

Street Railway Journal

Vol. XXI.

NEW YORK, SATURDAY, MARCH 14, 1903.

No. 11.

PUBLISHED EVERY SATURDAY BY THE
McGraw Publishing Company

MAIN OFFICE:

NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:

Chicago: Monadnock Block.

Philadelphia: 929 Chestnut Street.

Cleveland: Cuyahoga Building.

London: Hastings House, Norfolk Street, Strand.

Cable Address, "Stryjourn, New York,"—Lieber's Code used.

TERMS OF SUBSCRIPTION.

In the United States, Canada and Mexico.....\$4.00 per annum
Single copies, first issue of each month, 25 cents; other issues, 10 cents.

To all Countries outside of the United States, Canada and Mexico... }
\$6.00
£1-5s
M 25
Fr. 31

Single copies, first issue of each month, 40 cents; other issues 15 cents.

Subscriptions payable in advance, by check or money order. Remittances for foreign subscriptions may be made through our European office.

Entered as second-class matter at the New York Post Office.
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Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

All matter intended for publication must be received at our office not later than Tuesday morning of each week, in order to secure insertion in the current issue.

Address all communications to

THE STREET RAILWAY JOURNAL,
114 Liberty Street, New York.

Sub-Stations on Interurbans

A short article in another column, on the sub-station practice carried out by F. B. Perkins in interurban work near Toledo, Ohio, calls attention to the fact that there are at the present time two rather opposite tendencies in the design of distributing systems for interurban roads using alternating-current transmission. One tendency is to make each sub-station a very large and important factor in the operation of the road, putting in several large units, providing reserve apparatus and employing skilled attendants to give the sub-station constant attention, and with both day and night shifts. The other tendency, which is probably best represented by the practice mentioned at Toledo, is to make the sub-stations small and frequent, and to have them looked after by station agents who live at the sub-stations, and who give the greater part of their time to other than sub-station operation. Since these sub-stations are small the temporary shut-down of any one of them is not a serious matter, and this fact in a large measure compensates for the uncertainty introduced by not having a skilled attendant regularly on duty at each sub-station. There are no very elaborate duties involved in the attendance of the apparatus in a sub-station where but one converter unit is installed, especially if an experienced man can visit the sub-stations at regular intervals.

The portable sub-station, which is becoming very popular, practically does away with the necessity for reserve units at a sub-station, because the portable sub-station can be usually put in operation as a reserve unit at any sub-station at very short notice. For economical power service to interurban lines of the ordinary type, where the traffic is not so heavy but that many economies are justified, the practice adopted by Mr. Perkins offers a considerable saving in cost of power service. It is likely to be the case (present fashions to the contrary notwithstanding) that an alternating-current distribution system from one power house offers no very enormous gain in economy by the time it gets current to the cars over a number of simple, well designed and well taken care of direct-current power stations located at short distances along the road. The alternating-current distribution must usually be worked in the most economical manner to show a saving over a number of good direct-current power houses for accomplishing the same purpose.

Transportation at St. Louis Exposition

The report of C. V. Weston, who was selected as consulting engineer to draw up a comprehensive plan for an intramural electric road for the Louisiana Purchase Exposition next year, has been completed and is in the hands of the exposition authorities. And now comes the announcement that there is a possibility that automobile service will be substituted for electric railway transportation inside of the grounds. It seems beyond comprehension that such a plan could be seriously considered even for a moment, and we can only say that it would be a great handicap to the exposition should anything but the most efficient means of local transportation inside of the grounds be adopted, and it would certainly be the height of folly to rely upon automobiles at this stage of their development.

While it may be desirable to experiment with automobiles as means of public conveyance, it is hardly in order to do so on such a scale, and at the expense of public convenience, as would be necessary if automobile lines were substituted for electric railway transportation at St. Louis. This matter of local transportation, in such an enclosure as is included by the Louisiana Purchase Exposition, is not a small matter, to be given brief consideration by those interested in the success of the exposition. A lack of intramural transit facilities would hinder greatly the proper appreciation of the exposition by the public, as was evidenced in the case of the Pan-American; and it is to the public that the exposition must look for its success. When it is known that the engineer's plans for an intramural electric railway call for over 5 miles of single track, in the form of a continuous loop around the grounds, and that this extent of trackage is necessary in order to convey passengers between the principal points of interest, it must be realized that the matter of transportation is going to be a very important one.

Where are the automobiles that can carry passengers this distance in twenty minutes at the rate of 10,000 people per hour? Even if automobiles could furnish an equivalent service, where are they to run? If operated on the public walks of the exposition they would be an unmitigated nuisance and endanger

the lives of pedestrians. On the other hand, if separate roads are to be constructed for automobiles we doubt very much whether the cost of road building, plus the cost of the necessary number of automobiles, will be below that of a first-class electric road, as laid out by Mr. Weston, and certainly the operating expenses of the automobile line would be greater than the electric. The electric railway is the cheapest and safest means for the transportation of large numbers of people for short distances that is known to man, as is demonstrated by the phenomenal development and universal adaptation of this means of transit throughout the civilized world.

If automobiles are to be experimented with, why not select some less important place as a beginning; in other words, "try it on the dog." Don't jeopard the success of the exposition by withholding proper transportation facilities on the grounds. We do not take this position because of any desire to lessen the importance or possibilities of automobiles for certain classes of work, nor is it necessary, in this day and generation, to secure the adoption or permission to erect an electric railway at the St. Louis Exposition for purposes of demonstrating what the heavy electric railway can do. The intramural at the World's Fair at Chicago performed that service for the electric railway industry. From that beginning electric traction has made a clean sweep of the elevated roads of America. If adopted at St. Louis it will simply be a means of well-known efficiency to serve an end—serving a commonplace end, to be sure, but a very important one, none the less. There is no other means at present known that can handle such a large number of people per hour with such efficiency.

Development of the Pleasure Resort

The history of the pleasure resorts maintained by electric railway companies has been an interesting one in the last ten years. Some of the earlier pleasure resorts had many of the same characteristics as the earlier electric roads—being of mushroom growth, hurriedly established and not of a character to attract permanent traffic. Eight or nine years ago there was probably a much stronger tendency to spend a great deal of money on cheap, temporary attractions for electric railway pleasure resorts and less on permanent improvements than there is at present; not that the summer theater and out-door vaudeville entertainment has been entirely superseded, but it has not the all-important place among street railway pleasure resorts that it once had. A review of the pleasure resorts maintained by the electric railway companies of the country shows that the present tendency is to maintain parks more on the order of the best city parks than was customary a few years ago. The tendency is undoubtedly the outcome of a study of public tastes and also a study of the financial balance sheet. Vaudeville entertainments and various theatrical attractions involve a constant outlay during the season, and unless they are of a character which will attract large crowds or pay for themselves by an extra charge for admission, it means that the pleasure resort business will leave little profit for the company at the end of the season. There is undoubtedly a tendency to secure the very best and highest class attractions at some of the larger parks. These are good enough so that the public will not only come to the park to hear them, but is willing to pay a reasonable price of admission after arriving there. This is not true of the cheaper attractions, as it is expected that they will be included in the price of car fare. A great many of the parks of to-day have no attraction in the way of entertainment, and are maintained simply for the purpose of giving the electric railway patrons a desirable objective point for an outing. To

a large class of people nothing appeals so much as a chance to escape from noise and crowds, which are the natural outcome of the "Coney Island" style of pleasure resort. To another class, very large, especially in some mining and manufacturing districts, the heterogeneous conglomeration of noise and diversion peculiar to the Coney Island style is just the thing. Each manager can learn what the class of people he deals with likes the best, and make his plans accordingly. Sometimes a combination of the two methods can be made in the same park. On lines running out from moderately large cities it may not be a bad idea to have two or more resorts of different character, so as to cater to the tastes of both of these classes of people.

The resort situated along the line of an interurban road is essentially different from one reached by city lines. The traffic coming over the interurban is seldom sufficient to justify the maintenance of costly entertainments. The distances are too great, and the fares too high for that. The interurban park must be rather in the nature of a picnic ground—a place for private picnics, camp meetings, summer conventions and the like. It must be on an attractive site, but beyond keeping in order and the maintenance of a few conveniences should cause no expense to the company. Distances and fares are too great and rolling stock too limited to permit of taking great numbers to evening or afternoon entertainments at such parks.

Feeding Interurban Lines

In a recent issue we presented a very important series of tests on an interurban electric road fed on the booster system. The results were exceedingly satisfactory, and the power house expense proved to be remarkably low for a road of the class and size under consideration. We earnestly wish that similar reports of exact tests might oftener be made public, for they are immensely instructive and give a clearer idea of modern power house practice than can otherwise be obtained. More particularly we would like to see a similar test of a line of approximately the same character operated with high-tension feeders and sub-stations. We very much doubt whether it could show a result equally good. The performance of the Dayton & Troy system reflects great credit on the good judgment of the engineers.

We have often taken occasion to remark the need of individual treatment of interurban problems rather than the following of any set method of procedure, and the present is a case admirably in point. There is a constant tendency to exaggerate the future of a local enterprise and thereby to be led into the use of metropolitan methods in places entirely unsuitable. If one were to stop and reflect a bit he would realize that there is a limit to the practical possibilities of any given section of country within the time covered by the life of any commercial enterprise. Ten years ago, for instance, the real estate boom swept over Southern California, a region of rare natural advantages, and streets and house lots were laid out for a population of perhaps 25,000,000 people, when there were only, say, 2,500,000 on the entire coast from San Diego to Seattle.

The same sort of thing is often done in planning transportation facilities, with a similar disastrous result. There is a certain temptation to plan the interurban line between two small cities with a view to its soon becoming an integral part of the great Eastport & San Diego Electric Railroad, unmindful of the fact that before the latter is built electric traction may be out of date, and flying machines in vogue. There is a certain inability to get nearby objects in their true perspective, which continually crops out in human nature. When an interurban line is to be built the whole problem of its construction turns

on the kind of work that it will probably do, and the shrewd engineer will cut his coat according to the cloth at hand.

As to methods of feeding, high voltage transmission, boosters, multiple stations and plain feeding each has a proper and legitimate place in the art, and we could, without difficulty, point out instances in which each of these methods has been woefully misused. The booster system is at its best in just such a case as the one described, but it might be inadvisable to use it elsewhere in a case apparently similar. For instance, we have in mind an electric line a dozen miles long fed by boosters at a very serious loss, while at the distant terminus is a car house where a man, fully capable of tending a rotary converter without added assistance, is kept continually on duty to look after certain machinery there operated by the railway company. The high-voltage system would undoubtedly be the proper one to use in that instance, but the circumstances are peculiarly favorable to it. Another system of roads within our ken is operated by a most elaborate high-voltage system, whereas, under the conditions which exist, separate stations, with some assistance from boosters, would give a very much better economic result and far more reliable service. The difference between mediocrity and skill in engineering lies in the quick recognition of the economic conditions and in prompt action thereon, irrespective of precedents.

The Dayton & Troy plant is notable for several things beside the shrewd use of boosters. It appears to have been deliberately planned to utilize a low-grade fuel for all it is worth, and the results are certainly most striking. The boilers were planned for an evaporation of 7 lbs. of water per pound of coal, instead of a theoretical 11 or 12, and the low-grade fuel is put to good use. Every year this matter of fuel cost gets more serious, and it is very important to bear the quality of fuel in mind in designing the plant. In the present state of the art engines and dynamos are within limits fixed quantities as to efficiency, and the biggest chance for economy lies in the boilers and furnaces, which must be fitted to the fuel on one side just as they are fitted to the engines on the other. The engineer who would never dream of using non-condensing engines where water was available will often lay out a boiler plant entirely unfitted to deal with the fuel which would actually give the best economic result. It is very easy to waste in the furnace far more than can be saved on the engines. As to distributing the electrical energy once it is generated a method can be found to suit any case in hand, but the same method will not do for every case. The great difficulty with economical distribution of power for electric railways lies in the limitation of the voltage on the working conductors. None of the schemes for raising this limit has as yet been worked into satisfactory practical shape for general use. In fact, it is very likely that no general method can be devised, but that the rapidly diverging classes of electric railways will have to be treated each upon its merits. Nearly all the present schemes of distribution aim to deliver the same fixed voltage upon the trolley wire or the third rail, while the really serious limitations lie in these working conductors themselves. Even now third-rail roads have often to deal with very inconveniently great amounts of current, and the moment heavy trunk line work is attempted the troubles, now only annoying, take on a most forbidding aspect. To be sure, we have not yet evolved the electric trunk lines, but their coming hinges more upon the difficulties of current supply than upon any other one thing. In particular, our dear old friend, the hundred-mile-an-hour line, is waiting patiently by the wayside for further improvements.

Weight of Rails for Interurbans

Elsewhere in this issue Mr. Gonzenbach, in dealing with the engineering preliminaries of an interurban electric railway, calls attention to several facts in regard to weights of rail, which seem to be frequently overlooked. One of these is that in steam railroading the rails are subjected to as high as 40 tons per axle, while in interurban electric work there are no cars as yet which have over 45 tons distributed among four axles, and the majority weigh less. The selection of very heavy rails for the average run of interurban work, therefore, is not advocated by Mr. Gonzenbach, and he calls attention to the girder rail which weighs 137 lbs. to the yard. This rail was rails.

Rails are the most expensive item going into the construction of a roadway. We have sometimes seen on steam roads very heavy rails laid on a poorly ballasted track, and the results, as far as the passengers and rolling stock were concerned, were much worse than if the amount of money spent on the extra heavy rails had been devoted to ballasting and securing good alignment of track. The weakest point in a track is the joints; and the selection of heavy rails is usually governed by the probabilities of joint depreciation. There is no doubt that the heavier the rail the slower the joint depreciation. There are, however, few electric interurban roads having rails of 60 lbs. per yard and over where the joint depreciation in five years has amounted to much, if the track has not been neglected in the matter of ballast and tightening of angle-bars. In fact, we have frequently had occasion to note how well interurban track stands up under traffic when compared to steam-road track of similar weight. Interurban roads have been influenced somewhat in the selection of rails by the experience of city lines having heavy traffic, and on such lines the weight of rail has steadily increased, partly on account of the desire of the city companies to secure a track which will not require the frequent tearing up of the pavement to get at the joints, partly because of the depth of rail supposed to be required on paved streets, and partly by the value of steel rail as a conductor of electricity. There is a vast difference, however, between the service required of rails buried in the paving in a crowded city street, with cars of less than one-minute headway and interurban track, with cars from fifteen minutes to thirty minutes apart, and with rails that are accessible at all times for the tightening of joints or for any other track maintenance.

It is far from our purpose to discourage first-class, substantial interurban construction; but, having the interests of interurban electric railway companies at heart, we do not feel that it is desirable to encourage unnecessarily expensive construction in one direction, when there are so many places in an interurban electric road of to-day where money may be spent to advantage. Further than this, if the interurban is to reach into less thickly populated districts than at present, its standards of construction must be made to conform to the conditions and requirements, so as to cut down the investment to a figure that will not be unduly burdensome at the beginning. It is, therefore, in order to look for the places where unnecessarily heavy investment can be reduced on roads of light traffic; and it looks as if the weight of the rail was something that could, in many cases, be cut down with safety. When it is remembered that some of our western trans-continental steam lines have for a number of years operated regular steam equipment over 50-lb. standard T-rail, it is time to stop and think whether the less important interurbans may not safely adopt lighter rails than are common at present.

THE THIRD RAIL ON THE BALTIMORE & OHIO

BY W. D. YOUNG

The installation of a third rail system to meet standard steam road conditions involves many difficult and serious problems. The most notable ones are the providing of clearance between

there is not another third rail system to-day which could receive a complete standard railroad equipment on its tracks. As many interurban lines are designed to handle both freight and passenger service, this will mean that these roads will be subjected to many of the same limitations as would follow if different track gages were used instead of a common standard.

Most of the present third rail installations have been on



VIEW IN MT. ROYAL STATION, SHOWING TWO LOCOMOTIVES

the third-rail construction and what might be termed "moving obstructions," as cars and engines; the clearance between the third-rail shoes and their supports and "fixed obstructions," as platforms, bridges and signal work; the providing of protection from live third rail for employees and the public; the design of a shoe and its supports that will meet every necessary re-

quirement, and the maintaining of a continued line of conductor through special track work on grades and through passenger stations.

what are to all intents and purposes private right of way. But with the Baltimore & Ohio Railroad there were conditions instituted long before the idea of third rail was ever conceived. Possession was nine points at law in this instance, and the new construction had to adapt itself to the old. It is also worthy of noting that this work had to meet not only local conditions of traffic, but had to permit the passage of any car or engine that the railroad might accept on any other part of its system. In meeting this last condition it may be taken for granted that the final plan followed was a long step forward in the matter of establishing a standard third-rail gage for steam roads.



BIRD'S-EYE VIEW OF ENTRANCE TO CAMDEN STATION

quirement, and the maintaining of a continued line of conductor through special track work on grades and through passenger stations.

At the outset it is well to bear in mind in regard to the Baltimore & Ohio installation that with possibly two exceptions

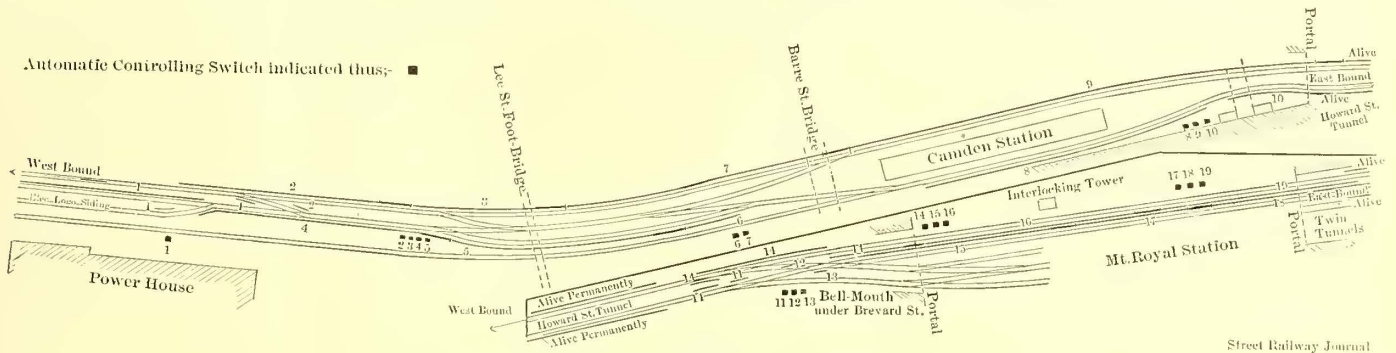
At the start a clearance chart was made up, which covered all the moving equipment at that time. Another chart showing the platform clearances was also used. From the data given it was thought a 24-in. gage and 2½-in. elevation of third rail could be used. The guards were 2 ins. higher than the third rail, and the inside guard board was 18¾ ins. from the track gage line. This provided a clearance on paper of 2½ ins. under what were considered the extreme limits of travel of steel cars with worn wheels and journal brasses and truck springs compressed solidly. As the steel cars were being received while the plans were under consideration, there was no practical way to determine before hand just how the cars would act. It was found that they were more or less out of form, and rolled very considerably in passing over loose joints or low places and curves in the track.

