

for himself a high reputation as an electric railroad contractor. Since then he has been actively engaged in the work of promoting and building electric lines, among which may be named the Citizens' Passenger Ry., of Harrisburg, Pa.; the Carlisle & Mt. Holly Ry.; the Cumberland Valley Traction Co., Carlisle, Pa.; the Harrisburg & Mechanicsburg Electric Ry., crossing the Susquehanna River from Harrisburg to Bridgeport; the Greensburg, Jeannette & Pittsburg Street Ry., already mentioned; the railway now in course of construction at Mechanicsburg; the Harrisburg & Lewisberry Street Ry.; the projected interurban between Harrisburg and Lewisburg; the Elizabeth & Middleton Ry.; the Hummelstown & Palmyra Ry.; the Womelsdorf Electric Ry.; and the Boiling Springs & Mt. Holly Ry. Mr. Smith is also building the Steelton and New Cumberland bridge across the Susquehanna River.

MR. RICHARD STOCKTON, assistant to the president, and Mr. Frank D. Moses, chief engineer of the South Jersey Gas, Electric & Traction Co., resigned on November 1st to embark in another enterprise in New York City.

MR. C. H. DEERE was elected president of the Moline (Ill.), East Moline & Watertown Railway Co. at a recent meeting of the stockholders. The other officers are: George W. Wood, vice-president; F. W. Rank, secretary; Joshua Hale, treasurer. The officers, together with F. Y. Keator, constitute the board of directors.

MR. GEORGE M. COLE, of Plattsburg, N. Y., became general manager of the Oneonta, Cooperstown & Richfield Springs Railway Co. December 1st. Mr. Cole has had over 15 years' successful electrical railway experience.

MR. J. BEYERS HOLBROOK was admitted to partnership in the firm of Charles Henry Davis and Partners, engineers and architects, 25 Broad Street, N. Y., December 1st. Mr. Holbrook is the firm's heating and ventilating engineer. The firm has offices in New York, Boston and Philadelphia.

MR. GARDNER F. WELLS, employed by Stone & Webster, of Boston, as manager of the Brockton (Mass.) & Plymouth Street Railway Co., was transferred to Terre Haute, Ind., December 1st, to be manager of the Terre Haute Electric Co. Mr. J. Peyton Clark will continue to be general manager of the company, but his time will mostly be taken up with the development of interurban interests of Stone & Webster.

MR. C. A. TAYLOR, assistant secretary of the Northern Texas Traction Co., Fort Worth, Tex., has been elected secretary and treasurer, succeeding Mr. Geo. F. McKay, of Cleveland, O.

MR. FRED NEWMAN, foreman of the Citizens Electric Street Railway, Newburyport, Mass., retired from the service of the company November 10th and was presented with a fine Masonic ring as a token of good will from the employes.

MR. J. S. MACKENZIE, of the Toronto (Can.) Railway Co.'s offices, has taken charge of the Winnipeg Electric Power & Light Co.'s works. Previous to his departure from Toronto Mr. Mackenzie was presented with a gold chain and locket as a gift from the office staff.

MR. JOHN G. WEBB, vice-president of the Central Market Street Railway Co., Columbus, O., tendered his resignation to the directors November 11th. R. M. Emery, superintendent of the Columbus, London & Springfield Railway Co., will succeed him, and has also been made a member of the board of directors.

MR. ELLIS BURNETT, superintendent of the Citizens Railway, Light & Power Co., Newport News, Va., has tendered his resignation to accept a responsible position in a confidential capacity with W. J. Payne, president of the Newport News & Old Point Railway and Electric Co., and vice-president of the Norfolk, Portsmouth and Newport News Co., recently organized.

MR. R. S. IVES, formerly superintendent of the Chicago & Milwaukee Electric Railway Co., resigned that position November 1st. A few evenings afterward he was surprised by a band of his former employes, who presented him with a diamond ring in appreciation of his kindly regard for them during his management. It is understood that Mr. J. W. Mauck, treasurer, will serve as acting superintendent for the present.

MR. CHARLES CARROLL BENSON, who for over three years was superintendent of the Citizens Electric Street Railway Co., Newburyport, Mass., sailed for Porto Rico, November 11th, where he entered the employ of the San Juan Light & Transit Co., San Juan, as announced in the November "Review." Mr. Benson was born in Manchester, Me., June 4, 1866. His father was a contractor and builder. After completing the public school course he took a business college course at Augusta, Me. In 1886 he entered the employ of the West End Street Railway Co. of Boston, and was soon promoted to foreman of the construction gang of that road. He afterwards entered the firm of Woodbridge & Turner, contractors. After a short stay with that firm, in 1888, he entered the employ of the Thomson-Houston Co. as constructing engineer, and in that capacity assisted in installing electric equipment on a large number of lines in New England and also in the South. He was for some time with the Boston Electric Light Co. and left that position to become superintendent of the Citizens Electric Street Railway at Newburyport. He found the road in poor condition but succeeded in putting it in first class order and giving the public an entirely satisfactory service. He left with the best wishes of his fellow officers, employes and the citizens of Newburyport. He was a member of a number of social and fraternal organizations of the town. A few evenings before he departed he was summoned to the car barn where he was presented with a handsome diamond ring as a token of the esteem in which he was held by his former employes.



CHAS. C. BENSON.

MR. W. H. GRAY has been appointed manager of the Indianapolis, Shelbyville & Southern Traction Co., which now has 27 miles of road in operation.

MR. WILLIAM BROWN, who has been with the Metropolitan Railway Co., Toronto, Can., for several years, has been appointed manager and superintendent of a new company which has secured control of the Guelph (Can.) Street Railway Co.

MR. R. S. MASSON has been appointed consulting electrical engineer of the Los Angeles Railway Co., Los Angeles, Cal. The duties of Mr. Masson in this capacity will be to pass judgment upon all plans for electrical machinery and apparatus and outline the arrangement of installation. He will report to Mr. J. A. Muir, general manager.

MR. HERBERT H. VREELAND, for years the head of the Metropolitan Street Railway Co., of New York, has resigned to become president of the Metropolitan Securities Co., the holding company of the Metropolitan interests. He is also president of the Interurban Rapid Transit Co., which operates the lines absorbed in the recent Metropolitan merger. Mr. William L. Elkins is his successor as president of the Metropolitan Street Railway Co.