The side of the chute came straight down and occasionally a door would not be closed. All these bad features often caused this lower part of the car to come closely to the third rail and in contact with the inside guard boards, and scarfed them severely. The guards were then reduced 1 in.

in depth, as a means to overcome this trouble; it also involved a complete change in the proposed plans protecting the rail through station districts. The lower cylinders of compound locomotives presented moving obstructions similar to those of steel cars.

While endeavoring to meet and overcome these new conditions the 85-lb. track rail was replaced by 100-lb. rail, and it

head of the lag and the base of the stand. This was to allow for an independent movement of the insulator tie. In practice it was found impossible to have an insulator tie every 10 ft., so that the limits were set for any distance between 8 ft. and 11 ft. This irregular spacing of ties also affected the ending of guard boards at the stands. No standard length of board could be used without a very considerable amount of waste. To meet



PLAN OF CAMDEN TERMINAL, SHOWING SECTIONS

was $\frac{3}{4}$ in. higher than the old rail. This had the effect of lowering the third rail $\frac{3}{4}$ in., and also decreased the clearance between the bottom of the shoe and track rails an equal distance. It called for a condition of track maintenance that could not be met, and the shoes were continually coming in contact with the wheel rails at cross-overs and crossings. The entire third rail would have had to be raised to bring it back to its former elevation. In view of all the new facts that developed from the experience with the installation as first laid down, it was deemed wise and prudent to widen the gage, to increase the elevation and to keep away as far as possible from steel cars and compound locomotives. So the third rail was relaid to 30½-in. gage and 3½-in. elevation. The entire absence, since this was done, of any noteworthy interference, such as had been before experienced, is the best evidence that the change was a desirable one to make.

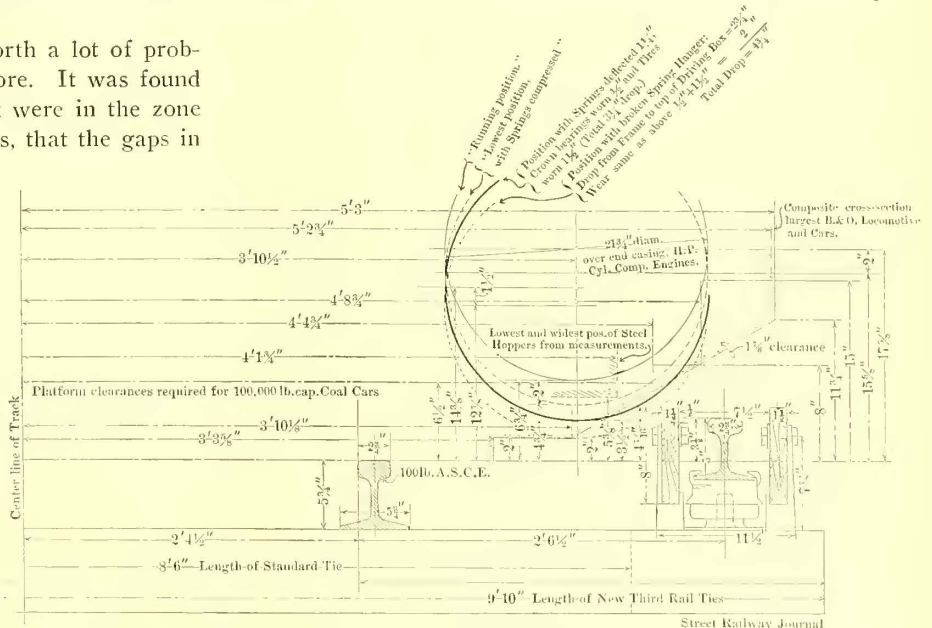
The change of gage, however, brought forth a lot of problems that had not presented themselves before. It was found bridge gussets and considerable signal work were in the zone of travel of the third-rail shoes and supports, that the gaps in third rail for cross-overs were nearly twice as long as before, and in providing an essential continued line of conductor through special work on grades, twice as many movable rails were required. Ties 9 ft. 10 ins. long were used in place of standard railroad ties, and dwarf signals of a different form had to be employed. These details were each met in turn and presented no impossible or seriously expensive problems. The gaps in the third rail at cross-overs caused no hindrance to the satisfactory movement of the motor.

It was deemed absolutely necessary to use every reasonable precaution to protect employees and others from coming in contact with the third rail and which was assured to be alive at all times on any part of the system. A sectional third-rail system, to be described later, was installed. In addition the writer designed a combined guard board and insulator stand, which is illustrated herewith, and which has given very satisfactory results. The stand, which is a malleable iron casting, is provided with a post for supporting the reconstructed granite insulator, and also with upright standards at the sides for the guard boards. The stand, insulator and insulator caps are held together by cement. In lagging down the stands the lags were screwed down so that there was a clearance of $\frac{5}{8}$ in. between

this difficulty the guards were frequently allowed to end where they would, and the button ends were held in position by flat iron plates and bolts as fastenings. The guards are 1½ ins. thick, 8 ins. deep and of dressed Georgia pine.

"Danger—Third Rail—Keep Off," was painted in letters 6 ins. high on the guards about every 50 ft. The guards come 2 ins. below the base of the rail and 1 in. above the head. In this way very satisfactory protection is afforded to the rail itself from careless or accidental laying of tools across the rail, and from earth and ballast incident to track repairs. In fact, they mark clearly and sharply the safety lines of mutual protection to employees, the third rails and shoes.

The designing of a generally satisfactory arrangement of conductor through station districts is replete with troublesome details. The tracks in question were covered with flush plat-



CLEARANCE DIAGRAM, WITH DIFFERENT EQUIPMENT ON STRAIGHT TRACK

forms over which trucks and passengers were able to pass without hindrance. The simplest form of overhead construction was deemed impracticable, because of weight, cost, overhead shoe details and the interference of the old overhead structure, which could not be abandoned until something else took its place.

The first installation could not remain as designed because of the interference of steel cars, etc. A second attempt was made, which had the novel feature of providing a level platform by using a depressed conductor, the shoe making contact with

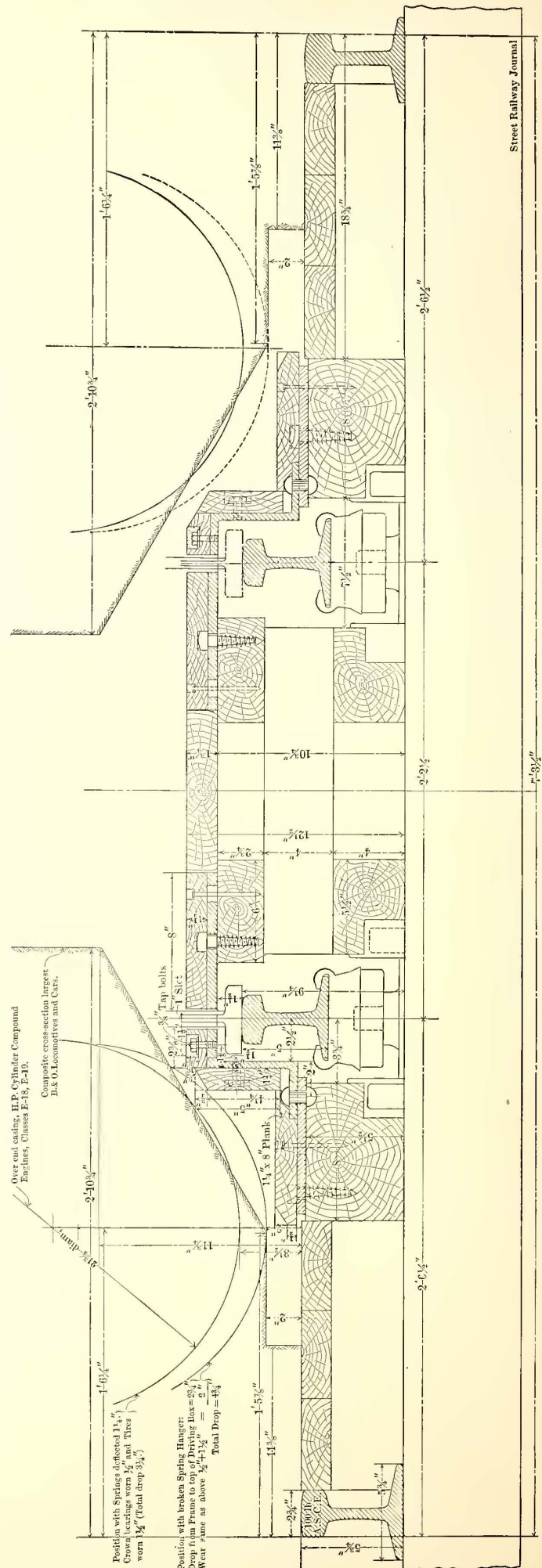
the under side of the conductors on their upper faces. This was accomplished by supporting the shoes on springs, which allowed them to be drawn down as the motor moved past an incline leading from the third rail to the depressed conductors beneath the platform. However, the necessity of changing the gage and elevation of the third rail in the outside sections required that this be also abandoned, and under the new gage and elevation the design first proposed was put down.

The accompanying engraving shows the general form of construction used. A Z-bar is riveted to a plate, and this is used as a cover on the side next to the track rail. A 1/2-in. x 8-in. iron plate supplies the other half of the cover. Both covers are lagged down to timbers and then sheathed over with Georgia pine. The shank of the shoe passes through the slot provided, the shoe riding on the third rail, which is supported by the same methods used in open work. It is needless to state, perhaps, that the covered plates do not come in contact with the third rail. Gaps of an inch in length are provided between each cover plate and the one next adjacent. It is also understood that, as a further safety precaution, automatic sectional third-rail switches are used in stations and switch yards. These safety switches are also used to control the current whenever movable rails are used around special work and the third rails adjacent to a foreign railroad crossing.

At certain cross-overs on grades it was necessary to maintain a conductor in the body of the special work. It is obvious these special conductors could not remain permanently elevated, but had to be lowered in sympathy with track switching, so that trains could pass over them, otherwise they would be an obstruction. As it was compulsory to secure every inch possible to bridge the existing gaps and to meet the reach of the shoes, 30 ft., they were designed so as to have a vertical movement only. This is done, as shown herewith, by using cast-iron yokes, in which the rails travel up and down. The vertical movement is secured by using a pair of hardened steel rollers on the ends of cranks, which are attached to a square shaft leading to the signal pipes. The rollers bear on the under side of plates fastened to the insulating blocks. In the insulating blocks is held the T section used for the conductor. An upward movement of the cranks will cause the rail to rise; the reverse movement of the rail is dependent on gravity. Clamps are attached to the yokes to prevent the rail from leaving the yokes; 3-in. and 4-in. T-sections are used. The longest rail is 38 ft., and weighs, approximately, 600 lbs., including insulating blocks, etc. Most of the simple cross-overs can be provided with a line of conductor by this means, while in case of a diamond cross-over through tracks only can be taken care of in this way. The rails are bent down at the ends to provide them with the necessary inclines. Their success is an accomplished fact.

One of the most interesting problems was to provide a satisfactory shoe and shoe supports. The shoes have a flat contact surface of 64 sq. ins., and are 4 ins. wide, 20 ins. long. At first they were supported by toggle links, but these were found to be very uncertain in the making of contact as the shoe mounted an incline. For a moment the shoe would jump up, away from the rail, and as current would have to come through this shoe or not at all, the tendency would be to draw an arc or to "lose a switch," as the case might be. Again, it was found necessary to cause the shoe to bear heavily on the rail itself to prevent arcing. The least irregularity in the rail would cause the shoe to rise, and this making and breaking of contact caused trouble. Neither could this method of support adapt itself to allow a free movement of the shank of the shoes through the slots of the covered work at curves.

In place of this form of support a cast-iron bracket was attached to the bumper block of the motor and braced to the frame by an adjustable brace. A double, extra heavy wrought iron pipe was used as the central sliding rod, with threads on each end. This engaged with a box form of iron casting, and the

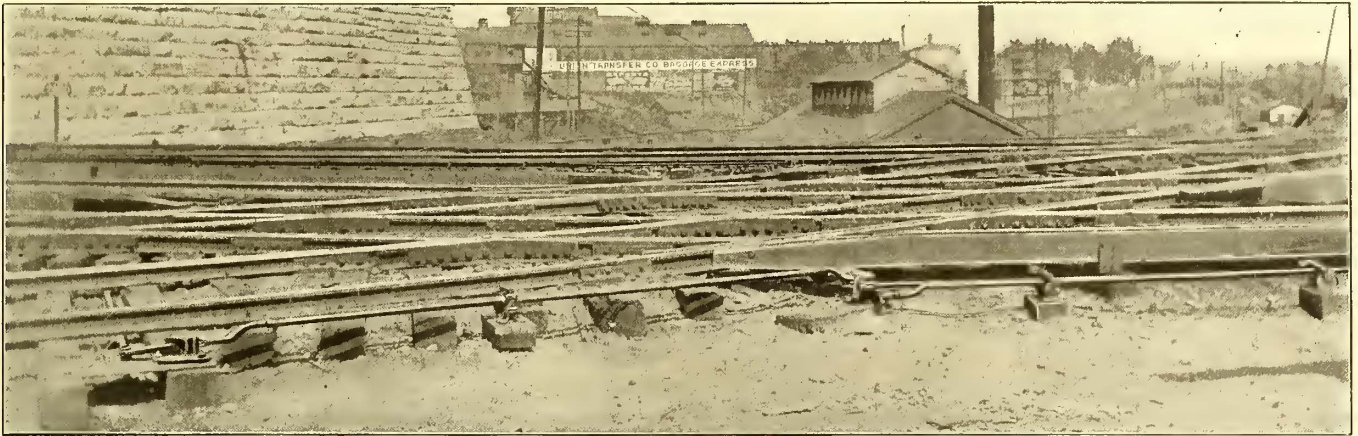


SECTION SHOWING CLEARANCE AND CONSTRUCTION OF PROTECTED THIRD RAIL IN MT. ROYAL STATION

Street Railway Journal

two are held together by lock nuts. Adjusting nuts are supplied at the opposite end of the rod. An insulating block, made of three pieces of maple, boiled in paraffine, shellacked and glued

provision has been made for eight distinct movements of the shoe. The up and down movement are for the travel of the shoe in its lowest position off the third rail to the highest ele-

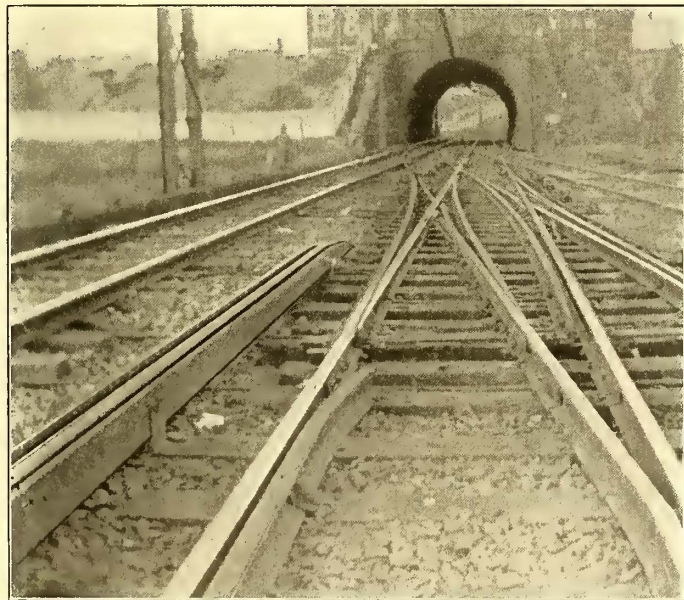


MOVABLE THIRD RAILS AT HUNTINGTON AVENUE

together, is attached to the lower face of this box. As this block sets up into the box, to which it is bolted, the sides of the box act as a hood to protect the block from any drip or mechanical injury. To the insulating block is fastened a wrought iron bracket. This is supplied with four dependent ears, each one having an elliptical opening. These elliptical openings are figured for allowing a 1/2-in. up and down motion of the shoe.

The shoe proper is attached to a brass shoe head supplied with two bearings. Side motion rods pass through these bearings and engage with the bracket ears. A pair of springs are

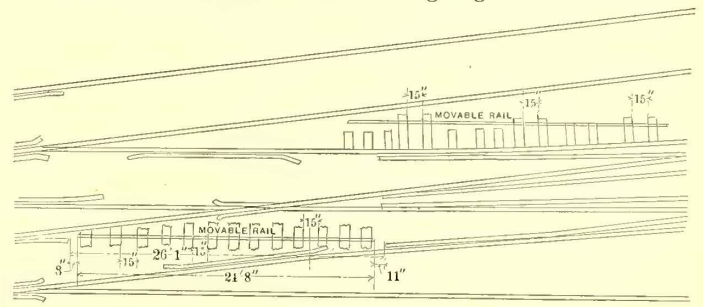
variation of third rail, and the distance is 2 1/2 ins. The movement of the shoe head on the side motion rods is to take care of the side movements of the motor in going around curves and



MOVABLE THIRD RAIL AT HUNTINGTON AVENUE

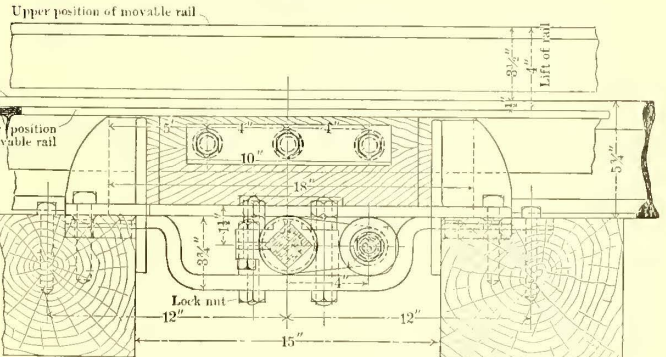
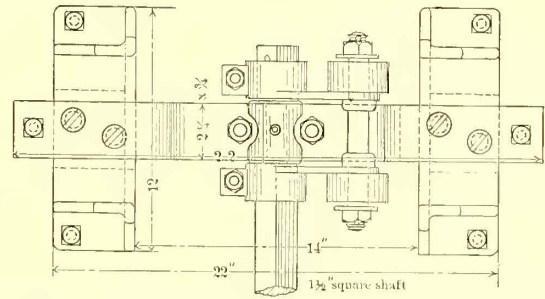
placed on each side motion rod, set in between the ears of the shoe bracket and bearings of the shoe head. A seat for each spring is placed in the elliptical opening in the bracket ear. The bodies of the shoe-head bearings are circular and tapering in form, to provide a seat for the springs. In addition to the central sliding rod two side rods are provided, which are attached to the box casting and pass through arms of the bracket. They hold the shoe parallel to the track and assist to prevent the shoe from dropping too low.

A study of this detailed description will readily disclose that



PLAN SHOWING LOCATION OF MOVABLE THIRD RAIL

allow free travel for the shank of the shoes in the slots of covered work. The travel secured is 1 3/4 ins. on either side of the center of support.

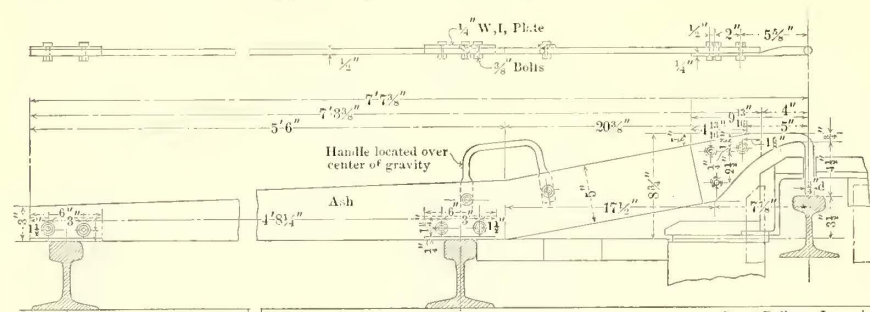


SECTIONS AND PLANS OF MOVABLE THIRD-RAIL APPARATUS

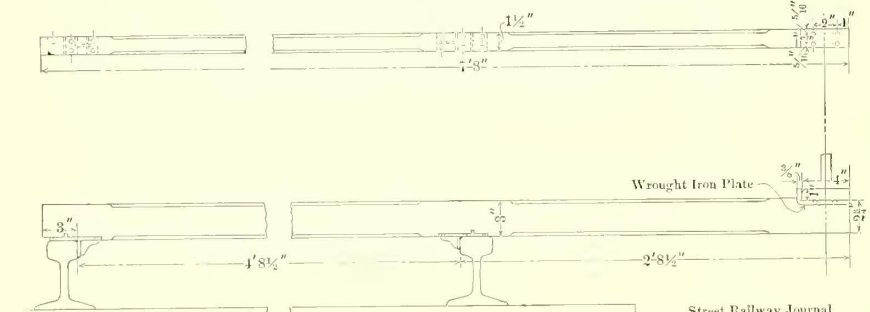
The movement of the side motion rods through the spring seats working in the bracket ears are tilting movements, up or down sidewise, and up or down lengthwise. The sidewise tilting movements are to allow the shoes to rest squarely on the rail,

whether its surface is parallel or not to the plane of the track rails. The lengthwise tilting movements are to allow the shoes to take the inclines easily, and by this flexibility the shoes are

motor service is necessary to maintain a good contact surface. On the opposite side of the tunnels, under the same conditions, but with the motor running light, the deposit is constantly there. When this rail is used for heavy service the arcing at the shoes is most severe and the shoes are heated to redness. After a few trips the conditions rapidly improve.



TRACK GAGE FOR SERVICE AND THIRD RAILS



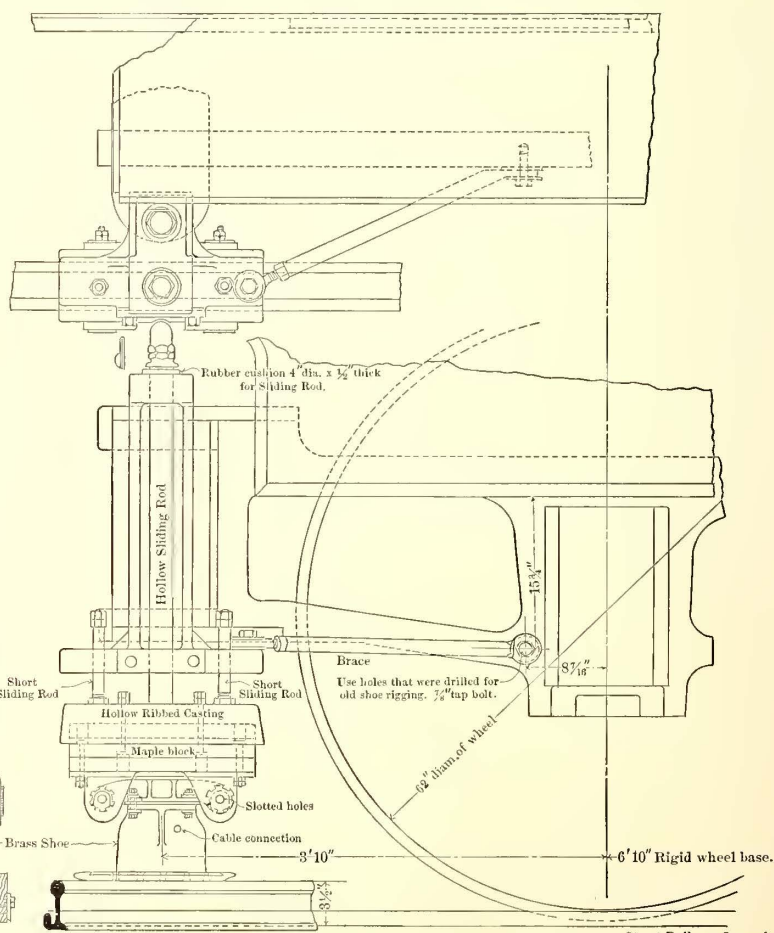
GAGE FOR SETTING SHOE ON LOCOMOTIVE TO PROPER HEIGHT

sure to bear on the inclines and rails at all points in its travel. The entire weight of the sliding rods, shoe and all attachments is about 150 lbs., and this entire weight is used to cause certain and sure contact between the shoe and rail. Triple insulation is provided in all cases between the shoe and motor frame.

on the incline part with steel plates, and are held in position with the rail by strap and bolts.

At cross-overs a wooden "dummy" rail is used near the point

The shoe is faced with a steel plate, attached to the brass shoe body by copper rivets. Experience with cast-iron and brass shoes showed that they had short life and very little, if any, cleaning effect on the third rail. In open sections these steel-faced shoes produce a bright,



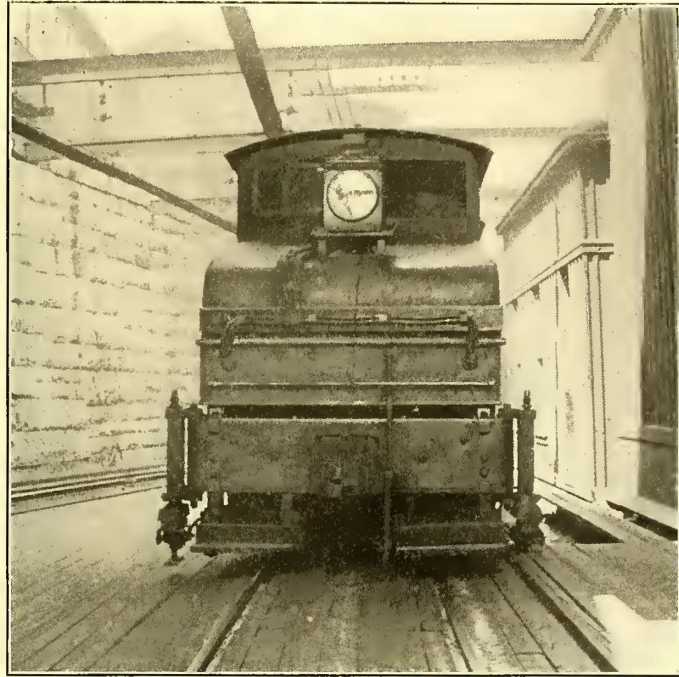
SIDE ELEVATION AND SECTION OF THIRD RAIL SUPPORT

clean surface. In the tunnels the deposits from various sources form a very tenacious scale. There is an absence of sufficient draught to blow off the loose particles of rust, etc., and considerable dampness is present. It is found that constant heavy

of the switch, in the line of third rail, and it is cut down with inclines at each end, as so to allow the shoes to pass off or on without any side interference. A 75-lb. T-rail was used, principally because of cheapness and promptness in delivery. One

feature of the sectional third-rail system is the automatic cut-out switches, to which reference has already been made. As the locomotive takes from 500 amps. to 2000 amps., the successful design of an automatic switch to open and close these heavy currents without racking and with reliability and promptness was a difficult undertaking, from both a mechanical and electrical standpoint. Another function re-

quired of the switch is that while it must be of sufficient size to carry the current used in operating service it is also necessary that its coil should have sufficient power to hold the switch securely with a very small current. The current used for picking up the plunger is 25 amps., or about one-hundredth of the maximum current carried by it.



END VIEW OF ELECTRIC LOCOMOTIVE, SHOWING SHOE



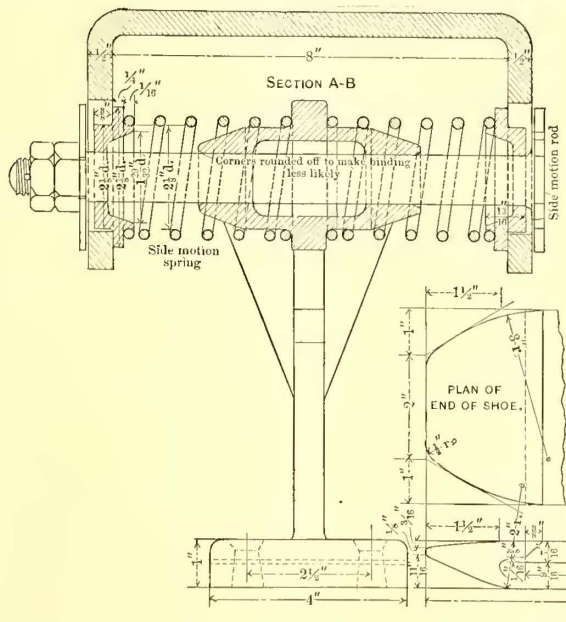
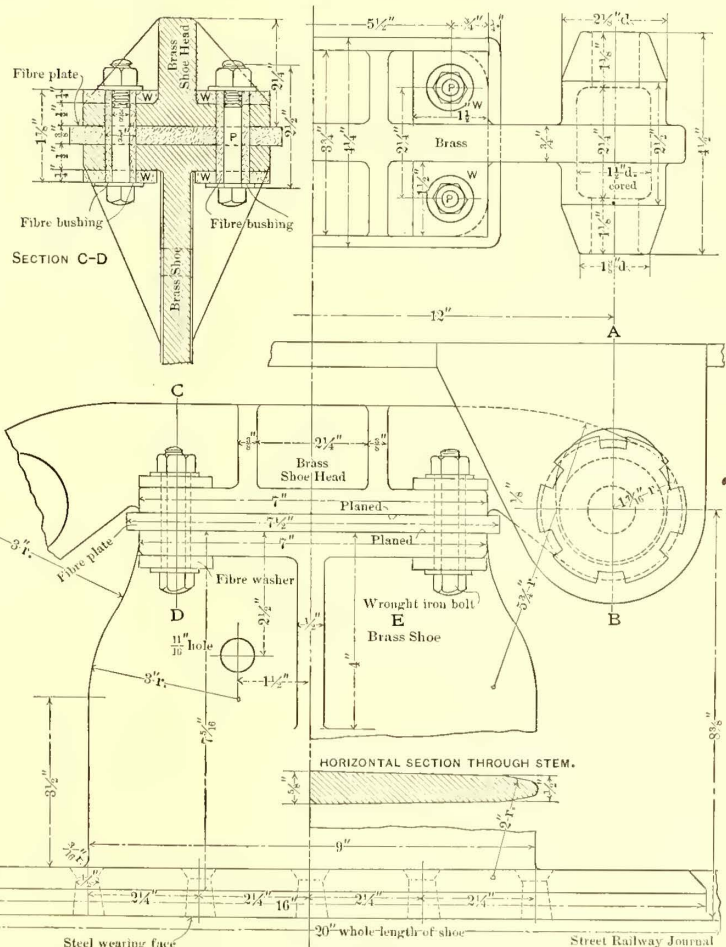
VIEW IN MT. ROYAL STATION, SHOWING PROTECTED THIRD RAIL

since the original design, are as follows: The balancing spring on which the movable portion of the spring falls has been made very much stronger so as to have the plunger practically weightless on the start. This necessitated a very much smaller gap at the opening break between the tip of the plunger and the contact on which it rested. In order that the arc at that point should not hang, a special form of blowout has been installed.

It will be readily understood that the switch, when it falls open, must break such current as is leaking from the third rail

quired of the switch is that while it must be of sufficient size to carry the current used in operating service it is also necessary that its coil should have sufficient power to hold the switch securely with a very small current. The current used for picking up the plunger is 25 amps., or about one-hundredth of the maximum current carried by it.

The switch as originally made for this service was described in the columns of the STREET RAILWAY JOURNAL for March 2, 1901. Improvements have since been made in this switch, however, by the manufacturers to enable it to work at the voltages which are encountered on the line and which are exceedingly variable. As at present employed the switch will pick up at anything from 175 volts to 700 volts. The principal modifications, made



SECTIONS OF THIRD-RAIL SHOE

to ground. This current often reaches a value as high as 8 amps. or 10 amps., causing an arc which is likely to be self-

taking electric power from the third rail and driving the dynamo as a motor, which drives the pneumatic apparatus as a compressor, and pumps up the tanks till the pump governor breaks the circuit. When this occurs the compressor automatically changes into an engine without reversing its motion and drives the dynamo electric machine as a dynamo, thereby providing electric power to pick up the switches. Thus the machine performs both offices of pick-up device and compressor. The reversible principle of dynamo and motor is already familiar to street railway engineers, but the way in which the compressor has been made reversible is interesting. The compressor is of the trunk piston type, and contains inlet valves and piston, the outlet valve E, see cut, allowing the air taken in to escape into the pressure chamber B. The port C during the act of compression is closed, and therefore the apparatus acts like an ordinary compressor. When the circuit is broken from outside, and has to slow down somewhat. The specially designed governor then changes its position, due to slight reduction in speed, and begins to operate a piston valve in cylinder A, which distributes air to the cylinders and also allows it to escape through the exhaust; the port C serving alternately as an in-take and exhaust port. The piston valve is of the well-



VIEW SHOWING PRESENT THIRD RAIL AND OLD OVERHEAD CONSTRUCTION

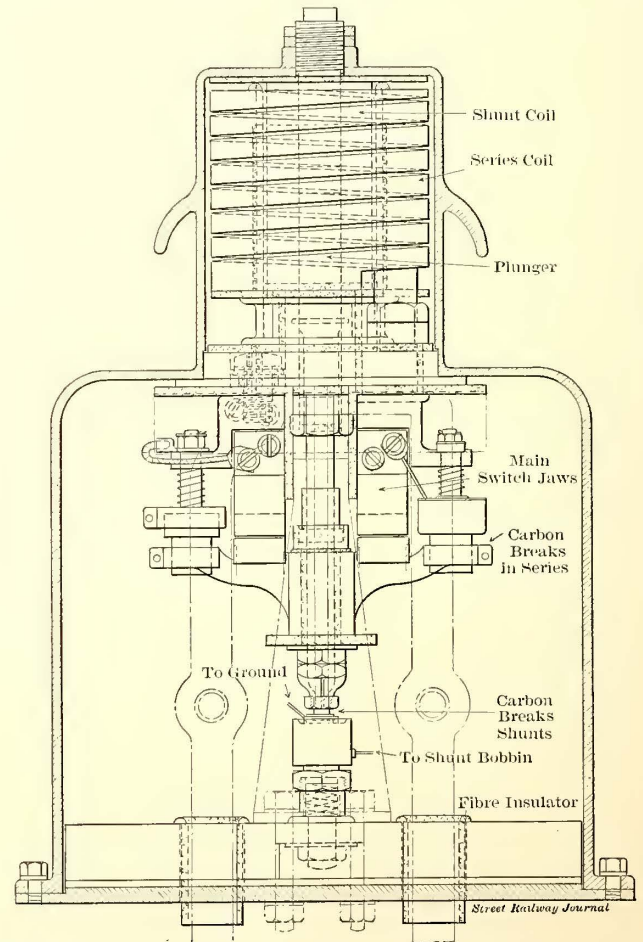
maintaining. To avoid this, magnetic blowouts have been installed on the main jaws of the switch. A peculiar feature of value of the switch and a modification which was found to be necessary over the original design is the top governor. The switch requires to be set so as to fall open when the current reaches a certain predetermined minimum, and this is a matter which is likely to vary if the section leaks. The force tending to throw the switch down is made up of its weight and the pressure on the jaws. The top plunger is arranged to be raised or lowered at will and clamped with a nut. In this way the pressure on the jaws and consequently the throw-down pressure can be balanced off by any magnetic force exerted by the jaw. Thus the switch can be set to fall open at any currents within the limits of adjustment.

The upper plunger is bored out to receive an interior brass plunger, the lower end of which projects beyond the base of the upper plunger. This brass plunger is held in position by a spring, and when the lower pressure plunger is raised it is compressed inside the upper plunger. The tension on this spring can be regulated by screw pressure so that the exact amount of tension required to balance the residual magnetism at variations of throw-down pressure can be secured.

The troubles that have appeared in the switch as it was originally built, and such difficulties as have been encountered in connection with the system have been met and compensated for by the modifications and additional devices already referred to.

Another feature of the sectional conductor system, as installed in Baltimore, is the pick-up device on the cab. It is safe to say that this factor has caused 80 per cent of the failures of sectional conductor systems, because it involved a motor and dynamo storage battery or additional complicated equipment. The plan employed on the Baltimore & Ohio is to provide an air compressor and motor, and to arrange this combination to work both ways, that is to say, the machine is capable of

escape through the exhaust; the port C serving alternately as an in-take and exhaust port. The piston valve is of the well-



SECTION OF SWITCH FOR SECTIONAL CONDUCTOR SYSTEM

known hollow type. It is plain that during the action as an engine the valves in the piston will remain shut, for the pressure in the cylinder is greater than that of the outside air. It is also equally apparent that the valve B will remain shut, for the pressure in the tank is always higher than the pressure in the cylinder. The machine is connected between the shoe and the ground, a resistance being provided in circuit therewith to keep the high voltage of the line from the commutator. This circuit is equipped with a circuit breaker, and if for any reason power be cut off and the machine thereby attempts to drive the locomotive this circuit breaker opens and relieves the compressor. This will only happen in case the circuit breaker at power house gives out, or in case the locomotive was drifting over a cross-over with the controller open, and the motormen are instructed to see that this latter combination does not occur. The locomotive is equipped with a resistance which will take enough current to hold up the switch in case it is desired for any reason to stand or drift over the section with no motor current on and with the compressor stopped. The procedure of starting up the locomotive is as follows:

We will assume that the locomotive is standing on a section, the switch being dropped, with the compressor at rest. The valve is opened and air is admitted at the compressor, starting it up as an engine. The dynamo quickly picks up the switch and the machine immediately becomes a compressor and takes sufficient current to hold up the switch. The locomotive will then be started and continue to run, picking up its own switches by reason of the live shoe, live because of its contact from the rear section. The compressor having pumped up to full tank pressure automatically opens its pump governor and operates as an engine for a short period and then reverses its functions. It may be left running or shut down at will. If the trip is a long one the compressor is usually shut down after the

Now that the various details have been worked out, through much that was discouraging, the results obtained in the satisfactory service are such as to afford the conclusion that a third-rail system can be perfectly adapted to meet steam road con-



VIEW OF SLIP SWITCHES AT HUNTINGTON AVENUE, SHOWING MOVABLE THIRD RAIL

ditions. In almost every detail steam road service marks the very extreme of requirements. In meeting these there are enough obstacles that have to be overcome to satisfy the most ambitious desires of all.