MR. W. C. SMITH has been appointed general manager of the Pennsylvania & Mahoning Valley Railway Co., Youngstown, O., to succeed Mr. A. A. Anderson. Mr. Smith was born near Saxon Station, Butler County, Pa. He was associated with the street car companies of Pittsburg for 20 years, and was assistant superintendent of the Citizen's Traction Co. when it was a cable line, and was later general superintendent of the Central Traction Co. When this line was absorbed by the Consolidated Traction Co. in 1896 he was appointed superintendent of transportation of that company. In February, 1902, Mr. Smith was appointed assistant general manager of the Pennsylvania & Mahoning Valley Railway Co. at Youngstown, and on the resignation of Mr. Anderson last month he was appointed general manager.

MR. H. C. REAGAN, Jr., who is at present engaged in the construction of several Ohio interurban railways, was born at Pughtown, Chester Co., Pa., Aug. 19, 1864. He received a high school education at Pottstown, Pa. Inheriting mechanical tastes from his ancestors, who were engaged in the iron and machine business, he began his career as fireman on the New York Division of the Pennsylvania Railroad and was promoted to engineer. Having given some attention to the study of electric light and power plants he entered the service of the Hestonville, Mantua & Fairmount Park Passenger Railway Co., having charge of the transportation department. Since Mr. Reagan entered the electric railway field he has held the position of chief engineer on the Quakerstown (Pa.) Traction Co., the Tarrytown (N. Y.), White



H. C. REAGAN, JR.

Plains & Mamaroneck Railway Co., the Union Railroad Co., New Rochelle, N. Y., the Easton (Pa.) Consolidated Electric Co., and is at present constructing engineer of the new power house and equipment on the Columbus, London & Springfield, and the Dayton, Springfield & Urbana Electric Railroads, and also of the power plant in the Arcade Building, Philadelphia, for the Pennsylvania Railroad Co. He is the inventor of a number of mechanical and electrical devices, among which is a third-rail system for which was granted the Edward Longstreth medal by The Franklin Institute. This system has been thoroughly tested by experts in this and foreign countries and over 40 patents have been granted on it alone. Mr. Reagan is the author of a book under the title of "Locomotives, Simple, Compound and Electric."

MR. ALBERT A. ANDERSON recently resigned as general manager of the Pennsylvania & Mahoning Valley Railway Co., Youngstown, O., after eight years' service. Mr. Anderson went to Youngstown from Indianapolis, where he had already achieved success in the electric railway field, taking charge of the Mahoning Valley Railway Jan. 1, 1894. At that time the business of the company was less than one-third as large as at present. The lines have been extended from the Youngstown system to a street and interurban system over 90 miles in length and extending to Leavittsburg on the west and Newcastle on the east. Mr. Anderson's retirement was made the occasion of a very flattering demonstration by some 500 employes, who, headed by a brass band, called at Mr. Anderson's residence at 2 a. m. Nov. 24th and presented a handsome "grandfather's clock" inscribed as follows: "Presented to Mr. and Mrs. A. A. Anderson by the employes of the Pennsylvania & Mahoning Valley Railway Co., Youngstown, O., Nov. 24, 1902."



A. A. ANDERSON.

MR. JOHN I. BEGGS, president and general manager of the Milwaukee Electric Railway & Light Co., was thrown from his buggy December 7th and received painful but not serious injuries. The accident resulted from the horses becoming frightened and bringing the vehicle in collision with a telegraph pole.

MR. J. H. VAN BRUNT has been appointed general manager of the St. Joseph (Mo.) Railway, Light, Heat & Power Co.

MR. C. W. SIMONSON, formerly with the Dayton, Springfield & Urbana Ry., has been appointed general passenger agent of the Columbus, Delaware & Marion Ry., of Columbus, O.

MR. FRANK H. BROWN has been appointed superintendent of the Plainfield division of the Elizabeth (N. J.), Plainfield & Central Jersey Railway Co. He has been employed for the last ten years as conductor and inspector on the Worcester (Mass.) Consolidated Street Ry.

MR. S. S. NEFF, who was formerly superintendent of the Chicago Union Elevated R. R., and later of the Boston elevated lines, has been engaged by W. E. Baker & Co., N. Y., as superintendent of construction and operation of their street railway enterprises. Mr. Neff has been successfully associated with numerous steam and electric railroads.

MR. GILBERT F. BROWN, general manager of the Jackson (Miss.) Electric Railway, Light & Power Co., died November 17th at his old home in Philadelphia, Miss.

In order to make the new schedule of the Winnebago Traction Co., Oshkosh, Wis., a success and to avoid the danger of possible accidents the company has established a block system. The system is considered necessary because cars on certain branch lines are expected to sandwich their trips with those of the regular cars on the main line.

A bridge spanning both the Lake Shore & Michigan Southern and the Michigan Central railroads and the Kalamazoo river has been completed for the Jackson, Albion & Battle Creek Electric Railway Co. by the American Bridge Co., of New York. The bridge is nearly 900 ft. in length. The two girders over the river are each 75 ft. long. The cost of the bridge is said to approximate \$50,000.

BIRMINGHAM NOTES.

In order that the claim department of the Birmingham Railway, Light & Power Co. may make prompt investigation of accidents on the lines of the company without waiting for a crew to come in off its regular run there has been prepared an emergency accident report which is designed to bring the important facts of each accident promptly to the head of the department in order that such action may be taken as is necessary. Each conductor and motorman is required to have a blank report in his pocket at all times when on duty and to fill it out in case of an accident and hand it to the first dispatcher seen after the accident. This blank is on heavy manila cardboard, size 4 $\frac{1}{4}$ x 9 $\frac{1}{4}$ in. The face of the card contains the name of the company, the department, and the name of the report followed by blank spaces for the Date, Car No., Line, Time, Place, Direction of Car, Number of Passengers, Kind of Accident, Name of Party Injured or Owner of Animal or Vehicle, Description of Accident, Names of Motorman and Conductor with their respective numbers. The back of the card contains blank spaces for the name and addresses of nine witnesses, and the following instructions:

"Conductors will fill out this card when there is an accident of any kind in connection with their car and hand to first dispatcher they see after accident. Motorman and conductor will both sign this report. When crew get off their run they will make out regular accident report, Form 106, and turn it in as usual. Dispatcher on receipt of this will bring to manager's office immediately."