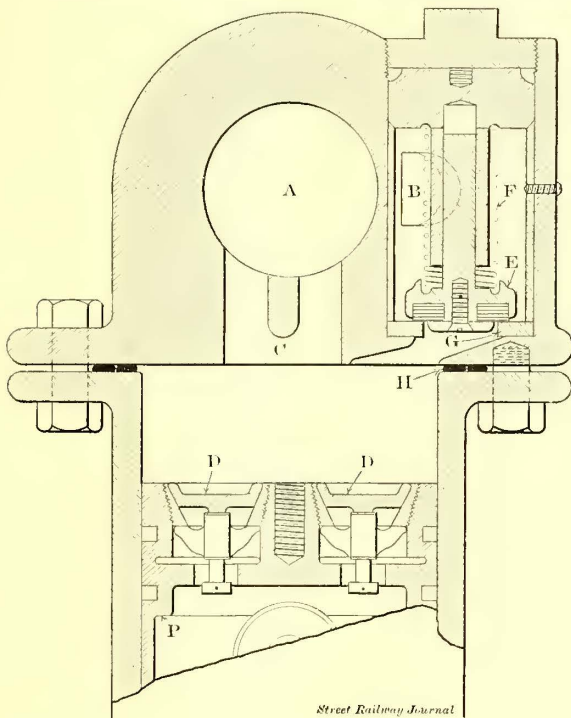
FRANCHISE GRANTED IN MANILA

The franchise for a street railway system in the city of Manila, which was advertised in the STREET RAILWAY JOURNAL and other papers last November by the War Department, was allotted last week by the Municipal Board of Manila, the Advisory Board and the Philippine Commission of the United States acting jointly. Several bids were received from various American and foreign syndicates for the contract. The bid accepted was presented by Charles M. Swift, of Detroit, and was for a syndicate consisting of himself, J. G. White & Company, of New York; P. L. Kimberly and Frank H. Buhl, of Sharon, Pa., and George C. Smith, of Pittsburg, representing the Westinghouse interests. The bidders agreed to charge 6 cents for first-class fares and 5 cents for second-class fares. One hundred first-class tickets will be sold for \$5.50, and six second-class tickets for 24 cents.

The franchise awarded covers the electric lighting system as well as the railway system for Manila, and the syndicate expects to spend about \$2,000,000 in the development of the system. The construction must be commenced within six months, and will be carried out by J. G. White & Company, of New York. Thirty-five miles of track will be built, and Westinghouse apparatus will be used. The population of Manila is over 300,000.



For the second time in three months the South Side Elevated Railway Company, of Chicago, raised the wages of its employees. The raise amounts to about 2 cents an hour, averaged among various employees, and makes them the highest paid elevated railway employees in the country, not excepting the wages recently granted by the Northwestern and Lake Street Elevated Railroads a few days ago. First-class motormen are to get 29 cents.



SECTION OF COMBINED AIR COMPRESSOR AND COMPRESSED-AIR MOTOR

locomotive is well started. If, however, it is only a short trip over special work, much of which is drifting, the compressor is left running to pick up and hold up switches so that the motorman can have current at his command at all times, regardless of whether his controller is on or off. New compressors are now being built utilizing this same principle, but on a very much modified and improved plan from the light of experience gained.

ENGINEERING PRELIMINARIES FOR AN INTERURBAN ELECTRIC RAILWAY—II.

BY ERNEST GOZENBACH

LOCATION

An interurban private right of way located along the highway is very often a sign of imperfect emancipation from horse car practice. It is sometimes urged that it is necessary to adopt such a location in order to serve the country population along the highway. If that population must be served to the extent of sticking to the highway, then it would seem best to avoid the expense of a private right of way and locate tracks in the middle or on one side of the highway. Following the highway usually means numerous stops, which preclude high schedule speed; and, vice versa, high schedule speed is impossible along the highway because of teams on the road and in the door yards of houses, numerous crossings at entrances to farm houses and fields, not to mention the objections of the wary native who may dislike to see a car pass by his door at 50 miles to 60 miles per hour without stopping for his accommodation.

Furthermore, highways, as a rule, follow township and section lines regardless of gradients. In order to enable cars to be operated on or to one side of them it is sometimes necessary to mount grades of 6 per cent to 8 per cent, or to assume great expense in filling or cutting to avoid such grades.

On the other hand it is not always the best policy to locate the line to obtain the best gradients, nor to locate exactly as a steam road would be located. Curves and grades are much less serious obstacles to electric cars than they are to steam trains, and if a particularly prosperous farming community can be approached by a little detour of the line it is well to consider carefully before deciding either way. As a general rule, however, the writer believes it to be the best policy to locate the private right of way when near country houses so that the house and barn shall be between the railway and the highway. This avoids some of the objectionable features of the highway location and at the same time serves the neighborhood. One must not lose sight of the fact that interurbans are and must continue to be local roads, dependent upon the population reached for their revenue.

Referring to the map, Fig. 1, in the previous chapter (*STREET RAILWAY JOURNAL*, March 7, 1902), the D, E & F Railway starts in the center of D. It has its own tracks, and does not anywhere use the local street railway's track or current. After passing the Union Depot and crossing a steam road at grade the line cuts diagonally across city lots and touches the small suburb O, without leaving its private right of way. The same way it passes N, where a route has been found which does not necessitate any street tracks. From N the course is due east, paralleling a highway, but sufficiently far away to permit high speed. At a point about 2 miles east of M, there is a crossing with the steam railway. This is to be made overhead for reasons which will be shown later.

At M and L the road passes through on its own right of way and between these towns the right of way is parallel and adjacent to the steam railroad. At E the right of way extends well into the city limits, but the tracks follow the street the whole length of the business section of E. Passing E the right of way is so shaped that cars touch the hamlet K through J and I, all on its own right of way, and pass through a short section of street at H, with another overhead crossing between I and H. From H, through G to F, the right of way is again parallel to the steam railroad, and cars enter the city streets at the entrance to F. There is a total of 5.4 miles of the road on public street, the balance of 57 miles being private right of way.

The width of the right of way should never be less than 40 ft., even for single-track roads. The price paid for land is often fixed arbitrarily and independent of the width of the strip, so

that by insisting on sufficient width in the first place the cost is usually no more than a narrower strip of land.

ROADBED AND TRACK

In the case we are considering there is comparatively little grading to be done, the country being practically level. Cuts and fills do not exceed over 3 ft. in depth at any place, and the whole right of way is so chosen that the grades do not exceed 1.2 per cent except in one case where there is a grade of 1.8 per cent for a distance of 800 ft. The flatness of the land is a reason for using extra care to secure good drainage of the roadbed. There are several bridges of 10-ft. to 25-ft. span required. These may preferably be made of steel concrete construction. In a few cases the headroom under the bridge is so low that concrete-arch construction cannot be employed, and steel girders laid on concrete abutments must be used to secure the necessary cross sectional area for the flow of water at its maximum stage. The sub-grade is to have a width of 14 ft. for single track and 25 ft. for double track at sidings.

The two railroad crossings that have been referred to are recommended to be built so that the electric railway crosses the steam road above grade, the approaches to consist of earth embankments with a 2 per cent grade. Such crossings can be built for about \$32,000 each, even in a perfectly flat country. The fixed charges on this investment amount to about \$1,600 per annum, hardly more than the maintenance of an interlocking plant, and immeasurably cheaper than the latter when the time lost is capitalized and the extra cost of power added to it. A crossing above grade also disposes at once and for all time of the possibility of collisions at such points.

The right of way is to be fenced, not alone on account of using the third rail, but as an insurance against accidents which would be an advisable measure with any construction.

In the case at hand gravel has to be purchased and hauled long distances by railroad, as none is available along the right of way. The cost laid down is estimated between 60 cents and 65 cents per yard. There is available, however, a good quality of rock, and while the cost of rock ballast would not be warranted, provided gravel could be put down for a lower figure, it here becomes good engineering to use this rock. Its cost is very largely a matter of good management, and when properly handled this rock ballast may be delivered for but little more than gravel, or at an estimated cost of 80 cents per cubic yard. Its use should be liberal, not less than 2200 cu. yds. per mile of track. Plenty of ballast properly placed is generally conceded to be the chief ingredient of a good roadbed, and it is poor engineering to attempt to build a good track with heavy rail and only little ballast, because the latter is very much less expensive than steel rails per mile of track, and a better track for less money may be built, using plenty of good ballast and small rails.

The question of cedar ties versus hard wood has been pretty thoroughly thrashed out by steam roads, and the use of cedar ties is increasing, which is pretty good evidence that they are satisfactory, at least on tangents. The specifications should, therefore, read for cedar ties, 6 ins. x 8 ins. x 8 ft., spaced 2 ft. between centers on tangents, every fifth tie to be chestnut or oak, 8 ft. 6 ins. to 9 ft. long, depending on the distance of the third rail from the track rail, which will be discussed under its proper heading. On curves all ties should be of chestnut or oak. Whether the ballast should be tamped level with the top of the tie or crowned at the center is outside the sphere of this paper.

Steel rails for the track are the most expensive single item that goes to make up the grand total of the cost of a railway, and one cannot be too careful in choosing correctly to meet the requirements without buying a rail either too large or too small. The first duty of the rail is to provide a smooth pathway over which the wheel may roll with a minimum of friction. This it does regardless of the size of the rail, provided the alignment

remains constant. To preserve this alignment it is necessary that the rail have sufficient stiffness so that it will not bend when a weight is imposed midway between two supports. From these and allied necessities has been evolved the present form of rail which in steam railway practice is sometimes submitted to a weight of 40 tons and over per axle imposed with the hammer blow of the reciprocating parts of the locomotive. The tendency has been to increase the size and weight of rails in this class of work, and electric railways have followed this practice to a point where the extra cost of these heavy rails often is not warranted by corresponding gains. Taking into consideration the fact that there are no reciprocating parts on an electric car, there is consequently none of the hammer blow to test the strength of the rail as with steam locomotives. It is further to be considered that the heaviest electric cars in use to-day do not exceed 45 tons in weight, and we are not likely to go very much higher. This weight is equally distributed over four axles, and the maximum weight per axle, therefore, is not likely to exceed 12 tons in electric cars for some little time. It is apparent, therefore, that a very much smaller rail may be satisfactory for an electric railway than for a steam railway. Just how much smaller the rail may be made is a fine point to decide.

Another factor enters here which is absent on steam roads, namely, the value of the rail as a return feeder. This depends again on the total amount of current lost in the rail for a given period. It is this factor which warrants the use of extremely heavy rails in city work where cars are numerous and the current transmitted runs into thousands of amperes. For the interurban railway under discussion the difference in current so lost did not warrant any additional investment in rails, and it would appear, from calculations made on this basis and a comparison of service conditions with other roads, that a rail weighing 60 lbs. per yard would be large enough. On account of the comparatively high speed and the possibility of heavier cars or heavier traffic or both in the future a rail weighing 70 lbs. per yard was actually recommended. For speeds of 60 miles per hour and over new conditions have to be met which do not alter the case in hand, and it is to be hoped that no one will cite the failure of the track during the Berlin-Zossen tests as having any bearing in this case.

The length of rails and the cost of joints should be given careful attention. If the saving in rail-joints on steam roads warrants the use of long rails then their use is doubly warranted on electric roads, due to saving of first cost and maintenance of bonds. Rails 60 ft. long are recommended; joints to be better than the ordinary railroad fish-plates. Either a "Continuous" or "Weber" joint was recommended.

For track bonding two bonds per joint were recommended, because bond troubles mostly occur at the rail connections, and with double bonding the liability of such trouble is reduced. The two bonds together may be about equal to or slightly below the conductivity of the rail, and too much care cannot be exercised in installing them.

ROLLING STOCK

A general specification of the cars of the D, E & F Railway might be put into the words "The best which can be bought." To the traveling public the car is the representative of the railway company. Handsome, easy riding cars with luxurious furnishings are an inducement and invitation to ride, and if such cars are supplemented by polite and neatly uniformed car employees, the business once obtained will be held. The inexpensive advertising of thousands of satisfied passengers is many times more valuable than tons of paper leaflets with fancy engravings and printed invitations to ride on the "greatest electric railway of the world, handsomely, etc." When the public, fed with such glowing printed descriptions of the road, finally decides to take a ride and finds the coaches filled with uncomfortable rattan seats, the bodies mounted on trucks which

shake the passenger as if he were a bottle of medicine, and the car in charge of a grouchy conductor of the "step lively" pattern, it usually waits for the steam train when it has a long trip to make and uses the electric only for short distances. In the case we are considering the cars were recommended to be between 55 ft. and 60 ft. long and 8 ft. 10 ins. wide over the sheathing; the body construction to be of the strongest possible design consistent with good appearance; wide platforms to be provided; the seats to be upholstered in plush. Rattan is generally supposed to be more cleanly than plush, but one has only to look at the rattan seats which have been in use for a year or more to disbelieve. All classes of seat coverings seem to get about equally dirty, and the best a railway can do is to clean seats as frequently as possible and adopt a covering regardless of its supposed hygienic qualities. Rattan has the disagreeable trait of not affording a firm seat. It has not been found that plush seats are more subject to mutilation by hoodlums (an objection sometimes urged) than rattan on roads using both types, and cars are never equipped so as to be beyond the possibility of mutilation by hoodlums anyway. If they were they would have to consist of steel cages with bars in place of windows. On most long-distance electric railways there has been a very noticeable demand for toilet rooms on cars, and while a number of interurbans have lately gone into service without these accommodations the demand for them is strong enough to warrant their adoption. That they are a nuisance is not denied, but a railway serves the public and their absence may be the cause of turning over to the steam railway some of the traffic, and the interurban needs all the fares it can collect.

For the case in hand it should not be necessary to mention that open cars are out of the question, and one type of car will have to answer for both summer and winter service. The windows should, therefore, be of a pattern which will give a maximum opening and not interfere with the view in the summer season, while double windows are a profitable investment for the winter season. The small fittings which add so much to the comfort of the passenger, such as parcel racks, water-coolers, match scratchers, cuspidors, etc., should not be neglected and should be of the best quality and appearance. As a matter of fact appearance in the car and its fittings has a tangible value as nowhere else on a road. There are roads, however, which make the best appearance in power house and sub-stations, where all sorts of polished brass fancies and pressed brick decorations are indulged in, and which run little dingy, filthy cars that have a habit of choosing their own time of running and meeting at unexpected places. Such concerns give one the impression that they are retailing their current over the brass railings at the power stations instead of selling it in the form of rides to the public.

Trucks for high-speed service are too often a source of weakness on roads well equipped otherwise. The schedule speed of 34 miles per hour proposed for the D, E & F Railway presupposes a maximum speed of between 50 miles and 60 miles per hour. Some trucks which ride well at the lower speeds may absolutely fail at these higher speeds. It cannot be said that there is any one form of truck which has overwhelming advantages over others, the general design of all seems to follow very closely along the M. C. B. Association standard, differing mostly in details. Some of these details, it seems, should never have been adopted considering the experience in electric and other railroading. Many roads adopt a form of light truck suitable for city service for high-speed interurban cars with disagreeable results both to passengers and trucks. Other trucks are built up of heavy materials and the spring plank connected with the transom through suspension links of the flimsiest sort, or, in other words, the proportions are not kept uniform in transmitting the strains from swing bolster to pedestal boxes. Whatever shortcomings high-speed trucks may

have as a class should be charged not to the manufacturers but to the purchasers. We have become so much accustomed to a certain price for trucks in strictly street railway work that few are willing to pay the extra price needed to produce a really first-class high-speed truck, and competition is so keen among manufacturers that the purchaser is really the loser in the end.

Brakes will, of course, have to be of the air type in our case, and it remains to choose between automatic and straight-air systems. Briefly, automatic air has no value except when cars are to be used in trains. In our case there will be part of the service which will consist of two-car trains and the balance of single cars. It is possible that one of the two-car trains might part and cause great damage, but this is less liable to happen when each car is a motor car than if one were a trailer. Automatic air necessitates the triple valve, and triple valves are apt to "stick" at inopportune moments. This is not serious when there are several cars in a train, but when there is only one or at the most two cars and a triple valve should refuse to work, especially in a crowded city street, the consequences might be disastrous to the public and to the railway. The chances that a two-car multiple unit train will break in two at high speed are many times smaller than that a triple valve may stick at a critical moment, and for the case in hand, therefore, straight air is recommended. A device can easily be provided to apply the air in case a train breaks in two even on a straight air system. For the very high speeds which are now becoming common on interurban railways a more efficient application of the air brake is very much to be desired. The Westinghouse "high-speed" brake embodies some of the principles which should be modified for use with cars operating at 30 miles per hour and over, and equipped with straight air brakes. An initial brake-shoe pressure of 125 per cent of the weight of the car with gradual automatic release, which is a function of the speed, and not of the time, would be a great benefit and accident saver. Straight air brakes have attained a degree of satisfaction hardly reached by any other part of the car equipment, and there is danger of letting well enough alone to the extent of not keeping abreast of the present exceedingly rapid march of progress. As an example, it is only necessary to mention that 90 per cent of interurban roads still carry around their air compressors a cumbersome wooden box, patterned somewhat after the bulwarks which used to be built around the old-fashioned street railway motors and discarded fifteen years ago.

◆◆◆ STEEL-TIRED WHEELS ON INTERURBANS

Although chilled cast-iron car wheels have been used extensively on high-speed interurban lines, in the opinion of a number of engineers the chilled wheel has no proper place on an interurban equipment on motor-driven axles for speeds of over 50 miles per hour. The trouble with broken flanges seems to increase very rapidly when the speeds get above that point, and there is undoubtedly security in steel-tired wheels that cannot be obtained with cast-iron. The advocates of the latter, however, point to the many successful interurban lines operating at speeds up to 45 miles per hour in which cast-iron wheels are used without serious trouble. An engineer, who has had considerable experience in operating over 50 miles per hour, expressed the opinion the other day that it was folly to purchase anything but steel-tired wheels for such equipment, and cited the trouble which has recently been experienced in support of his position.

◆◆◆
The Attorney General of New York and the attorney for the corporations concerned will appear before the Court of Appeals on Monday, March 16, and unite in the request for additional time to present arguments in the franchise tax cases. These cases would be reached in the regular order of court business by March 17 or 18.

CAR HOUSE CONSTRUCTION

Recently considerable uneasiness has been occasioned among street railroad managers by the tendency on the part of insurance companies to increase the rate on certain classes of railway property. This is particularly true of car houses, and the action of the underwriters is explained by the number and character of the fires that have occurred in structures used for this purpose, and the serious losses resulting therefrom. Thousands of dollars worth of cars have been destroyed during the last year, part of which at least might have been saved had the houses been constructed in conformity with the requirements of the best modern practice, and especially if attention had been given to the subject of dividing the area enclosed into smaller spaces and separating them by standard fire walls. In the construction of most car houses it is often apparent that too little thought is given the matter of fire protection, and with the exception of concrete flooring and iron roof trusses it has been the practice to make little provision for safety from fire; yet a brief consideration of the subject of car building, the material employed in the car bodies, and the paint, oil and varnish used in finishing them, should afford convincing proof of the necessity for carefully divided or fireproof construction of the building in which they were to be stored, if such were attainable. Indeed, it is doubtful if present methods of fireproofing would withstand such a severe test as the burning up of fifty cars or 100 cars in one section of a car house, and with this in view the necessity for employing the best construction and getting as nearly complete fireproofing as possible will be apparent at once.

The proposition really resolves itself into one of areas. Safety can only be secured by dividing the space enclosed within the barn into sections of limited areas with standard fire walls between them, composed of either protected iron work or slow-burning heavy mill construction. As a guide to those who are anticipating the construction of new car houses, or the remodeling of old structures, the following suggestions are offered by an expert who has devoted considerable attention to the architectural features of street railway plants and has made a special study of the subject of car house construction. These recommendations are based upon the actual requirements of the underwriters, and must be complied with literally by those who wish to insure their property, as a slight deviation therefrom will result in an increase in rate, and any marked departure from the practice here outlined is considered sufficient cause for rejecting the risk altogether as being undesirable. It is further suggested for the benefit of those who are considering the erection of new houses that they consult the rating bureau having jurisdiction in their district before starting their work. By submitting their plans to the experts of the underwriters they may save themselves considerable expense and delay, and in some cases an entire overhauling of their plant after it is well under way or completed, as the productions of local architects are usually very unsuitable from an insurance point of view for this class of building.

DESIGN AND CONSTRUCTION

Car houses should be one story in height, built of brick, with walls of not less than 12 ins. in thickness. When two stories are demanded the first story should be 16 ins. thick, and the second 12 ins.

Side walls need not extend above the roof unless they face an exposure within 75 ft., and in that case they should be treated as division walls, openings in which should be protected by standard doors or shutters. All walls facing serious exposures should be blank.

The area of any section should not exceed 10,000 sq. ft., if possible, and in no case should it be more than 20,000 sq. ft. Wherever possible to restrict the area of enclosures to 5000 sq. ft. it is desirable to do so.

Fire walls throughout should be built of brick without openings, and they should extend 3 ft. above the roof. Where there are openings they should be as small as possible, and protected by good standard double lock-jointed tin-covered doors, $2\frac{1}{2}$ ins. in thickness, hung on tracks, bolted every $2\frac{1}{2}$ ft. with $\frac{3}{4}$ -in. bolts running through the wall, and having nut and washer on the opposite side. Tracks should be not less than $\frac{3}{8}$ in. thick and $3\frac{1}{2}$ ins. wide, of best quality rolled steel; hangers of the same material. All hardware for fire-doors or shutters should be fastened on with bolts and not screwed.

Roofs should be arranged so that there need be no openings in the fire walls above the roof line for drainage. If there are belt holes in the walls they must be protected by an approved sliding fire door, kept closed around the belt when it is not in use. Roofs, made entirely of iron or iron asbestos and composition; should have all exposed iron-work thoroughly protected by concrete, at least 2 ins. thick, on all sides of iron-work.

A heavy mill roof, of 3-in. plank with gravel, slate, tin or iron covering, supported by at least 8-in. x 10-in. beams, is much more desirable than a light iron trussed roof with iron work exposed. Heavy mill roofs will stand fire a great deal better than any form of fireproof material other than solid concrete protected iron work. Roof trusses, either iron or wood, should never extend into another fire section, for it often happens that two sections of roofing are completely destroyed by the ends of the trusses being burned away or distorted by the fire communicating through the openings occasioned by the dislodgement of roof trusses in the burned section.

Cornices, if any, should be of brick, stone or metal. No boxed or wood cornice of any kind should be used, as it is not only an unnecessary expense but an additional element of danger. Skylights or monitor lights should have wired glass in standard frames, and all windows should be protected by wire screens. Skylights of wired glass only are recommended.

Floors throughout should be brick, concrete, cinder or dirt, if a one-story building, and heavy mill construction for everything above the first floor. A mill floor consists of heavy splined plank, 3 ins. or 4 ins. thick, and a top floor of matched board with a water and fire retarding material between the two. In no case should such floors be carried by bare metal supports.

Pits should be of brick with brick or concrete floors. They should extend under one track only. Stringers, supporting tracks, should rest on brick, where pits extend under two tracks and a small portion of floor. Steps to pits should be of iron or other non-combustible material. Pits should be located at or as near the rear end of the house as possible, and should be confined to one section.

Under no circumstances should cars from under which the trucks have been taken, or disabled cars, be permitted to stand on tracks in front of operative cars, thereby preventing the exit of the latter in case of fire.

Partition walls about the offices should be of non-combustible material, such as brick, terra-cotta, asbestos blocks, wire-lath and plaster or iron or other fireproof substances in general use.

Stairs throughout, elevator openings or any other floor openings should be protected by being entirely enclosed or covered by suitable trap-doors, arranged to close automatically.

Heating by steam or hot-water system is preferable, and the piping for the system should be kept clear of wood-work and supported on iron hangers. Stoves may be used in offices and stock rooms, but when used there must be placed under them metal sheeting over asbestos. Piping must be run to a suitable chimney or carried above the roof, remote from woodwork, and not out of a broken window, as has been observed in numerous instances, especially during construction period, when the danger from fire is very great, owing to the large amount of inflammable material all about.

Electric heaters are dangerous unless they are carefully installed, and in all cases they must be properly protected. They should be mounted on suitable legs, and, if screwed to the wall, should have slate and asbestos back or them projecting 6 ins. beyond all edges of the heater. Each heater should have an individual fuse and switch.

When gas is employed for lighting the fixtures must be arranged so as not to allow the flame to come in contact with woodwork, and all fixtures should be rigid. Of course, electric lighting is preferred, but the building must be carefully wired in accordance with the rules of the National Board. Most car house electric lighting is supplied with current from the trolley, and in such cases the circuits should be supported not less than 1 in. from the wall, ceiling or other surface wired, and should be amply protected where exposed to accidental or mechanical injury. In all cases the wires should be supported at frequent intervals, so as to eliminate completely all danger of injury from possibility of wire touching floor in case of a break. It is desirable to wire pits in steel conduits, using approved wire, and to employ sufficient lights to make the use of portable lights unnecessary.

Boilers should be outside of the car house or cut off from it by standard fire walls with no woodwork near. The wall should extend 3 ft. above the roof, and if there are any openings through it that might lessen the effectiveness of the wall, care should be taken to protect the openings by standard double fire-doors, one of which, at least, should be automatic. If boilers are in the building they should be in a fireproof room.

Chimneys or stacks must be brick or iron outside, and rest on their own foundations.

Track doors swing outward in approved practice, and are hung to clear trolley wires, pull-offs, etc. Doors and frames should be tin-clad similar to standard fire-doors, and if there are any windows or other openings in them they should be of wired glass. Doors should have suitable stops to prevent their swinging over each other. Where doors close against trolleys they should have insulating blocks fastened upon them so as to prevent the possibility of an arc.

Tracks in buildings must run clear without break. Transfer tables should be designed not to interfere with the running of the cars within the building. Cross-overs and frogs must be avoided within buildings, and exit curves must be as easy as possible. Every effort should be made to have part of the tracks leave the house in opposite directions, and thus avoid congestion in an emergency. Curves should have guard rails, and all tracks stop blocks, maintaining 4 ft. between building walls and cars at the ends. Where there are more than eight tracks in a house with no space at the sides for firemen to operate, one track, at least, should be left vacant for fire purposes.

Where there is more than one section to the house each should have an independent emergency trolley switch and line breaker mounted on a pole outside. Provision should also be made for cutting off all power wiring from an outside point, leaving the trolley lines dead for at least 100 ft. from the front of the house.

In all structures used for storing cars painting and carpenter work and machine or blacksmith work should be prohibited, but where such work is permitted it should be confined entirely to one section. Car houses should be constructed without hollow or combustible finish.

Exposures count seriously against the car house in establishing rates of insurance unless guarded against by parapetted blank walls, standard shutters and doors, all of which are given careful consideration in rate making.

Inside protection is best effected by a suitable standpipe service, with a good supply of heavy pressure and suitable piping. No pipe employed should be less than 2 ins., and the size should be increased at least $\frac{1}{2}$ in. for each additional standpipe.

Where houses are not heated frost-proof hydrants are required, and in no case should piping above ground, which is turned off or frozen in winter, be taken into consideration as available for fire fighting purposes. Generally 100 ft. of 1½-in. linen hose for each 5000 sq. ft. of surface would be considered fair pro-

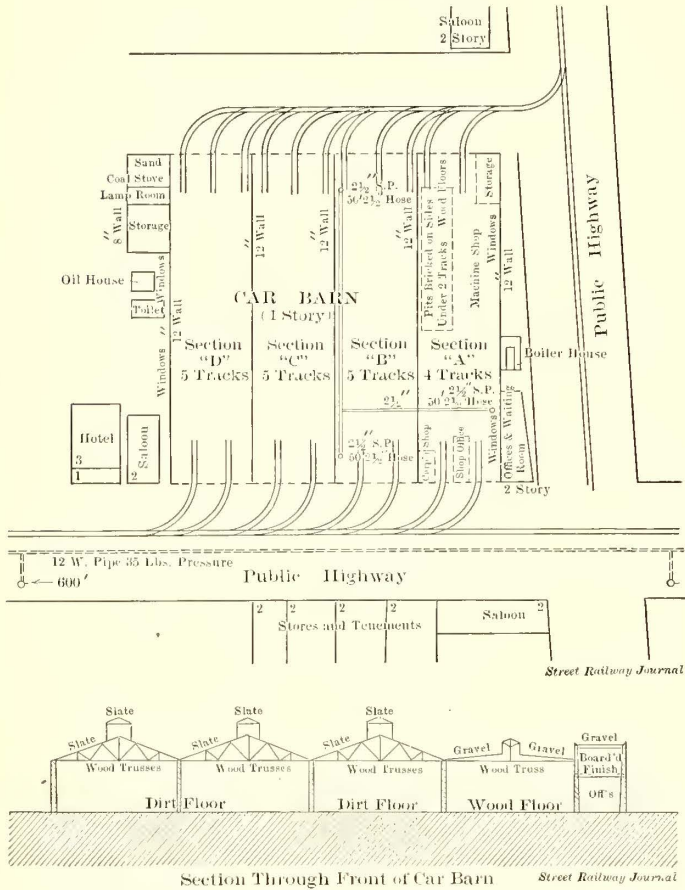
crete; door, self-closing and standard tin-covered construction, designed to clear floor at least 4 ins. Ceilings should be of concrete or terra-cotta, and should not leave any concealed space above. In no case should air spaces be left under the ceiling. One window should be provided with an area of at least 6 sq. ft. The floor should be of brick, laid in cement, or with cement laid upon galvanized corrugated iron above the wood floor. The upper surface of brick or cement floor should pitch to one corner or center not less than 1 in. per foot, and in no place is this floor to be less than 4 ins. above the floor of the barn. At the lowest point in the floor there should be a 4-in. drain pipe orifice, protected by a heavy wire guard. The pipe should be carried down and out of the building to the sewer or cesspool. All hardware should be bolted and sufficiently strong to correspond with other fittings. The door sill of the oil room should be raised at least 4 ins. above the floor of the oil room.

SEVERAL EXAMPLES FROM PRACTICE

In order to illustrate more clearly some of the points discussed in the foregoing paper, several illustrations are presented herewith showing actual plans and photographic views of typical structures designed and built for this purpose. Some of these contain many admirable features, and all of them were built according to the lights of their projectors. The companies had the right idea, but the architects who laid out the buildings and prepared the plans did not appreciate the special requirements of this class of structures, and consequently their best efforts fell short, in some respect, of the Underwriters' demands.

The car house, illustrated in Figs. 1 and 2 (plan and section), is a fair attempt at standard construction. In this case the area enclosed is divided into the proper number of sections, and arrangement of the tracks leading into the enclosure would be approved. The division walls do not pass above the roof, but the roof passes over the division walls, and this serious defect considerably reduces the value of what might have been strictly a cut-off, if the division walls had been carried 3 ft. above the roof. The monitors here are also unnecessary, and better roof lighting could have been obtained by skylights with wired glass or heavy screened glass. The boiler and oil houses also are not approved, and, moreover, lamp storage should be in a fireproof room similar to the oil storage.

The plan, Fig. 3, the section Fig. 4, and the view Fig. 5, show



FIGS. 1 AND 2.—PLAN AND SECTION OF A CAR HOUSE CLOSELY APPROXIMATING STANDARD CONSTRUCTION

tection, and not less than two standpipes to such a section should be provided. Fire pails are required, and there should be not less than three to every 2000 sq. ft. of floor surface, with a sufficient number of sand pails in the oil room and work shop. One approved chemical extinguisher for each 2000 sq. ft. should be provided.

Oils, paints and lamps should be stored outside of the main

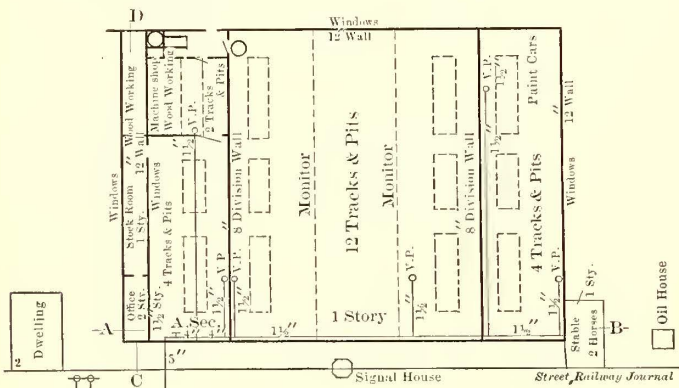


FIG. 3.—PLAN OF POORLY DESIGNED CAR HOUSE

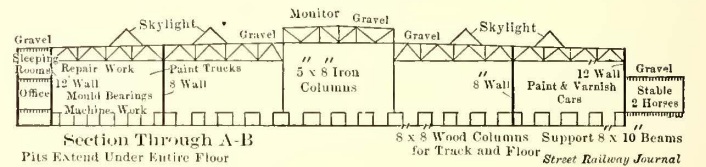


FIG. 4.—SECTION OF CAR HOUSE NOT APPROVED, BECAUSE OF INCOMPLETE CUT-OFF WALLS

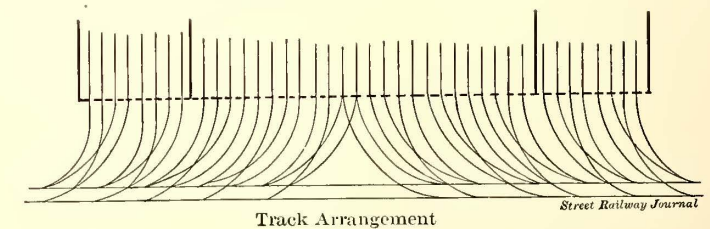


FIG. 6.—PLAN OF TRACK ARRANGEMENT

structure, and not less than 50 ft. away in a fireproof oil-house of brick or concrete, properly drained and ventilated. Walls must be continued above the roof, and the door sill raised. Wired glass or screen-protected window, if any, should be placed on the opposite side from the house.

Any oil, paints or lamps stored on the premises should be kept in an approved lamp room or oil room; the lamps in one and the oil and paint in another, with walls of brick or con-

another car house in which an incomplete form of cut-off has been attempted. The paint shop and repair shop have walls extending to the roof only; the iron roof trusses and supports are imbedded in the division walls, and form almost as bad construction as would be a total area of similar dimensions. Wood flooring and a large roof monitor form very undesirable features in addition to these already mention, and the pits, in this instance, are also far from satisfactory. The iron roof

trusses and columns would bend and warp to such an extent that it is very doubtful if any part of the roof structure or the material forming it would be of use after a severe car fire.

building, and two tracks running part way. This house should really have been divided into at least four sections, with heavy wooden roof trusses and plank and gravel roof, or, better yet, a new site selected for its construction that would admit of six or seven well-divided sections, each of which should not exceed 10,000 sq. ft.

It is a significant fact, and one that should be borne in mind by railway managers, that a strict compliance with the underwriters' requirements in design and construction of car houses would not entail much additional expense, and would insure much better buildings, both in the matter of safety from fire and suitability for car housing purposes.

The force of this has been shown several times within the last few months, in the case of several large car sheds that had been erected by progressive companies at considerable expense, but without fully complying with the requirements of the Underwriters. In one case the area was considerably in excess of that allowed—in fact, this defect alone would have made the rejection of the property almost certain, and then, too, the roof construction was not acceptable. Unfortunately, a fire visited this property and, as might have been predicted, resulted in the

complete destruction of the building and almost an entire loss of contents. Only a few cars were saved, although the sheds were filled when the fire was discovered. The roof fell in soon after the fire was discovered. The iron work was not properly protected, and the intensity of the heat from the burning cars soon bent and twisted the girders so that the workmen and firemen were in danger, and had to be withdrawn. The collapse of the roof completed the destruction of the cars.

This house could have been made very fair by placing standard division walls every 50 ft., and providing for five tracks in each division. The present arrangement is shown in Fig. 6. The roof in this—as in other cases, would be better if made of heavy wood trusses, plank and gravel, and in no case should their ends pass through or over division walls.