The freight business on this company's suburban roads has so materially increased during the past few months that it was found necessary for the company to move its freight office from the heart of the city to a point further out in order to obtain more yard room. Plans are now being prepared by Messrs. Ford, Bacon & Davis for a large freight depot into which the freight cars may be run and loaded or unloaded from both sides on a platform and into a warehouse.

Until a few weeks ago the freight for Gate City and East Lake has been handled by a freight car attached to a passenger car, but owing to the increase of business along the line a special freight train is run twice daily in each direction between the city and those towns.

ACCIDENTS. --

The evening of November 10th a freight train on the Chicago, Burlington & Quincy R. R. parted, and after the first section had passed the gateman at Eighteenth St. and Western Ave., Chicago, not knowing that the train had parted, raised the gates for a street car to pass, and the conductor signalled the motorman to go ahead. Just as the motor car with its trailer were in the center of the crossing the rear section of the freight came in sight and despite the motorman's effort to cross by putting on full power the freight struck the trailer, which broke loose from the motor car and was crushed to pieces, being carried more than 200 ft. One passenger was killed and a number injured.

In an accident on the Wilmington (Del.) & New Castle Electric Ry., November 18th, one person was killed and several others injured. The accident was caused by the breaking of the rear axle, which overturned the car. There were 65 persons on the car at the time. The man who was killed was riding on the platform and was thrown under the car as it overturned.

In a collision between a fire engine and street car in St. Louis recently the engine was overturned and completely wrecked.

A head-on collision occurred between a passenger car and a coal car on the Scranton Railway Co's. line at Scranton, Pa., November 23d. One person was killed and nine were injured. The accident is said to have been caused by wet rails, fast running in an effort to make up lost time, and the failure of the conductor of the coal car to give signal to the approaching car that the turnout was occupied. The turnout is around a sharp curve from the direction of the approaching car and on a steep grade.

At Des Moines, Ia., November 27th, two persons were fatally and six seriously injured as the result of a street car collision which is said to have been caused by a broken brake, allowing one car to run down a hill nearly half a mile long and crashing into another.

An accident occurred on the Northwestern Elevated Railroad, Chicago, about 9 p. m., December 2d, in which the motorman was slightly burned and the body of the motor car almost entirely destroyed. Through some unknown cause the current was short-circuited, and blowing out a fuse in the circuit breaker set fire to the woodwork of the car.

An accident occurred on the Philadelphia & Lehigh Valley Traction Co's. line at Hatfield, Pa., on Thanksgiving day in which two persons were killed and a score of others are reported injured. It is said that in descending a grade a bolt in the brake mechanism broke and the car gained such velocity that it overturned on a curve at the foot of the hill.

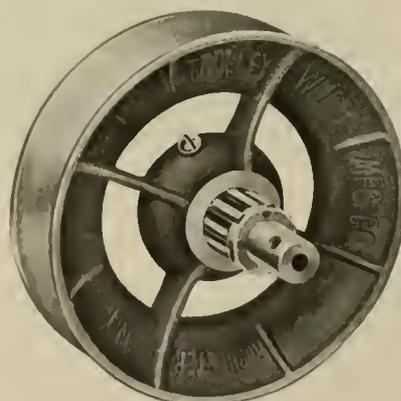
A car on the line of the Pottstown (Pa.) Passenger Street Railway Co. jumped the track on a steep grade November 27th and ran into a stone wall, fatally injuring one passenger.

At Reading, Pa., a young man riding on the front step of a crowded car was caught by a car passing in the opposite direction and rolled between the two cars their entire length. He lived only a few minutes.

THE "NATIONAL" TROLLEY.

The National Trolley Manufacturing Co. is the name of a new corporation recently organized at Rochester, N. Y., for the purpose of placing on the market roller bearing trolley wheels, bearings for car axles on both steam and street railways, and other specialties.

The "National" trolley wheel differs from the ordinary types in several particulars. Instead of being the ordinary 4-in. or 4 $\frac{1}{2}$ -in. wheel it is 5-in. and 5 $\frac{1}{2}$ -in., giving a larger contact surface, while the weight is but slightly more than the ordinary wheel, because of the open construction as shown in the accompanying illustration. The extra weight is also reduced by the use of silicon bronze material well known for its rigidity and strength. The bearing of the



"NATIONAL" TROLLEY WHEEL.

wheel, which is emphasized as the main feature, is entirely independent in its construction, being a roller bearing and of such mechanism that each single roller must be worn almost to a thread before the bearing gives out. Each roller revolves in a separate pocket and is not hung on small pivots or axles. The bearing is so placed that it is in contact with the axle on one side and presses on the surface of the wheel or hub which is incased within the bushing. This bushing is of brass and is pressed into the main hub of the wheel, becoming a part of it. Back of the bushing there is a space in the hub for an oil box which answers two purposes - lubrication and protection for the bushing against the electrical currents. The bearing is of soft steel case hardened as is also the axle, which is hollow allowing a circulation of air which tends to keep the bearing cool.

These wheels have been tested on high speed lines both in the United States and in Canada and in one instance it is reported that the bearings of a wheel that had run for 9,000 miles when examined, were found to be in perfect condition, the only wear appearing on the surface of the wheel itself. The wheels have been especially designed and are claimed to be particularly adapted to high speed lines. The National Trolley Manufacturing Co. will be glad to furnish any number of wheels for test.

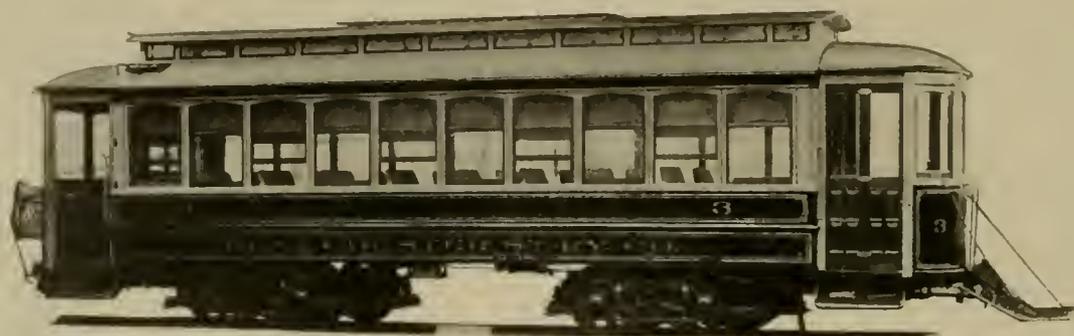
A CLEAN ACCIDENT RECORD.

In an Article on railroad management in England and the United States by Charles Hansel, C. E., which was recently published in the Railroad Gazette, the following statement in regard to accidents on railroads in the United Kingdom was made:

"The record of railroad operation in the United Kingdom for the year 1901 is phenomenal, for on a mileage of 11 per cent of the mileage of America were carried about 100 per cent more passengers and not one killed. I believe this record was made possible by the completeness of block signaling and interlocking coupled with discipline. The question of protecting traffic by block signaling and interlocking is not left to the decision of the railroad officials. It must be provided and pass the inspection of the Board of Trade. Automatic block working has just been inaugurated and owing to the congested traffic the quicker movement of trains by means of the automatic block will greatly increase the capacity of the railroads and at the same time reduce the cost of operating and maintaining signals."

NEW CARS FOR WESTCHESTER, PA.

Five handsome semi-convertible cars recently built by the J. G. Brill Co., of Philadelphia, for the Westchester Street Railway Co., are particularly fine specimens of the car builders' art. The structural features include an extra number of steel rafters in the roof, and heavy 12-in. plates, bolted to the inside of the side sills and to the bases of the posts add to the longitudinal and vertical



BRILL CAR FOR WESTCHESTER, PA.

stiffness. The interiors are finished in natural cherry with ceilings of decorated birch. The cars are 28 ft. long over the end panels, and 37 ft. 5 in. over the vestibules. The width over the sills is 7 ft. 10½ in., and over the posts at the belt 8 ft. 2 in. Each car is equipped with Brill rocking sand boxes, angle iron bumpers, "Dedenda" gongs, Brill radial draw-bars and ratchet brake handles. The trucks are Brill 27G.

GREEN BAY-KAUKAUNA INTERURBAN.

The Knox Construction Co., which was recently incorporated under the laws of Wisconsin, with G. W. Knox, of Chicago, president, and R. M. Haskett resident engineer, will begin the construction of an interurban line between Green Bay and Kaukauna, Wis., which is to be completed before the end of 1903. The preliminary work is well under way and construction will begin as soon as possible. The new road will be equipped in a first-class manner and cars will be used capable of maintaining a speed of 50 miles an hour. The power house will be built near the center of the line. Negotiations will be made with the Fox River Electric Railway & Power Co. for terminal facilities in Green Bay. If these negotiations are not successful the new company will apply for a franchise for its own line into the city.

Mr. Knox is also president of the Knox Engineering Co., of Chicago, which has under construction the interurban lines between Rockford, Ill., and Janesville, Wis.; Alliance and Canton, O., and other lines in southern Illinois and in Oklahoma Territory.

Founders' Day exercises were held at the Thomas S. Clarkson Memorial School of Technology, Potsdam, New York, Monday evening, December 1st.

ELECTRIC RAILWAY ADVERTISING.

"Nickel Trolley Rides in and About Ohio's Greatest City" is the title of an attractive folder issued by the Cleveland Electric Railway Co., which maintains an outing department under the management of Mr. J. W. Butler. Mr. Butler has at various times published a number of attractive advertising announcements and this latest folder is fully in keeping with the excellent advertising matter which has previously appeared. The folder gives a list of all the principal points of interest in and about the city and beside each point of interest named is a brief description giving its historical relation and the means of reaching the same by the electric cars; it is printed in red and green and comprises a very attractive advertisement.

RECENT STORAGE BATTERY INSTALLATIONS

The Electric Storage Battery Co., of Philadelphia, has contracted with the Cleveland Electric Railway Co. for the installation of a battery of chloride accumulators consisting of 264 elements capable of discharging at the rate of 1,200 amperes for regulating the fluctuations and maintaining the voltage during the hours of peak load. The battery will also assist in carrying the load on the Euclid Beach line during the heavy traffic of the summer months. The installation will be at Windemere, a point five miles from the power house. The company has also closed a contract with the Baltimore & Ohio Railroad Co. for the installation of a second battery of chloride

accumulators to be operated at the Mt. Royal entrance of the Baltimore tunnel. The first battery was installed in November, 1900. The railroad company has completed its plant for the electric haulage through the tunnel of both freight and passenger traffic, and for this purpose has contracted for two electric locomotives of approximately double the capacity of those now in service. The increased service necessitates a corresponding increase in power equipment, which will be supplied by the installation of this second battery. Previous to the installation of the first battery the load at times required the operation of three 500 k.w. generators. After this installation only one was required. It is estimated that even with the increased service the larger capacity in battery output will require only one generator. The total battery output will be 2500 amperes, there being added to the first battery 320 type G-25 cells.

A fire recently destroyed the new car shed of the Elizabeth, Plainfield & Central Jersey Railway Co. Eight cars were burned. The building was 40x125 ft. and supposed to be fireproof, being built of steel girders with corrugated iron roof and sides. The loss is fully covered by \$21,000 insurance.

It is rumored that H. E. Huntington, formerly president of the Pacific Electric Railway Co., contemplates spending several millions of dollars in southern California building a system of interurban railways.

The Winnebago Traction Co., Oshkosh, Wis., has adopted a block signal system. Red light signals are operated by the car conductors on passing certain points.

A SOLID RAIL BOLT JOINT.

The illustrations herewith show a general view and cross-section of a rail joint invented by Dr. O. S. Weddell, of McKeesport, Pa., that uses bolts having a solid head on each end, dispensing entirely with nuts and threads. The angle bars of this joint are securely fastened by means of special shaped solid bolts, which, after being inserted through the bars and rail webs, are tightened by moving the angle bars longitudinally along the rails, which wedges the heads of the bolts against inclined faces on the angle bars.

These joints may be cast instead of rolled, which permits several desirable features which would be impossible in a rolled joint. Instead of round bolt holes in the angle bars, there are inclined recesses in which are oblong openings. These openings are enlarged so as to permit the square shank of the bolts to be turned. Ribs are cast on the sides of the bars for the purpose of giving them additional stiffness, and the lower parts of the bar nearly meet under center of the rails. Part of this lower portion extends down between



SOLID RAIL BOLT JOINT.

the ties and contains the inclined recesses and oblong openings which contain the bolts beneath the rails. Both of the angle bars are exactly alike. The bolts are drop forged, with a square shank or body and a T-shaped head on each end. The heads are flat and of the same thickness as the shank of the bolt and about 1 3/8 in. in diameter. The holes in the web of the rails are made sufficiently large to admit the head of the bolt.