Attention is called to the accompanying illustration (Fig. 7) of a car house having a floor space of 19,240 sq. ft. The structure is entirely of brick, concrete and iron. Its chief defects are its large area and the bare iron roof trusses. The inside protection, as can be seen, is by means of frost-proof hydrants, which are the most desirable form of inside protection. This house has seven tracks, its walls are 21 ft. high at the sides to 35 ft. at the peak. In the event of a fire in two or more cars there would be great immediate danger that the roof trusses of the house would begin to bend, which would preclude the possibility of saving any considerable number of cars. There would have been only a slight additional expense incurred in dividing this house into two sections, making each hold four or three tracks, with heavy wood roof trusses. The same company has just constructed a house, 100 ft. x 600 ft., following exactly the same plan, the entire space being in one enclosure, with no divisions or sections, and with bare iron construction throughout. The new house will have seven tracks, running entirely through the



FIG. 5.—VIEW OF LARGE CAR SHEDS, WITH INCOMPLETE CUT-OFF, UNPROTECTED ROOF TRUSSES, UNSATISFACTORY PITS, AND WITHOUT STANDARD DIVISION WALLS

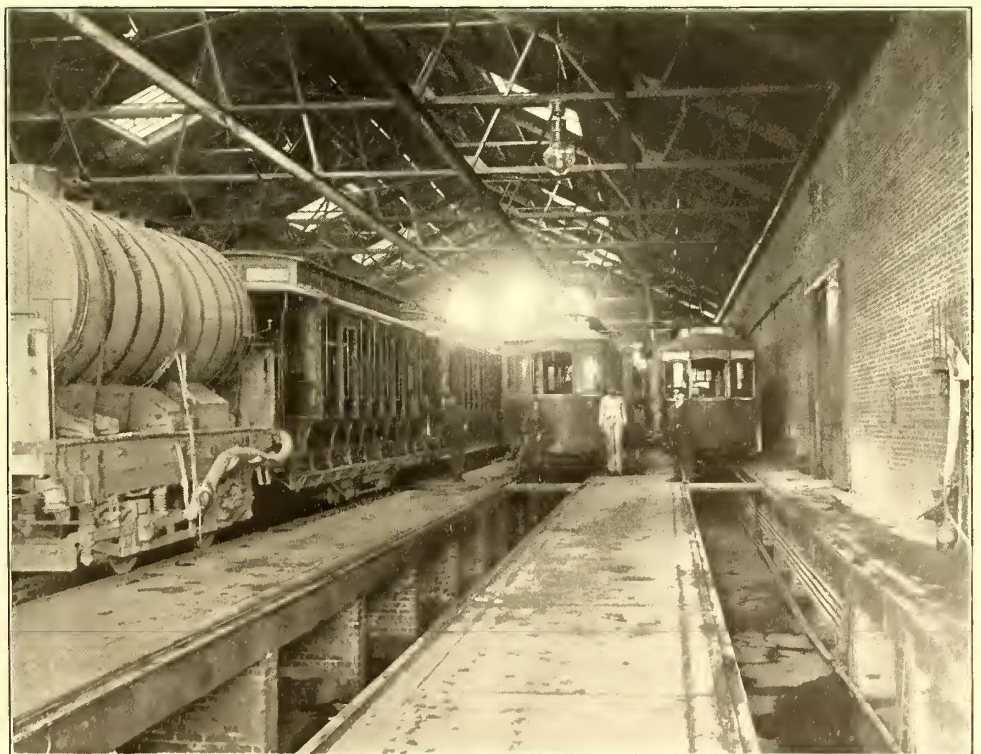
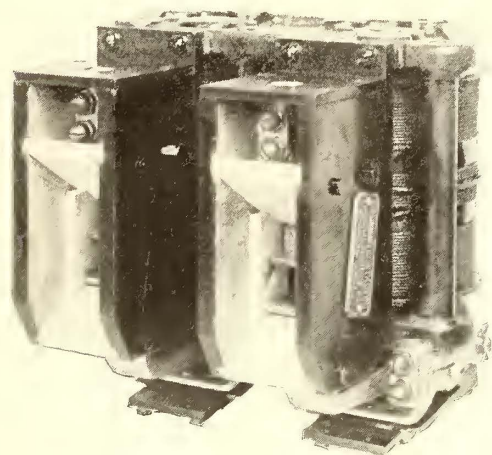


FIG. 7.—CAR HOUSE CONDEMNED ON ACCOUNT OF LARGE AREA AND BARE IRON TRUSSES

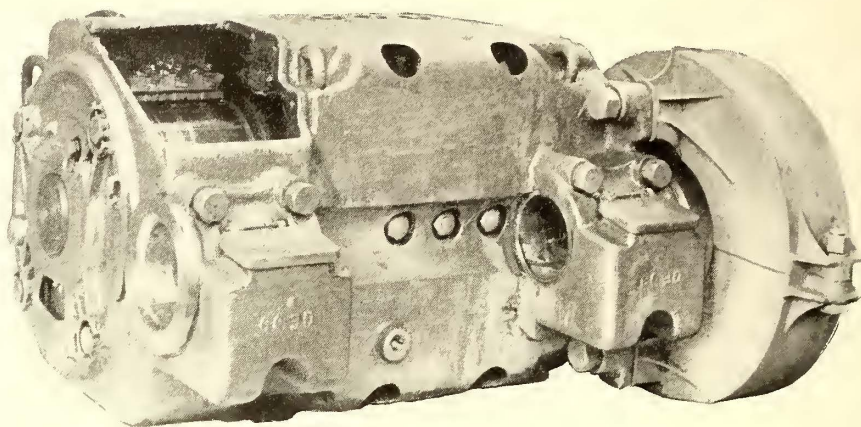
THE TYPE OF CONTROLLERS AND MOTORS TO BE USED IN THE NEW YORK SUBWAY

As announced in the last issue of this paper the Rapid Transit Subway Construction Company, which is building the rapid transit line in New York for the Interborough Rapid Transit Company, awarded on March 4 a contract for 340 control equipments and 680 motors. The order for the controller equipments and 340 motors was given to the General Electric Company,

position. In either case the spring causes the operating cylinder to follow the movement of the handle until it reaches a position corresponding to that of the operating handle. To prevent the operating cylinder from moving too rapidly its speed is regulated by a limiting device, and the rate of current input is regulated by a current relay in series with the motor circuit. This closes a local circuit, locking the master controller cylinder against movement until the acceleration current has fallen sufficiently to release the master control cylinder for the next



NEW FORM OF CONTACTOR

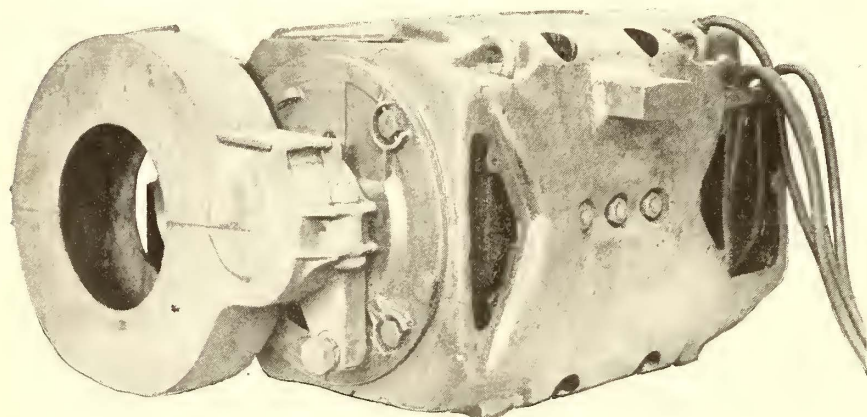


AXLE END OF MOTOR

and the order for 340 motors was at the same time given to the Westinghouse Electric & Manufacturing Company. Particulars of the controller equipments and of the General Electric motors are given below. A description of the Westinghouse motors which have also been adopted will follow in an early issue.

The controller system adopted is manufactured under the Sprague and General Electric patents and differs in a few respects from the type-M control which is employed on the Manhattan Elevated Railway, of New York, and which was described in the *STREET RAILWAY JOURNAL* for Oct. 5, 1901. One of these changes consists in the use of an attachment to the

notch. In other words, the motorman in notching up slowly controls the train in exactly the same manner as the ordinary manually-operated master controller. The automatic feature comes into operation only when the rate at which the operating handle is turned on would allow more than the desired amount of current to pass through the motors if it was limited. In ordinary practice, however, the motorman throws the handle to the full parallel position, and the controller cylinder follows up, notch by notch, as fast as the motor current will permit.



SIDE VIEW OF MOTOR

master controller, which provides for automatic acceleration at a predetermined current without preventing or interfering with the manual operation of the master controller at less than the predetermined current if desired.

As arranged the master controller has twelve notches instead of ten, as with the Manhattan controller. The operating cylinder instead of being directly attached to the control handle is moved by the handle through the medium of a spring. To secure automatic acceleration the motorman moves the operating handle notch by notch, the operating cylinder following, or he can throw the handle to either full series or full parallel

An improvement has also been made in the form of contactor, and a view of a pair of the contactors to be used on the subway cars is shown in one of the accompanying cuts. As will be noticed, two contactors are mounted on the same base, instead of having them entirely separate, as in the Manhattan equipment. This plan of grouping contactors has been followed where two or more are of the same potential, and in the subway equipment there will be several groups of two and three contactors each. This saves room and also avoids the necessity of much of the interconnection of the contactors by heavy wires.

An improved form of contactor blow-out has also been adopted. It is considered by the manufacturers more efficient than that used on the Manhattan equipment, and by it a considerable reduction in weight has been secured

with a greater current carrying capacity.

A diagram of the connections which will be used in the control system adopted is shown on page 413. As will be seen by following out the control circuits on first notch, the coils of contactors 6, 7, 9 and 15 are energized in the order given. This allows the main current from the motors to flow first through contactor No. 7, then through contactor No. 6, resistances R-1 to R-8, motor No. 1 and contactor No. 15; then through contactor No. 9 and resistances R-7 to R-12, and then through motor No. 2 to ground. On the second series notch, contactors No. 5 and No. 10 are picked up, each cutting out a portion of

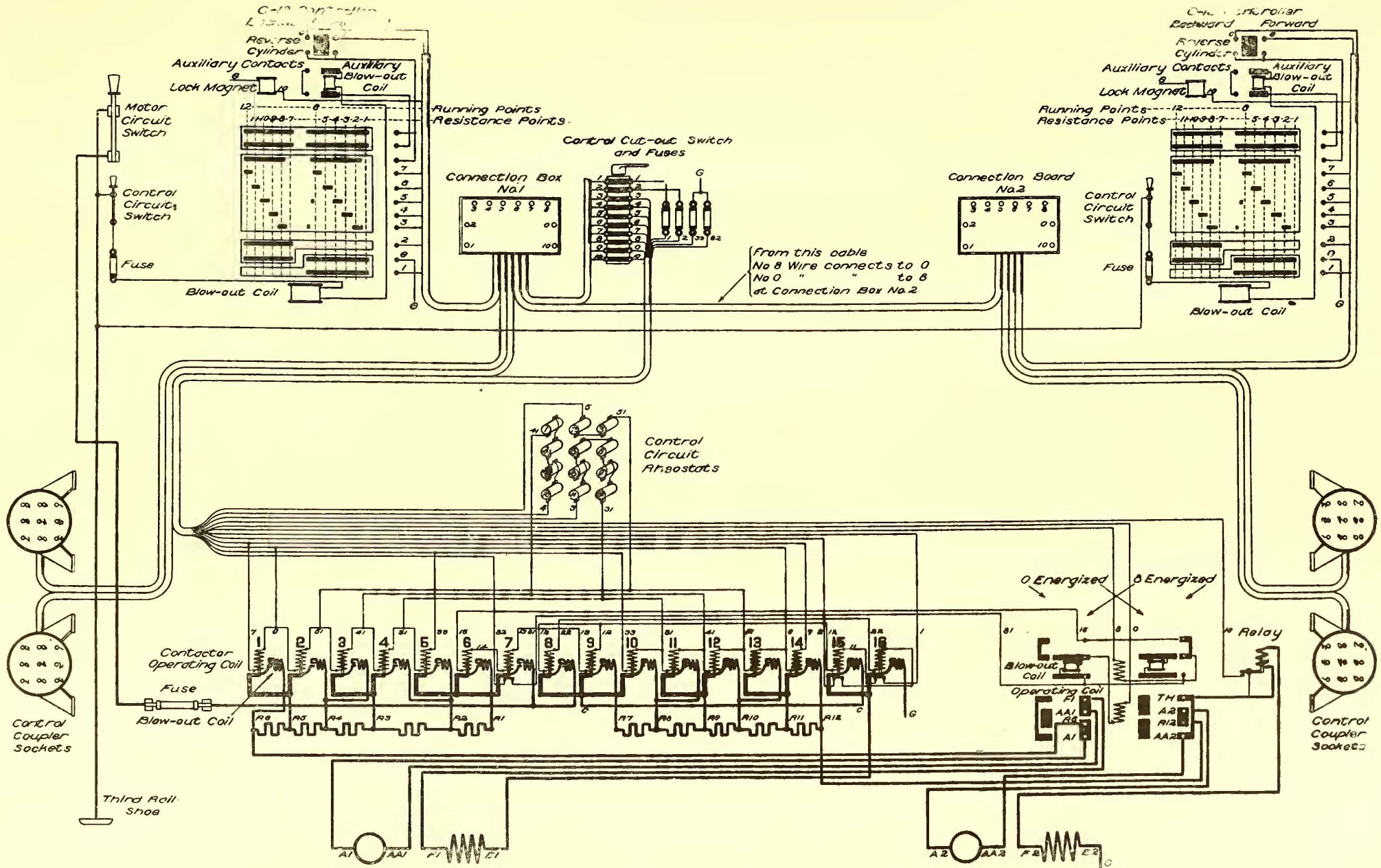


DIAGRAM OF TRAIN CONTROL SYSTEM TO BE EMPLOYED ON THE TRAINS IN THE NEW YORK SUBWAY

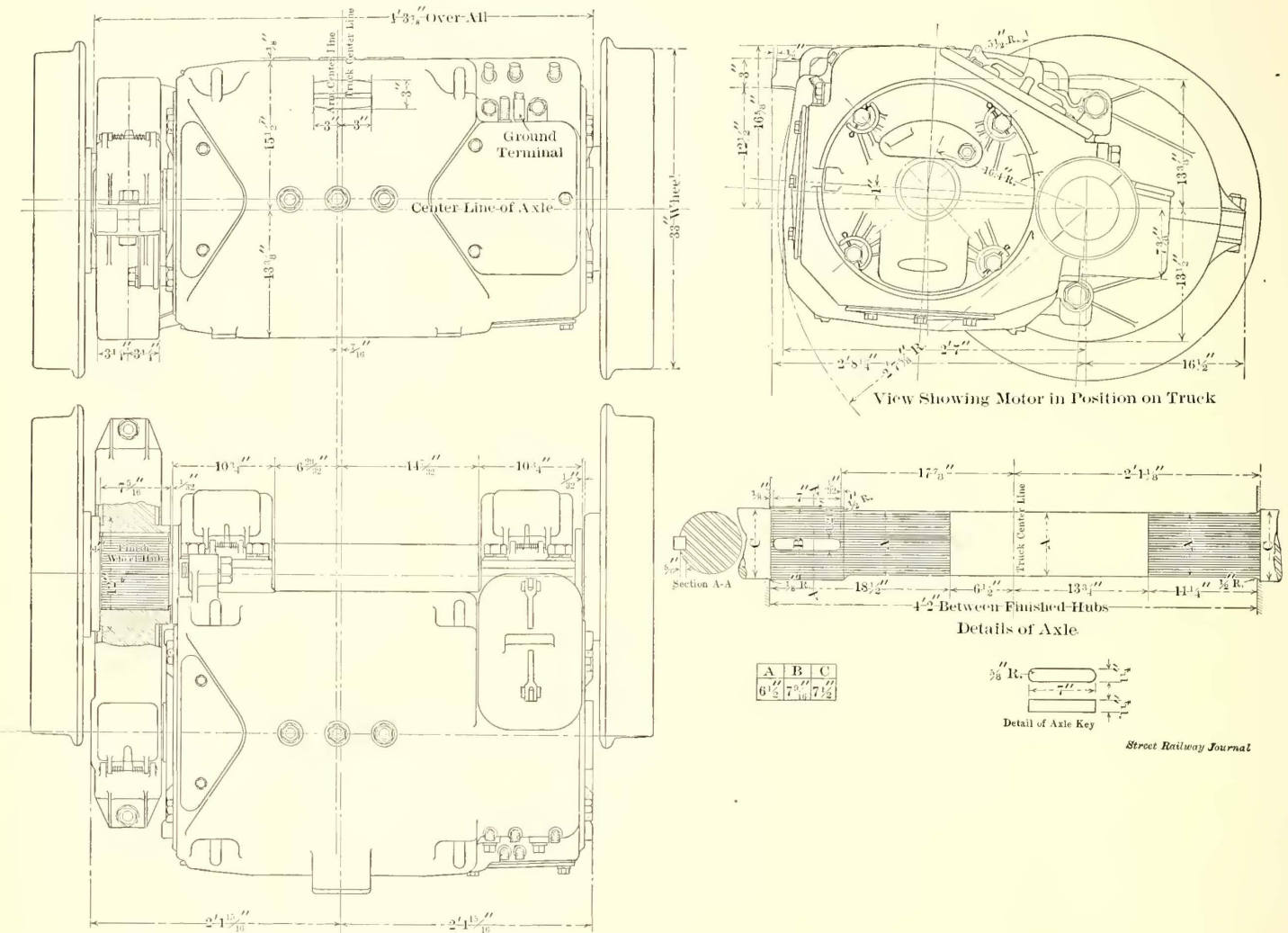
the resistance. The remaining resistance contactors pick up until all of the resistance is cut out, and the full series position is reached. The connections on the first parallel notch are such that the current for No. 1 motor passes through contactor No. 7 and No. 6, and through resistance R-1 to 8. The current for No. 2 motor in parallel working passes through contactors No. No. 8 and No. 9 and resistances R-7 to R-12.

It will be seen from this statement that the connections differ from those of the former type M control in two important particulars. First, the resistances are divided into two groups, and each group is always used with the same motor and only for that motor. The other point of difference lies in the fact that each resistance contactor short-circuits one section of the resistance only instead of controlling in some cases more than

wheel hubs. It is fitted with the nose suspension and its front side is supported by lugs cast on a frame. This lug is designed to rest on a bracket riveted to the truck transom with a forged strip bolted over the top of the lug to prevent the motor from rising. The motor is mounted on or removed from the truck from above, when the truck is out from under the car, no pit being required.

The magnet frame is unsplit, and is made of one piece of cast-steel, substantially in the form of a cube with well-rounded corners and large bored openings, one at each end, into which frame heads carrying the armature shaft bearings are bolted. Through these openings the armature is put in place or removed from the frame.

The pole pieces are laminated and are bolted to the interior,



PLAN AND ELEVATIONS OF G. E. 69 MOTOR

one. It follows from this that each contactor carries the current of only one motor. This arrangement allows the resistance grids to be made of larger cross section. At the same time the number of contactors required is not materially increased, owing to the fact that with the former method, in some cases, two contactors had to be used in parallel when working with heavy current. By the arrangement described the actual number of contactors is increased only by two, viz., from 14 to 16.

THE GENERAL ELECTRIC 69-MOTOR

The General Electric motor which was bought by the Rapid Transit Construction Company is to be known as the General Electric 69-motor, and has a capacity of 200 hp. It was designed especially to meet the specifications of the Rapid Transit Company.

The motor, which has a weight of approximately 6000 lbs., and is adapted for mounting on a truck with 50 ins. between the

top, bottom and sides of the frame through bolts with nuts on the outside of the frame.

The field coils are wound with flat copper ribbon in a common plane. The coils are insulated with mica and a specially prepared fabric which makes them semi-fireproof and practically impervious to moisture. The air gap is a total of 7-16 in., 3-16 of an inch above and 4-16 of an inch below the armature.

The armature has a series drum barrel winding. Its conductors are copper bars, separately insulated and assembled in sets of five, the set as a whole having an outside protective insulation. The bars are soldered directly into ears, forming a part of the commutator segments, thus avoiding entirely the use of connecting leads. At the back of the armature the top and bottom bars are connected together with tinned clips riveted and soldered but easily removable in case it should be desired

to replace top bars without disturbing the bottom bars. The conductors are held in slots by tinned steel wire bands imbedded in the core beneath the periphery, the wires being soldered together and held by tinned clips. The armature core is of the "ironclad" type, and is made up of soft iron laminæ.

The commutator segments are made of hard drawn copper



ARMATURE OF G. E. 69 MOTOR

insulated throughout with the very best grade of mica. The commutator shell and cap are made of cast-steel, the parts being especially strong; the segments are elamped very tight, the cap being pressed home in a hydraulic press previous to tightening the commutator bolts. The commutator ears, into which the armature conductors are soldered, are formed integral with the segments so that there is no joint between the ears and segments, thus making a thoroughly insulated, strong and compact construction.

The brush holders are made of cast bronze, and are adjustable to allow for wear of the commutator. The heads carrying the armature shaft bearings are each made of malleable iron cast in one piece. In order to secure large and long bearings without sacrificing other desirable features of construction, the heads in a cone shape are extended well under the commutator shell and pinion and armature core head. This construction forms a support for the bearing lining, which is very strong and rigid.

The armature bearing of the motor bearing is open to lubrication only on the side opposite the shaft pressure. The babbitt lining is only 1-16 in. thick, preventing the armature dropping more than this distance even in case of hot bearings melting out the babbitt. The bearing is soldered into a shell of the best quality bearing bronze by first tinning the inside of the shell before pouring in the babbitt.