In applying this joint to the rails, bars are placed on each side of the rail so that the enlarged portion of the openings in each bar is opposite the holes in the rails. The bolts may be inserted from either side, both those through the web of the rail and those beneath it. The bolts are then given a quarter turn so that their heads will



SECTION THROUGH JOINT.

and perpendicularly and the angle bars are then moved in opposite directions. By this motion the square shank of the bolts become fully engaged in the opening in the splice bars, which will prevent them from turning down, and at the same time the heads of the bolts will ride upon the wedge shaped portions of the bars adjacent to the openings. By driving the bars along the rails in opposite directions with a sledge the joint is made tight and firm, after which each bar is spiked to the tie through notches in its base. If the joint should need to be tightened at any time the spikes may be drawn from one of the angle bars, the holes plugged and the angle bar driven up tight again and spiked.

Contraction and expansion of the rails is provided for by the holes through the rail being larger than the body of the bolt.

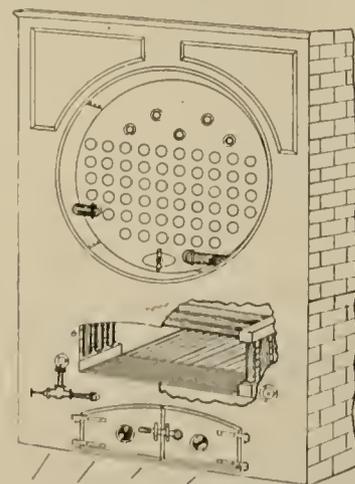
CEDAR RAPIDS-IOWA CITY PROPOSED INTERURBAN.

The Cedar Rapids, Iowa City & Southern Railway Co. obtained a charter a year ago to build a 25-mile electric interurban between the cities named in the title. This will be pre-eminently a freight line, connections for through traffic being made at Cedar Rapids with the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul and at Iowa City with the Rock Island system. It is the expectation of the promoters to bill stock and grain through direct to their market destination by special arrangement with the steam roads. The company will own stockyards along the route of the interurban, where the freight consignments will be collected for shipment.

Power for the operation of the electric line will be furnished by the Cedar Rapids Electric Light & Power Co., which, though a separate company, is allied with the interurban interests. Three passenger cars and baggage and express cars will be run between the termini. More definite details of the service have not been arranged as yet. The company is in course of organization and is financing its project. It was chartered under the general railroad laws, and has secured a perpetual franchise in Iowa City and all rights of way. A franchise in Cedar Rapids for 25 years has also been obtained. The officers of the Cedar Rapids, Iowa City & Southwestern company are: W. G. Dows, president; W. J. Greene, vice president; and T. B. Smith, secretary and treasurer, all of Cedar Rapids.

LAMPREY PROTECTIVE ARCH PLATE.

This device, which is shown in the accompanying illustration, is made by the Lamprey Co., of Westfield, Mass., and is designed to protect the brickwork and the boiler front from the intense heat of the furnace and to utilize the heat thus diverted. By this means it is aimed to avoid burned out door plates, cracked boiler fronts, etc. The system of pipes around the sides and tops of the openings through the brickwork of the boiler settings may be connected into a



LAMPREY PROTECTIVE ARCH.

feed pipe or be arranged as a circulation attachment to the boiler. By the former method the feed water is heated before its admission to the boiler while with the latter a continuous circulation of water to and from the boiler is maintained, the pipes in either case delivering heat to the feed water, which would otherwise be wholly or partially lost. This absorption of heat which is usually allowed to escape by radiation has the effect of reducing the boiler room temperature. Removable blocks are conveniently located to provide for cleaning and the device is applicable to all types of brick set boilers. The piping connections are easily arranged to suit any special connection.

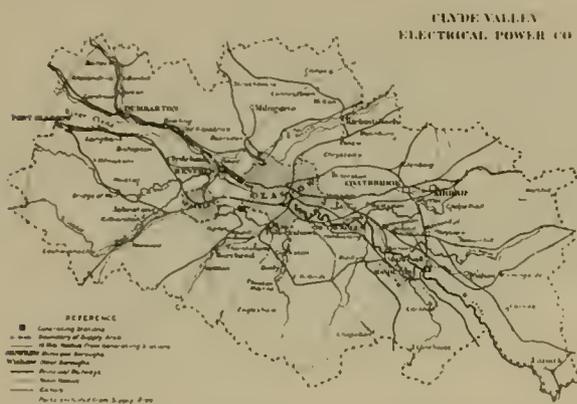
The Western Reserve Traction Co., with a capital of \$10,000 will build an electric railway from Warren to Kenilworth, O.

POWER DISTRIBUTION NEAR GLASGOW, SCOTLAND.

A bill has recently been sanctioned by Parliament, giving authority for an extensive power-distribution scheme contemplating the supplying of power to the industrial region of the lower Clyde River in Scotland. The district covered by the bill includes that part of the Clyde Valley extending about ten miles on each side of the river and about twenty miles up and down stream from Glasgow. The area covered is about seven hundred square miles, and three generating stations will be erected to meet the demand for power. The scheme has been promoted by a group of manufacturers who desire to obtain cheap electrical power and who realize that this can be better done by joining in a common system than by each putting down his own generating plant.

This is the busiest part of industrial Scotland and contains about twelve hundred industrial plants, many of which are large iron and steel works, coal mines, shipbuilding yards and chemical works. Some of these will alone require more power than many of the local municipalities now provide for lighting purposes, and it was easily shown that it would be inadvisable for the separate boroughs to attempt to supply an amount of power involving so large an expenditure of capital.

The three generating stations are to be built at Motherwell, Yoker and Crookston. The Motherwell station is located in the neighborhood of a large number of manufacturing works and in the center of an extensive coal field and can be connected with the adjoining



ELECTRICAL DISTRIBUTION NEAR GLASGOW.

line of the Caledonia Railway. It is, also, in close proximity to the river Clyde, from which water for steam and condensing purposes may be obtained.

The Yoker station is also situated on the Clyde, near the line of the Lanarkshire & Dumbartonshire Railway, and is in close proximity to a large number of shipbuilding yards, works and docks. Authority has been obtained to lay cables across the Clyde from Yoker to Renfrew, which will enable the works at Renfrew, and other works on the south side of the river, to be supplied from this station.

The third generating station will be situated near Crookston, on the Glasgow & Southwestern Railway Canal line; but, owing to the arrangement allowing the company to cross the river, it will not be necessary to construct this station immediately.

The works from which the most urgent demands for power have been received are situated in the areas immediately surrounding the first two sites and it is intended, therefore, to proceed with these stations first and to install in each a plant of about 4,500-kw. capacity. They will be so designed that they may be enlarged from time to time, as the demand requires. A radius of 14 miles from these stations covers practically the whole district in which the company will be allowed to distribute its power, but a large proportion of the works are located within a radius of six or seven miles of the stations. When the stations are in operation they will probably be coupled together electrically, enabling them to share the loads and average up their power factors or to supplement or aid each other in any emergency. The capacities of the respective stations will ultimately be about 10,000 kw. each at Motherwell and Yoker, and 5,000 kw. at Crookston. By utilizing cheap sites for the stations

outside of towns and near to the coal mines, it will be possible to generate power at a very low cost. Of the 710 square miles covered by the scheme, only 13 are at present supplied with electricity. It is said that over 300 manufacturers petitioned in favor of the proposition, and it is thought that many of the remainder petitioned in favor of the rival Caledonian scheme which was turned down. The carrying out of this mammoth system of power distribution will place the manufacturers of Glasgow on a footing to be compared to that of American manufacturers who are so fortunate as to be within range of our cheap water powers.

The authorized capital of the Clyde Valley Electrical Power Company is \$4,500,000, with borrowing powers of \$1,500,000. The total cost for plant on the transmission lines is estimated at over \$2,000,000. The electrical apparatus, which will comprise polyphase alternating-current generators and transformers for high-voltage power distribution, rotary converters for the supplying of direct current, etc., has been contracted for with the British Westinghouse Electric & Manufacturing Co. Messrs. Strain & Robertson are the engineers of the Clyde Valley Electrical Power Company. Mr. Robert Robertson has recently spent a considerable period in the United States investigating systems and methods of power transmission and distribution, particularly in the large cities and in such localities as Niagara, Snoqualmie Falls, Wash., Canyon Ferry, Mont., and other places.

ADVERTISING LITERATURE.

THE RODGER BALLAST CAR CO., of Chicago, has issued a handsome catalog under the title "Multi-Service Cars," describing and illustrating the various types of the Rodger ballast car and the Hart convertible car built by the company. The catalog contains 60 9 x 12-in. pages. The illustrations are so complete as to require very little reading matter, as the following preface will indicate: "Only 6 minutes are required to read the printed pages—it is worth your time." The cars are all classified and the illustrations show the methods of operation of each. A list of 74 of the leading railroads in the United States using the Rodger cars is given.

THE WHITING FOUNDRY EQUIPMENT CO., Harvey, Ill., has issued a new catalog No. 36, size 6 x 9-in., 124 pages, superseding Nos. 21 and 32. The catalog illustrates and describes a large variety of cranes and travelers built by the company and operated by hand, compressed air and electric power, up to 100 tons capacity.

THE SHELBY STEEL TUBE CO., Pittsburg, Pa., has issued under date of November 1st a new price list of Shelby cold drawn seamless steel tubing.

THE ATLAS CAR & MANUFACTURING CO., Cleveland, O., in distributing catalogs No. 1008, containing 48 6 x 9-in. pages, describing some of the cars recently built by the company for use in and about brick yards and cement plants, and No. 1012, 10 6 x 9-in. pages, illustrating some of the industrial railroad equipments, such as cars, trucks, switches, turntables, etc., made by the company.

GRAPHITE, published by the Joseph Dixon Crucible Co., Jersey City, N. J., for December, contains among others an interesting article on "Force Feed Lubrication," and also one on "Experiments in the Use of Dixon's Graphite in Air-Brake Equipment," by Prof. W. F. M. Goss, of Purdue University. "Dixon's Graphite Facings" is the title of a booklet, published by the same company, which gives some useful information about the uses of graphite in the foundry.

THE DE LAVAL STEAM TURBINE CO., 74 Cortlandt St., New York City, has issued bulletin No. 2 illustrating and describing the direct current turbine-dynamos ranging in capacity from 1½ to 300 h. p. It is claimed for these machines that the units are absolutely self-contained, free from vibration, occupy an exceedingly small space, and have an economy as good or better than the best compound condensing engine. The bulletin contains much information for persons interested in the application of the steam turbine to driving electrical machinery.

"STEEL CASTINGS" is the title of an illustrated catalog 6 x 9-in., 16 pages, issued by the American Brake Shoe and Foundry Co., New York and Chicago. The advantages of the "Tropenas" process of making cast steel are set forth and several hundred castings more or less complex are illustrated. The company's plant is at Chicago Heights, Ill.

NEWS OF THE MONTH.

Through car service was established between Boston and Lowell, Mass., November 17th, by running the vestibuled cars of the Lexington & Boston Street Railway Co. from the Sullivan Square Elevated Railway Station, Charlestown, over the surface tracks of the Arlington Heights, Lexington, Bedford, Billerica and Lowell, a distance of 22 miles. A 30-minute schedule has been established at a speed of 10 miles per hour. The fare between Boston and Lowell is 25 cents. Crews are changed at the end of the line of the Boston Elevated Railway Co.

The plans originally outlined by the Massachusetts railroad commissioners for investigating the street railways in other states has been considerably changed because of the illness of Mr. White and the demands of the regular business of the board on Mr. Jackson, the chairman. Accordingly, Mr. Bishop has visited St. Louis, Detroit, Chicago and other western cities alone. It is the intention of the three members of the board to make another trip of inspection, if it is possible for them to do so before their report to the legislature, which is due about the middle of January. It is generally believed that this year the board will ask for a greater power of supervision over street railways and will also take up the matter of workmen's tickets for street railways.

On December 5th the Rhode Island Senate passed an amendment to the 10-hour law, enacted at the last General Assembly, which allows all employes of street railways in the state to contract with the officials for as many hours of work daily as they desire. The 10-hour law took from the street railway employes the right to contract for work lasting more than 10 out of 12 consecutive hours. The law was vigorously contested by the street railway corporations as being unconstitutional.

The boycott instigated by the 'Trades' Assembly of Schenectady, N. Y., against the Schenectady Railway Co. for the purpose of forcing the 250 employes of the company to form a union has proved an utter failure.