The gears are made of a superior grade of cast steel and the pinions are forged steel, extra hammered to improve the quality of the metal. This material has an elastic limit of not less than 38,000 lbs., and a tensile strength of about twice that amount. The gears have a 5¼-in. face and are cut with 2½-in. diametrical pitch. The pinion has a taper fit on the armature shaft of ⅝-in. to the foot, measured radially.

The gear ease is of substantial construction and is bolted directly to the frame of the motor without the use of lugs. This form of construction was introduced by the General Electric Company for the first time on the Manhattan Railway, and has given very good satisfaction, as it avoids all possibility of the breaking of lugs. The gear ease is of malleable iron, and radiating from the three points at which it is attached to the motor frame are strengthening ribs to prevent the case from cracking when subjected to the excessive vibration received in service. Both top and bottom halves of the case are bolted to the motor frame and the two halves are bolted together.

Another very important feature of this motor is the method which has been adopted to overcome the trouble popularly known as "flashing over." It might be said that this is a subject to which the engineers of the General Electric Company have given a great deal of attention in the past, first to determine the cause of the "flashing over," and second to cure the

trouble. A large number of tests have been made at the Schenectady shops, and those which have been carried out on this particular motor indicate that the correct solution for the problem of cause has been discovered as well as its proper remedy.

Properly to understand the improvement adopted it is necessary to understand the reasons for the flashing. This trouble occurs almost entirely when the motors are running at high speed, when the line voltage is high, or, say, above 575 volts, and immediately after there has been a momentary interruption of the power circuit with full current on. This interruption may be due to a variety of causes, as, for instance, a break in the third rail, a high joint, which causes the contact-shoe to jump, or in some cases from sleet or ice on the rail. Assuming that there has been a momentary interruption in the circuit, the magnetization of the field disappears. When, then, there is a restoration of the current on the completion of the circuit after contact is again secured, there is momentarily a large rush of current through the motor, due to the fact that for a very short interval of time, the self-induction of the motor being low, there is no field on which the armature can build up a counter electromotive force. This interval is measured in hundredths of a second, but it is long enough so that the excess current is liable to produce a disastrous effect on the motor.

The method of obviating the trouble, as applied on the subway motors, is comparatively simple. As is well known, it has been the practice of the principal manufacturers heretofore to place around the field poles of the motor short circuited copper bands for the purpose of steadying the motor, and also, though not of the first importance, to reduce the arcing at the controller. With the type-M control, the contact resistances are of such a character as to possess ample margin to take care of any self-induction however great. The use of these copper bands are, therefore, unnecessary so far as the controller is concerned. They have, therefore, been omitted, and where the field winding is supported by or surrounded by a metal shell for mechanical support, that metal shell is cut or open circuited so as to prevent its acting as a short circuiting conducting band around the poles. In other words, the effect has been to make the self-induction of the motor sufficiently great to prevent a sudden inrush of heavy current in case of the momentary interruption of the power circuit.

DOUBLE SWING RUNS IN HAVANA

The Havana Electric Railway Company, of which George F. Greenwood, formerly general manager of the Consolidated Traction Company, of Pittsburg, is manager, is employing for the operation of its cars a system of double swing run of five hours each, with five hours rest between the hours of work. This plan has operated very satisfactorily and has become very popular with the men on the Havana system. The cars are run in that city for twenty hours, and the men work in two shifts of a total of ten hours each, divided into periods of five hours, with no time off for meal hours.

Although at first sight such a division of work might seem to give some poor runs, yet as a matter of fact there are very few, if any, poor runs in the schedule. For instance, if a man starts in at 5 a. m. he runs until 10, then lies off until 3 and takes his car until 8 p. m. On the other hand, a late run would work out somewhat like this: A man takes his first car at 10 a. m., works until 3, when he has his dinner, picks up his second run at 8 p. m., and keeps it until 1 a. m. Between these two runs, of course, any number of regular runs can be interpolated.

Whether this method would be popular or practical to any extent in northern latitudes is perhaps something of a question, but Mr. Greenwood speaks very highly of the method as applied to Havana conditions.

RECENT HISTORY OF MUNICIPAL OWNERSHIP OF STREET RAILWAYS IN GERMANY

BY EDWARD T. HEYN

The change from horse to electric power on the street railway lines in Germany was somewhat slow, because the franchises of many of the lines run by horses did not expire until quite recently. In the year 1891 Germany had only three electric railroads. In 1893 there were six new roads. Only at a recent date, between the years 1895 and 1900, when electric plants proved profitable, was the general decision reached to change the street railways from horse to electric power. When this became general the stockholders in the horse lines were offered large bonuses, in some cases amounting to 50 per cent of their previous market value. As in other cities of the world, German electric street railway lines have been very successful and stocks at one time were as high as 400 per cent. Such a condition of affairs had not been seen here since 1870. A reaction from these high figures set in during the recent crisis.

With such conditions and high prices prevailing, it need not be considered surprising that the German municipalities hesitated to purchase electric street railway lines. They could bide their time, for, according to the franchises granted in Germany, municipalities reserve the right of assuming these enterprises at certain periods.

The following cities now own their own electric street railway lines: Bonn Colmar, Düsseldorf, Elberfeld, Frankfurt, Mayence, Graudenz, Cologne, Königsberg, Mannheim, Mühlheim a/Ruhr, Munich, Gladbach, Münster, Oberhausen, Rheydt, Wittenberg, Witten a/Ruhr. Recently three other cities, Halle, Dresden and Nürnberg, have assumed their railway systems. Halle purchased the system known as the "City Railway," comprising some 17 miles of track, at the price of 125,000 marks, or somewhat more than \$30,000 a mile. Last October the city of Nürnberg purchased the street car system which connects that city with the town of Fürth. Although Nürnberg received over 5 per cent rental from the private company operating this line, it nevertheless considered it more profitable to buy the line and operate it. The company was willing to sell its system, because, owing to the expense of introducing electricity, its income in recent years has been small. For the same reason one of the lines in Dresden sold its system to the city. Of 133 German cities eighteen, or about 14 per cent, own their own street railway systems.

The most important question which has confronted German municipalities is how to obtain possession of street car lines at the most reasonable rates. There is no doubt that in several instances German cities have paid entirely too much for the good will and property of electric plants and street railway systems. The city of Essen is now considering this very problem. The Essener Strassenbahn is anxious to sell to the city. The franchise, which was made thirty years ago, does not expire until 1926. The system is a very poor one, the cars are bad, the fares are unusually high and employees are poorly paid. The Mayor of the city is one of the directors of the company. The company demands 21,000,000 marks for its system, while the city offers 18,000,000 marks. The replacement cost of the road is about 8,000,000 marks.

The question of the municipalization of the railway system in Berlin first came up in 1898, when the construction of several new street railway systems became necessary. At that time the city adopted the resolution to grant no franchises for street car lines in the future and to build the same at its own expense. At the same time it was stated that while the policy of the city was not to obtain larger profit from the operation of its own street railway lines than it now receives from private companies, it might do so, and in no case was the system to be run at a loss. It was declared that in view of the great need of an

improved system the city was fully capable of running such systems. Following this up the city of Berlin purchased the line belonging to Siemens & Halske, and connecting Berlin with the suburbs of Pankow and Treptow. It bought this stock, amounting to five and a half million marks, of the owners at 166 2-3.

Soon after this was done the Prussian Minister of the Interior extended the franchise of the Grosse Berliner Strassenbahn Gesellschaft, which expires in 1919, until 1949. This company has a practical monopoly of the surface transportation lines of the city. It was given out officially that the reason for the Minister's action was based on the fact that the city of Berlin could not come to an agreement with other municipalities as to the operation of the private line under its own management. However, the true reason for the lengthening of the franchise of the Grosse Berliner Strassenbahn was a judicial one. The Berlin municipality claimed that according to the Prussian light railway law it had the right to decide the length of time the franchise should be extended. On the other hand, the street railway company claims that while the city can say whether or not it shall give a franchise, the right of finally granting and extending a franchise is the exclusive prerogative of the State. It also admits that the city has the right to buy its line, after giving full compensation, but that it cannot do so unless it obtains the consent of other municipalities, which are connected by the Grosse Berliner Street Car Company. The situation has also been made more difficult because the Reichsgericht, the highest court of Germany, has rendered a decision which makes it illegal for municipalities to build roads whose competition will seriously injure private street car lines. Problems, similar to those which Berlin has recently passed through, have confronted the cities of Hannover and Cologne.

The old elevated road in Berlin, known as the Stadtbahn, which was built twenty years ago, is still in operation and has proved a decided success. Although this road pays regular pensions to retired employees, it was able last year to turn over to the government a dividend amounting to 3 per cent.

The new elevated and underground road, constructed and operated by the Siemens & Halske Company, has been fully described in American magazines and newspapers. To my mind its most noteworthy feature is the attention given in its construction to safety, noiselessness, architectural beauty and general good taste. For the privilege of building and operating the road the firm of Siemens & Halske pays the city of Berlin as follows: On a total yearly income of 6,000,000 marks 2 per cent, over 7,000,000 marks 2¼ per cent, and in an increasing scale, for every million marks ¼ per cent more, but at least 20,000 marks annually.

The city of Charlottenburg receives on the annual income of the road up to 7,000,000 marks 20-36 of 1 per cent; up to 8,000,000 marks 21-36 per cent, and so in increasing scale for every million marks 1-36 per cent more, but at least 7,500 marks annually.

In conclusion it is interesting to note that several German cities have established a number of other municipal enterprises. Among them are slaughter houses and municipal drug stores.

The morning and evening "limited" on the Cleveland, Painesville & Eastern Railway has proved so popular that the company is having a special car built to handle this traffic. It is being built by the Kuhlman Car Company, of Collinwood, Ohio, and will be 51 ft. over all, 8 ft. 6 ins. wide. Vestibules will be flush with the sides of the car. Interior finish will be solid mahogany, plain, with no panels or moldings, the idea being to make the car thoroughly hygienic. It will have Hale & Kilburn high back plush "walk-over" seats, and will be equipped with Smith hot-water heater, Christensen air brakes, four General Electric No. 73 75-hp motors mounted on No. 27 Brill trucks. The car will be geared for high speed.

* Abstract of paper read at the National Convention on Municipal Ownership and Public Franchises, in New York, Feb. 25, 1903.

LABOR CLAUSES IN FRANCHISE GRANTS*

BY R. V. INGERSOLL

Laws affecting railways have been passed in various States which require vestibules on surface cars during winter months, or prescribe maximum hours of work, or provide for appliances to lessen risk in coupling steam railway cars. There are likewise laws insisting that in all contracts for public works there shall be clauses to establish a minimum or the "prevailing" wage, or a maximum day. The courts, however, have shown marked disfavor toward provisions of this particular kind.

In test cases the grounds variously assigned have been "class legislation," "taking of property without due process of law," "interference with freedom of contract," and the "spending of public moneys for other than public purposes." In short, the courts are only slowly beginning to recognize that the maintenance of a proper standard of living among quasi public employees is neither against public policy nor contrary to the spirit of our free institutions, of which the courts assume to be judges; that it is rather a motive having justification quite as strong as has the desire to carefully safeguard neighboring property owners, or to insure greater comfort to travelers—provisions for which, however onerous, the courts have almost invariably sustained.

But this discussion has to do more specifically with the policy of embodying similar labor provisions among the conditions precedent to public franchise grants. In view of the frequency with which such clauses have long been considered in the letting of public contracts, this special phase of the movement is surprisingly new. The recent legal works on franchises and on public service corporations are wholly silent upon the point, while even the most progressive thinkers have prepared discussions of the desirable franchise clauses containing usually no reference whatever to the subject. Yet the intense feeling among the New York trades unions at the omission of wage and hour clauses from the Pennsylvania tunnel grant indicates that henceforth the subject is to be one of keenest controversy.

A careful though not exhaustive research brings to light almost no franchises in this country which have contained clauses of the kind in question. Detroit has made one street railway grant containing a ten-hour clause, and Mayor Johnson was responsible for a compulsory arbitration clause in a similar Cleveland franchise. The section in the Cleveland ordinance was as follows:

Whenever any controversy arises between the grantee under this franchise and his employees which interferes or threatens to interfere with the operation of the road, each side of the controversy shall appoint two persons as its representatives, who shall constitute a board of arbitration, whose actions shall be final. If said board fails to agree within three days, then the Mayor shall become the fifth member of the board, and a majority vote of said board, consisting of five members, shall be final. No motorman or conductor shall work more than ten hours within the limits of fourteen hours in any twenty-four hours, except in case of emergency causing obstruction of traffic.

The whole franchise containing this question was declared void by the Circuit Court of Ohio. The decision, however, did not single out the arbitration clause as the chief defect, but held only that it was one of the several sections which tended to prevent favorable bids, and which taken together were contrary to the State law providing that new franchises must go to the highest bidder. This decision, coming not from the highest court in the State, being based largely upon other points involved, and founded at best upon a strained logic, will probably not have great weight outside of Ohio. In fact, the courts in most States have said emphatically that any specifications will be upheld whose reasonable effect is to insure greater safety, comfort or continuity in the transit service.

A similar arbitration provision, and one which the courts sustain, occurs in a street car franchise in the city of Seattle, granted in accordance with the following section in the city charter:

It shall be the duty of the City Council to incorporate in every franchise or amended franchise efficient provisions for the compulsory arbitration of all disputes arising between the grantee therein and his, its or their employees as to any matter of employment or wages, unless upon submission to the electors of the city a majority of the electors voting upon the question submitted shall assent to the granting of such franchise without such provision.

In Europe, labor clauses in franchise grants have been somewhat more frequent than in this country. They have varied in effectiveness all the way from the establishment, since 1898, of a pension fund and of a ten-hour day on the Berlin roads, to the elaborate provisions attached to the franchise lease of the subway system in Paris.

The privilege to build the Paris subway was conceded only upon stipulation, among other things, that the men should be paid never less than 150 francs per month, or for temporary work not less than 5 francs per day, that their hours of work should not exceed ten, with one full day's rest in seven, that a vacation of ten days each year should be given them with full pay, and that their wages should not cease during periods of temporary illness nor while recovering from the effects of injuries sustained while at work for the company. It was likewise stipulated that the employees should have gratuitous medical and drug service, and that the company should insure the men against injuries by accident. The fund required for this purpose must be controlled by the workmen through their chosen representatives.

It may be added that careful provisions were made for the comfort and convenience of passengers, and for very reasonable fares, including a 4 per cent round trip for any one going to work before 9 o'clock in the morning, and a 1-cent fare for school children. While the city has constructed the subway tunnels, the cost is to be paid out of the earnings which accrue during the period of the lease, and the whole system, including tracks and rolling stock put in by the lessee, is at the end of thirty-five years to revert to the city.

During the recent agitation for a wage and hour clause in the Pennsylvania tunnel franchise it was objected that such provisions would be unconstitutional. This argument was based largely upon the case of *People ex rel. Rodgers against Coler*, decided in February, 1901, by the New York Court of Appeals. In this case a divided court, with a powerful dissenting opinion, declared unconstitutional the State law which provided that the "prevailing rate of wages" should be paid on all construction work done under public contract. The reasons assigned were as follows:

1. In making local improvements a city is not an agent of the State; its right of self-government entitles it to make its own contracts for such improvements, which cannot be prescribed by the State without violating constitutional guarantees.

2. The constitution provides that the public expenditures of a city shall be only for city purposes; hence the city cannot make a contract which obligates it to pay more than the necessary or market rates of wages, because such a contract requires the expenditure of public funds for a private purpose.

3. The act violates the constitutional rights of liberty and property of local property owners, who bear the expense of the improvement; because, when the expense is enlarged beyond its actual and reasonable cost, their property is taken without due process of law.

4. Similarly, the property (i. e., contract) of the contractor is taken without due process of law by the imposition of burdensome conditions with respect to the means of performance of the contract, thereby depriving him of its benefits.

It would seem that most of these points could not be made against the insertion of a labor clause in a franchise grant.

* Abstract of paper read at Convention on Municipal Ownership and Public Franchises, New York, Feb. 25-27, 1903.

Thus, there would be no conflict as to State and city jurisdiction. For while in theory all franchises have their source in the State, most of the States have established uniform general laws for their creation, making consent of local authorities one of the essential conditions. In construing these laws the courts have conceded that as a part of their power to give or withhold consent the local authorities have a right to insist upon conditions. Even here, however, there is possible doubt whether the courts in some instances might not condemn labor clauses as "unreasonable" and as inserted for private as distinguished from public purposes. The second and third points, having to do with the spending of public moneys and the burden on taxpayers, would, of course, not apply, inasmuch as the granting of franchise rights does not usually contemplate expense to the city.

The fourth point in the Coler case was to the effect that such clauses are an arbitrary interference with freedom to make contracts and to acquire property. The logic of this argument was most ably combated by Chief Justice Parker in his dissenting opinion. Nevertheless it secured a majority vote of the court, and would probably be held to apply with as much force to a franchise as to a contract for construction work to be paid for by the city.

Although some of our ablest judges, such as Judge Parker in New York, and Judge Holmes, formerly of Massachusetts, now in the United States Supreme Court, uphold the legality of wage and hour provisions in contracts for public works, still the trend of decisions is against them. Whereas eight-hour laws have been sustained by the highest court in Kansas, by the next court to the highest in New York and by the United States Supreme Court, they have been overthrown in Ohio, Illinois, Washington, Texas and California. Laws prescribing a minimum wage or calling for the prevailing rate have been upheld in Kansas, but declared unconstitutional in Ohio, Pennsylvania and New York. Several points made against these provisions in contract work would, as already stated, not apply to franchises. Nevertheless the array of decisions is sufficiently impressive to give rise to doubts.

The plan, however, of requiring compulsory arbitration appears to obviate most, if not all, of the legal objections, and to have other very important merits peculiar to itself. As to the machinery for arbitration, some such arrangement as that now existing between the New York Central Federated Union and the Association of Rapid Transit Contractors might be provided. This consists of a board of ten men, five chosen by the contractors, five by the men. To it all grievances are presented, and in case of failure to agree an outside arbitrator is to be called in. Trades unionists and other advocates of the labor clause principle would probably act wisely in most cases should they withdraw their demand for fixed wage and hour prescriptions and turn their efforts to the obtaining of an arrangement by which arbitration shall be mandatory upon franchise grantees.

Cases Upholding Eight-Hour Minimum Wage and "Prevailing Rate" Laws Upheld:

Vol. 94 U. S. Rep., p. 400. 59 Pac. (Kans.), 336.
 Vol. 59 Pa. Rep. (Kas.), p. 336. Such Laws Overthrown:

Eight-Hour Laws Overthrown: 7 Oh. Dec., 354.
 22 Wash., 327. 167 Pa. St., 47.
 7 Oh. Dec., 354. 166 N. Y., 1.
 188 Ill., 266.
 12 Tex. Civ. App., 45.
 85 Cal., 274.

The Sao Paulo Company, of Sao Paulo, Brazil, has made a new contract with the government of Brazil modifying the contract relating to the Santo Amora Suburban Steam Railway, allowing the conversion from steam to electricity of this branch of the company's system. Orders are increasing each month for lighting, and negotiations are under way with a view of securing the contract to light the city.