The New Jersey & Hudson River Railway & Ferry Co. has secured control of the Newark & Hackensack Traction Co. by the purchase of a majority of the stock and bonds of the company.

Sleet seriously affected the operation of the electric lines of the Manhattan Elevated, New York, on December 5th and 11th.

While sleeping cars are reported to have been ordered by at least two interurban roads, the record for births in street cars lies with Jersey City, N. J., one having occurred in that city on December 1st.

Rioting occurred in West Chester, Pa., and the street railway cars were attacked because the employes refused to join in a sympathetic strike.

Citizens of Chester County, Pennsylvania, are much alive to the advantages of trolley freight service and the members of the Legislature from that county have pledged themselves in favor of all measures calculated to extend this service.

Plans for a consolidation of the Cleveland, Elyria & Western Railway Co. and the Cleveland & Southern Railroad Co. were agreed upon December 9th. The new company will be the Cleveland & Southwestern Traction Co., with a capital stock of \$5,000,000. This company will also purchase the Norwalk Gas & Light Co. A. H. Pomeroy will probably be president of the new company.

The Cleveland (O.) City Railway Co. will build a \$40,000 car house near Woodlawn Hills Ave and Kinsman St. to hold 200 cars.

The Columbus (O.), Delaware & Marion Electric Railroad Co. has put its interchangeable mileage books on the market. The books are good for travel on any of the traction lines out of Columbus; also on the Dayton, Springfield & Urbana Electric Ry. One thousand mile books are sold for \$12.50 and 500 mile books for \$6.25.

The Cincinnati, Georgetown & Portsmouth R. R., operated as a steam railroad since 1877, has been changed for electric traction, regular operation commencing December 1st.

The Houghton County Street Railway Co. began the operation of car service between Laurium and Lake Linden, Mich., on December 1st. The Detroit, Monroe & Toledo Short Line Co. has been organized with a capitalization of \$3,000,000 for the purpose of acquiring the property of the Toledo & Monroe Ry. and extending it to Detroit.

The Rockford & Interurban Railway Co. has established an express service and is also doing a good business in the transporta-

tion of milk over its line. The cost is about one cent a gallon, including the return of empty cans.

The Chicago, Burlington & Quincy R. R. has discontinued its suburban service between Moline and East Moline, Ill., since the Moline, East Moline & Watertown electric line commenced operation.

Over 2,000 persons from Urbana and Champaign, Ill., made use of the new interurban line between those cities and St. Joseph, Ill., Sunday, November 23, though only two motor cars and one trailer were available for service.

A strike of trainmen of the Bloomington (Ill.) & Normal Railway Electric & Heating Co. was declared November 16th and compromised on the 20th.

It is announced that the Metropolitan Street Railway Co., of Kansas City, will spend \$5,000,000 in improvements next year. New rails are soon to be ordered for proposed extensions and 100 new cars will be ordered for delivery next summer.

The stockholders of the old Chicago South Side Rapid Transit Co. have tendered their stock to the city. Their attorney, C. A. Monroe, claims that while the Supreme Court has decided that the present company is the rightful owner of the property, it is not entitled to the franchise and that the city should receive \$200,000 a year for the use of the streets and alleys used by the company.

A rehearing in the Illinois Supreme Court of the case of the City of Chicago v. the Chicago Union Traction Co., wherein it was held that it was the duty of the company to clean the streets on which it had a franchise, was denied December 3d.

A verdict of \$225 damages was awarded a passenger for the loss of a telescope by theft from the rear platform of a car of the Consolidated Traction Co., of Chicago. In a former suit she was awarded \$100. The company has made a motion for a third trial.

Sixteen street car men implicated in the recent strike in New Orleans have been indicted on the charge of interfering with the United States mail.

The Beloit (Wis.), Delavan Lake & Janesville Electric Railway Co. ran its first car into Janesville December 8th.

The "Jim Crow" law recently enacted in Louisiana has been declared unconstitutional on the ground that none but judicial officers may determine whether a person is a negro, and also that the law failed to fix a maximum penalty for its violation.

A strike of the electrical workers and linemen of the San Antonio (Tex.) Traction Co. was declared December 4th, but settled by arbitration on the following day.

December 1st the trainmen of the Houston (Tex.) Electric Street Ry. struck for an increase of one-third in wages and recognition of the union; after four days a compromise was effected and a scale of 18, 19 and 20 cents, according to length of service, instead of 18 cents.

It is announced that the wages of the street railway employes of Dallas, Tex., will be advanced January 1st.

The coming carnival of the La Fiesta de las Flores at Los Angeles, Cal., will have a magnificent trolley parade. Fifteen special floats representing blooming flowers in gorgeous incandescent outline will be one of the features.

At a recent election in Winnipeg, Man., the proposal of running cars on Sunday was defeated by a majority of 409 votes in a total of 4,728 cast.

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THE KOERTING GAS ENGINE.

The discovery that gas of low thermal value could be used effectively in gas engines has resulted in a growing demand, particularly in Europe, for gas engines of greater capacity, 1,000 h. p. and upwards, and in consequence a great deal of attention has been given abroad to improving this class of prime mover. The gas engine is also receiving more consideration in America, and arrangements have lately been made to manufacture in this country a new type of gas engine invented by Mr. Ernest Koerting. The Koerting gas engine will be built and sold by the De La Vergne Refrigerating Machine Co., which is the sole licensee for the United States.

The Koerting engine is radically different in design from the gas engines with which most of our readers are familiar in that it is double acting; also the engine has a two-stroke cycle, scavenging being accomplished by the admission first of air, and later of the working charge of mixed gas and air, to the cylinder while the

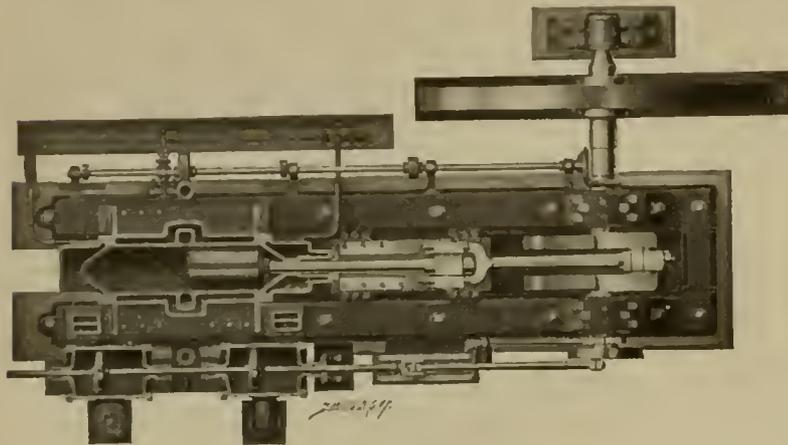
inlet valve is uncovered, thus entering the fresh charge into the cylinder and forcing the burnt gases from the cylinder.

The mode of operation and the general design will be apparent from the accompanying illustration and the following description.

The engine is double acting, with the crank and lead ends of the power cylinder similar, the admission valves are located in valve boxes bolted to the cylinder heads. The products of combustion escape through ports cast in the middle of the cylinder from which point the exhaust pipe leads, the piston itself being the exhaust valve. For this purpose the piston is made very long and is packed at each end by self-closing spring rings.

The combustible mixture is delivered through two double-acting auxiliary pumps, one for gas and one for air. These pumps are so proportioned that their combined action is intended to introduce into the working cylinder the proper mixture necessary for perfect combustion. The pumps compress both the gas and air to about 9 lb. per sq. in.

The illustration shows a horizontal section with the piston at the outer dead point, and that the exhaust ports open to the head end of the cylinder. When the piston begins to uncover the exhaust ports, the pressure of the residual products of combustion in the cylinder drops



THE KOERTING GAS ENGINE.

rapidly to that of the atmosphere and the greater portion of the gases leave the cylinder; after this has taken place, the inlet valve is opened and a fresh charge admitted by the pumps. The valve gear of these is so designed that air only is supplied at first (this being to separate the burnt gases from the succeeding mixture) and afterwards gas and air, mixed in proper proportions.

The combustible mixture of gas and air is produced only at the inlet of the cylinder. There is no storing of the gases after being mixed and by suitable construction of the admission device, mingling of the air first introduced with the burnt residue gases, or with the succeeding charge of the combustible mixture, is designed to be avoided. This also prevents loss of the mixture through the exhaust ports, which are open during this period.

On the return stroke, shortly after the exhaust ports are again covered by the piston, the air and gas pump pistons arrive also at the ends of their respective strokes, and the supply of mixture is cut off. The inlet valve closes and the charge is compressed in the cylinder until at the end of the stroke ignition takes place. The working stroke with combustion and expansion then succeeds, release taking place when the piston again uncovers the exhaust ports.

In order to secure the separating layer of air above referred to, between the hot consumed gases and the fresh charge, the gas pump is so designed that no gas is delivered until after a definite point in its compression stroke. The pump has piston valves with the valve gear so designed that the maximum capacity of the pump cannot exceed 50 to 60 per cent of the total piston displacement. This is effected by leaving the gas suction port open during a portion of the compression of the pump so that the gas can escape. The amount of gas furnished is thus made to correspond to the maximum power of the engine.

When the load on the engine is reduced, the gas pump begins to furnish gas at a correspondingly later period, thus discharging a diminished quantity of gas into the working cylinder. This regula-

tion is effected either by the valve gear of the pump and controlled by the governor, or by a by-pass located between each pump end and the compression channel which leads to the inlet valve on the main cylinder. The throttling device in this by-pass is also under the control of the governor.

The engine operates with a variable amount of the mixture, and correspondingly more or less air is sent into the power cylinder. The idea is to keep the air near the middle of the cylinder, while the combustible mixture remains at the heads of the cylinder near the inlet valves and igniters.

For the ignition there are provided two spark coils at each end of the power cylinder, which are operated by a separate shaft, driven by spur gearing from the cam shaft. The gear of the igniter shaft is connected with a sleeve having a feather, which is set helically around the shaft so that by a sliding movement of the wheel the igniter shaft may be set behind or in advance of the cam shaft, and the time of ignition can be varied during the running of the engine to suit the kind of gas being used.

The engine is started with compressed air, air being admitted at both ends of the cylinder, as in a slide-valve steam engine, by a piston valve operated from the cam shaft by an eccentric which may be thrown in or out of gear. Filling the cylinder with air twice is generally sufficient for starting up.

The power cylinder and piston are cooled by circulating water, which in the case of the piston enters the tube carried through the cross-head pin in the hollow piston rod, and returns the same way, but on the outside of the tube. The stuffing boxes in the cylinder heads are surrounded by water. The cylinder walls are cooled throughout except at the middle where the exhaust ports are located.

REMOVAL NOTICE.

On and after Feb. 1st, 1903, the Stewart Hartshorn Co. will have its New York stock rooms at No. 7 Lafayette Place, New York, one block east of Broadway, between Great Jones St. and East Fourth St., a central location for all interested. For the last 34 years Hartshorn shade rollers have been carried in stock at 486 Broadway, a location well known to the trade, and al-

though it is a rare thing to see old firms move, it was deemed best by the company in this case. Trade has been increasing, and also the demands for the many improvements which the Stewart Hartshorn Co. has brought into the construction of the shade rollers and accessories, and in order to carry the stock needed for immediate shipment in New York it was found necessary to acquire much larger store rooms.

At No. 7 Lafayette Place the main store room is on the ground floor, besides which the company will also occupy the basement, which is light, dry, well ventilated and equal in area to the main store room. This gives more than double the space formerly occupied so long on Broadway, and here will be carried a full line of new groove tin and improved wood rollers, as well as the older styles of Hartshorn shade rollers which are still called for by some dealers. Besides these a full line of shade roller brackets, pin ends, shade clasps, bottom roller clips, catch pulleys, etc., will be found, also models showing the various methods of placing shades properly in position.

To these new stock rooms the Stewart Hartshorn Co. cordially invites its friends. With more room and fuller stock, quick demands can be promptly met. In future, as in the past, large shipments will be made directly from the company's factories in East Newark.

The Consolidated Railway & Power Co., of Salt Lake City, Utah, has recently installed a 50 h. p. air compressor for the purpose of supplying air to be used in cleaning cars and other work at the East Second St. car barns. The company has received six new cars from the Laeclde Car Co., of St. Louis. The cars are equipped with air brakes, fenders, trolley catchers, etc. Seven hundred tons of 60 lb. steel rails have also been received and will be put down as soon as the weather permits.

CARNEGIE LIBRARY OF PITTSBURGH



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