STATION OPERATION AT DUBLIN

The following figures show the cost of operation of the Ringsend power station of the United Tramways Company, of Dublin, Ireland. This station is equipped with British Thomson-Houston generators, direct connected to Allis-Corliss compound engines, Babcock & Wilcox boilers, Vicars stokers, Green economizers and Wheeler condensers. The station contains four direct connected and one alternating-current machine. As will be seen the total cost per kilowatt-hour is 0.3812d. or 7.624 mills. If the operating cost of the sub-stations (£36, 16s.) is added the cost of power on the line is 0.39d. or 7.8 mills per kilowatt-hour.

STATION EXPENDITURE MONTHS OF NOV. AND DEC. 1902

	Nov. 1902			Dec. 1902			Per Kw. H
	£	s.	d.	£	s.	d.	
Coal, 1638½ tons at 9/6 per ton in Dec.....	648	14	0	638	5	9	.2926
<i>Operation—Wages</i>							
Supervision general.....	32	3	2	33	3	8	----
Engines.....	91	6	1	94	4	8	----
Electrical plant.....	16	1	6	17	4	2	----
Boilers.....	37	4	2	38	11	7	----
Coal handling machinery.....	4	0	1	3	10	0	----
Auxiliary plant.....	20	11	8	21	6	10	----
Lighting.....	--	8	10	--	13	5	----
	201	15	6	208	14	4	.0715
<i>Operation—Stores used</i>							
Lubrication.....	25	2	6	21	17	6	----
Engines.....	9	14	9	--	4	10	----
Electrical plant.....	1	3	2	1	4	11	----
Boilers.....	2	4	9	1	17	8½	----
Coal handling machinery.....	--	3	6	--	--	6	----
Auxiliary plant.....	1	7	0	1	10	2½	----
Lighting.....	4	19	1	2	3	8	----
	44	14	9	29	2	4	.0099
<i>Maintenance—Wages</i>							
Engines.....	20	12	5	16	4	7	----
Electrical plant.....	1	13	10	1	8	7	----
Boilers.....	31	0	3	29	17	8	----
Coal handling machinery.....	1	11	4	1	16	4	----
Auxiliary plant.....	17	19	8	8	5	6	----
Lighting.....	--	--	--	--	--	--	----
	72	17	6	57	12	8	.096
<i>Maintenance and repairs—Stores used</i>							
Engines.....	3	15	4½	4	16	3	----
Electrical plant.....	--	4	6	3	17	2	----
Boilers.....	5	14	7	16	9	2½	----
Coal handling machinery.....	--	1	2½	--	--	--	----
Auxiliary plant.....	6	4	5	7	8	11	----
Lighting.....	15	6	1	3	7	2	----
	31	6	2	35	18	8	.0122
Watchmen, yardmen, offices and stores.....	24	5	10	25	17	3	.0088
Discharging four coal boats.....	13	10	9	13	6	2	.0045
<i>Items chargeable to other than above</i>							
General labor operation, wages.....	32	14	10	39	1	2	.0132
Miscellaneous stores.....	--	15	3	2	7	8	----
Building repairs.....	9	10	7	--	8	11	.0009
Water used, 787,000 gallons at 6d. per 1000 ..	17	10	0	19	3	6	.0065
Building repairs, wages.....	3	15	5	4	10	8	.0015
Shop tools, stores.....	1	17	11	1	8	9	----
Construction, wages.....	--	5	4	--	--	--	----
Total expenditure.....	1,103	16	10	1,120	17	10	.3812

DETAILS FOR MONTH OF DECEMBER, 1902

Station output		
Direct current at Ringsend Busbars in kw hours.....		602,265
Alternating current at Ringsend Busbars in kw hours.....		102,670
Direct current at Blackrock in kw hours.....	35,256	
Direct current at Dalkey in kw hours.....	6,323	
Direct current at Clontarf in kw hours.....	60,777	
Direct current at Clontarf in kw hours chargeable to Howth Co.	11,300	
Kw. hours used for power and lighting.....		2189.1
Car miles run.....		557,719
Coal used in lbs.....		3,222,880
Cost.....		£683 5s. 9d.
Coal used per kw hours in lbs.....		4.55
Cost of coal per kw hours.....		.2326d

SUB-STATION RETURN, MONTH OF DECEMBER

	£	s.	d.	Total Kw. H.
<i>Blackrock</i>				
Direct current output in kw hours.....	11	4	0	35,256
Wages operation.....				----
<i>Dalkey</i>				
Direct current output in kw hours.....	--	0	--	6,323
Wages operation.....	7	0	0	----
Supplies operation.....	--	8	7	----
<i>Clontarf</i>				
Direct current output in kw hours used on own line.....	--	--	--	29,577
chargeable to Howth Co.	--	--	--	11,300
Wages operation.....	12	0	6	----
Supplies operation.....	2	9	8	----
Electric maintenance.....	3	13	10	----
Total sub-station expense.....	36	16	1	----

SUB-STATION PRACTICE AROUND TOLEDO

There is at the present time considerable diversity in the relative size and number of the rotary converter sub-stations used by interurban roads to operate a given length of line. On one hand the tendency has been to use large sub-stations a considerable distance apart and employ skilled attendants, because of the importance of each sub-station. The other extreme in sub-station practice is to be noted on two roads running out of Toledo, of which F. B. Perkins is mechanical and electrical engineer. On the Toledo & Western Railway and also on the Toledo & Indiana Railway it was Mr. Perkins' policy to design sub-stations having small capacity, and located at frequent intervals. Instead of hiring expert attendants these sub-stations are looked after by men whose principal duties are those of station agents. Sub-stations are located at passenger and freight stations, and the agent with his family resides at the sub-station. Instead, therefore, of having two high-priced attendants for each sub-station one station agent, with his family, looks after the sub-station machinery, and also the express and freight business. A skilled man from the main power house visits the sub-stations as often as is necessary, to see that the apparatus is being maintained properly. This brings the cost of sub-station labor, which is an important item on some interurban roads, down to a very low figure, since only a portion of one man's time is chargeable to sub-station labor at any one sub-station. Of course, the argument urged against such a practice is that it puts the sub-station in the hands of comparatively unskilled and inexperienced men, who can devote but little of their time to it. On the other hand, it is argued that sub-station attendance takes but little work, and since sub-stations are numerous, a shut-down of one of them because of the lack of a skilled attendant, would not seriously interfere with the operation of the road. If one was out of service the others would carry the load. The importance of any one sub-station in the operation of the road would not, therefore, be as great as if larger sub-stations were used, placed at long intervals.

The portable sub-station has been made great use of by Mr. Perkins in his practice, both in the construction of extensions to existing lines and as a reserve for the regular sub-stations. A portable sub-station, contained in a box car, can be run to any part of the line where there are high-tension wires, and put in service on short notice. Such a sub-station can be within a short time substituted for any sub-station out of service, and when new lines are being built the portable sub-station supplies these lines until such time as a permanent sub-station can be located. The Toledo & Indiana Railway is at present being operated by a portable sub-station at one end, and a sub-station in the power house at the other end. The portable sub-station acts as the equivalent of a reserve unit in every sub-station along the line, because it can be used at any sub-station.

IMPROVEMENTS AT BUFFALO

The plans for improved service between Buffalo and Niagara Falls have already been outlined in these columns, and now it is announced that the service of the city system of the International Railway Company is soon to be greatly improved by the completing of a loop near the terminal in Buffalo, known as Shelton Square.

It is the custom now to run the cars a considerable distance out of the way, reaching Main Street at a point nearly a quarter of a mile away from the junction of Main Street and Niagara Street, bringing them up Main Street and then holding them at the terminal at Main Street and Niagara Street until their schedule time for starting. By building a loop from the incoming track, which runs on Pearl Street, to the junction of Main Street and Niagara Street, considerable time will be saved and the long run down Main Street avoided.

CORRESPONDENCE

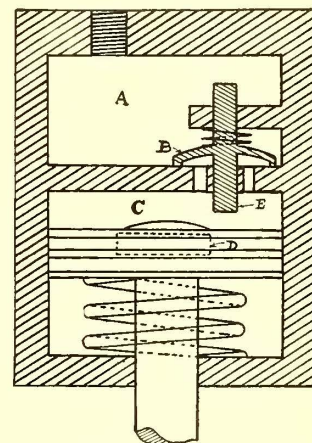
CHIPPING THE ICE FROM THE THIRD RAIL

New York, March 7, 1903.

EDITORS STREET RAILWAY JOURNAL:

The recent storm and the twelve-hour block on the lines of the Manhattan Elevated road again brought the sleet question before the mind of the public in a very forcible and unpleasant manner, and it was after this last storm that the following method of removing the ice off of the third rails suggested itself to me. Everyone who has watched the process of removing the ice from the sidewalks after a storm like the last, will recollect that when the ice is hit a blow it cracks for a considerable distance around the place where it was struck, and also that the cracked ice can then be brushed off with a broom. Ice on a smooth iron or steel surface is still easier to remove than on a stone surface. Why not then remove the ice from the third rails in the same way? If a brush, consisting of a few wire "bristles" or chipping edges be made to hit the third rail a moderately hard blow 500 or 600 times per minute, it would then crack and loosen the ice, which could be swept off by a follower brush, leaving the track quite clean. As there is an air compressor fitted to all the motor cars the reciprocating motion could be most conveniently imparted to the brush by a small air cylinder, the simplicity of which is shown by the accompanying diagram.

The chamber A is connected to the compressed air reservoir. Starting from the position of the piston shown in the diagram it is moved upwards by the spring till it comes in contact with the valve spindle E, thus lifting the valve B off of its seat and putting the chambers A and C in communication. The air pressure then acting on the piston forces the piston downwards till the brush, which is attached to the end of the piston rod, strikes the rail, in which position the upper edge of the piston will be below the upper edge of the exhaust port, shown dotted at D. The air in the chamber C will then exhaust to the atmosphere, reducing the pressure, thus allowing the spring to again force the piston up and so again repeating the same cycle.



PNEUMATIC CHIPPER FOR CUTTING ICE ON THIRD RAIL

The foregoing, I believe, would be a solution of the sleet problem, and would not be very expensive to install on the cars, for the air compressors are there and have a sufficient capacity to run one or two of these brushes besides, which, of course, would not use any air except when there was ice to be removed, at other times the air supply to them being cut off. H. F. S.

DRAINING RAILWAY ROADBEDS

Victoria, B. C., Feb. 6, 1903.

EDITORS STREET RAILWAY JOURNAL:

Which is the cheaper and better method of drainage for electric railway roadbed, the agricultural tile or the drain built of rock?
W. T. W.

The cost of building a substantial stone drain in most places would be prohibitive, and one that was not put in according to first-class methods would soon give a great deal of trouble and need constant repairing. Ordinary tile answers all practical purposes, and will last longer than a stone drain that is not very carefully built.

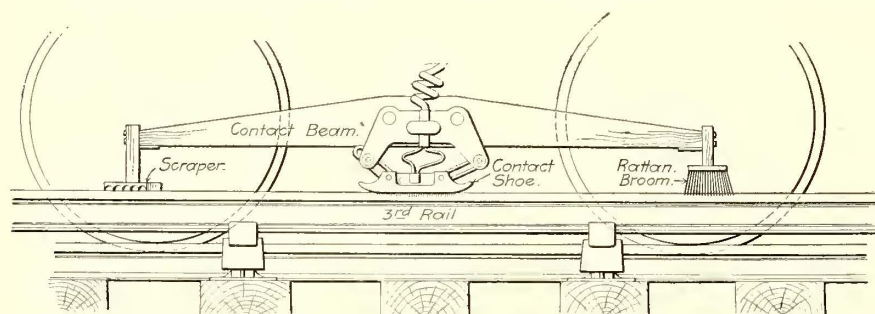
FIGHTING SLEET AND SNOW ON A THIRD-RAIL INTERURBAN LINE

Grand Rapids, Mich., Feb. 27, 1903.

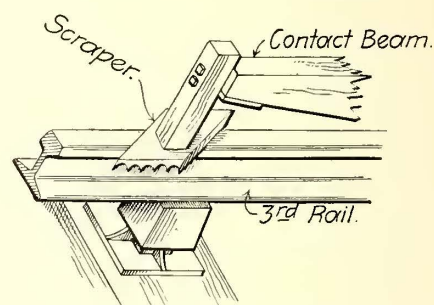
EDITORS STREET RAILWAY JOURNAL:

The experience with sleet of the Grand Rapids, Grand Haven & Muskegon Railway may be of general interest, as well as the methods devised for fighting this formidable foe of the third-rail system. A heavy storm came just one week after the line was opened, and snow fell to the depth of 2 ft., coming down almost steadily for three days. As we had an unprotected contact-rail it was not difficult to plow off the snow, excepting at very heavy drifts, when the track gang had to resort to the hand-shovel, and it was a simple matter to keep the rail clear by brooms fastened to the contact beams.

A sleet storm came later, during a thaw, and caught us early in the evening, when least expected. We had been hoping to



EQUIPMENT FOR CLEANING SNOW AND SLEET FROM THIRD RAIL



STEEL CUTTER

be spared the experience, as we had no appliances on the cars to handle an icy rail, and everything and everybody was new to third-rail transmission. The first car caught put a man on the fender with a shovel to cut the ice off the rail; this was all right so far as the rail was concerned, but very hard on the man on account of the blinding flashes from the arc. We saw something had to be done quickly or we would be tied up, and, as we had fought the snow successfully, we did not care to give up before so simple looking a proposition as sleet, but, as usual, appearances were deceiving. It was decided that the sleet must be scraped off and the rail cleaned, and in looking about for something already at hand, we took some pressed steel tie-plates and improvised scrapers, which were fastened to the outside ends of the contact beams, as shown in the accompanying sketch. This was crude, but effective, and, as a result of our experience at that time and since then, we are satisfied that nothing but cutting the ice off the third rail and following by a brush to clean the rail thoroughly can be satisfactory or effective against sleet.

Our experience since the opening of the road inclines us to the belief that a device using a steel scraper, with the cutting blades diagonally across the rail, in place of the steel brushes now on the "L" road, together with a stiff rattan broom, wide enough to run in the third-rail trough, will keep the contact-rail clear of sleet and snow. The cutting device need only be used when ice is on the rail.

The steel wire brush was tried, but it is too elastic to do effective service as a scraper under the severe conditions surrounding the third-rail system of transmission, and a stiff rattan broom is superior for brushing purposes.

Suggestions are being made continually by the general public regarding housing or covering the third rail, but those who are familiar with the care and maintenance of roadbed and third-rail transmission line know something of the tribulations and difficulties that would follow such practice. There are troubles which might become chronic if the rail was covered, whereas sleet and snow are but occasionals.

G. R. H. M.

DOUBLE SWINGING DOOPS FOR CARS

A well-known master mechanic, in rebuilding some old cars, found it almost impossible, on account of certain peculiar construction in the old cars, to adopt a regular sliding door. As an expedient he has constructed a double-swing door, which is a decided innovation in car building. He is not inclined to say much about this door, probably because he is afraid of being laughed at by some of his brothers who are not acquainted with the difficulties which drove him to this move.

A double-swing door for the rear end of a street car does not seem very attractive at first thought; but there is some merit to the idea. As constructed by this master mechanic it is provided with a spring strong enough to close it promptly, and with a roller and cam, which prevents the door from swinging backward and forward when closing, after the manner of most double-swing doors. Along the edge of the door a flexible

rubber guard made of hose pipe insures a fairly tight fit and allows the door to swing freely either way.

One of the first objections that the reader will probably think of against this door is the room it takes up in its swing. Indeed, it may be thought that the use of any kind of a swing-door is going back twenty years in car-building practice. This may be so; but as far as taking up room is concerned a double-swing door in its opening takes up practically no more room than would the passenger in passing in or out of the car. It may be said that the passengers will stand in front of the door and prevent it from swinging; but there is no reason why passengers should stand in front of a door when some one is trying to open it any more than they would stand in front of a passenger desiring to get off.

One very strong point about the self-closing double-swing door is that in very cold weather it makes a car much easier to heat. A sliding door is sure to be open more of the time after a passenger has entered or left the car than is a door which closes itself immediately after a passenger has passed through.

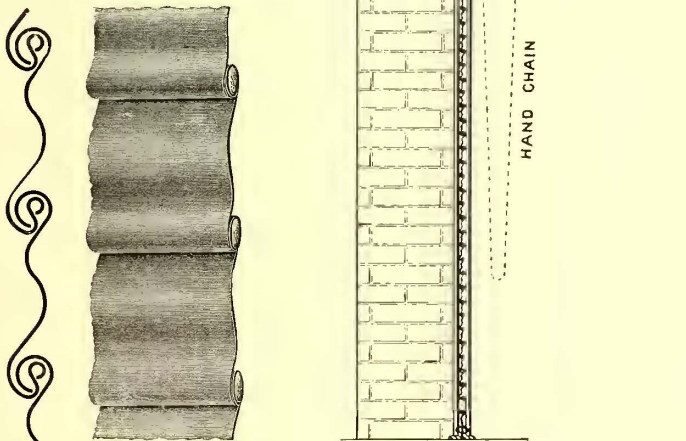
The claim department might object to this door on the score that it is insecure, and gives a passenger standing just inside the door no definite support. Very few operating men, however, would maintain that a door should be considered as a substitute for the straps or grip handles on the backs of the car seats as a means of support. The less temptation there is to stand near the door the better, and if the door gives no solid support to the standing passenger he will seek some other location, and this will make entrance to the car easier, and so, on the whole, aid operation.

One objection has been found to the door, namely, that passengers are, in the main, used to a sliding door, and are at a loss to know what to do when encountering a double-swing door. While only a few cars are operated with such doors and all the rest of the cars have sliding doors, of course this is a very practical objection. If all the cars on a line had the swing-door this objection would not be so serious.

These are the pros and cons of the automatic swing door for street cars, as brought out in a discussion of the matter with the master mechanic before referred to, and while they do not show that this kind of door is altogether desirable it will be seen that it has its strong points.

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STEEL ROLLING DOORS FOR CAR HOUSES

The advantages of rolling sheet-steel doors and shutters, combining ease of operation, security and efficient fire protection, have come to be widely recognized, and have practically become a standard fitting of modern street railway car houses. That rolling steel doors possess points of superiority over the ordinary sheet-steel, hinged door is obvious and several designs of the former type are now obtainable. One of the most recent forms of this style of door is that originated and patented by P. Ebener, which is being manufactured by the Columbus Steel Rolling Shutter Company, Columbus, Ohio. The company was organized about a year ago, and the important feature of its doors is the form of the steel slats used. The details of construction are clearly shown in the accompanying illustrations, in which Fig. 1 presents a sectional view of the slats, showing the formation of the hinge, Fig.



FIGS. 1, 2 AND 3.—STEEL ROLLING DOORS

2 shows the slats as they appear from the outside, and Fig. 3 shows the details of the hoisting mechanism.

As will be seen from Fig. 1 each hinge has two distinct bearing points, so shaped as to produce the least friction when the shutter is being rolled, and the small bead within the large barrel of the hinge prevents the slats from being jammed apart. The rounded or cylindrical formation is very strong and not liable to spring, and the surface of the metal is not broken or weakened as is the result of short right-handed bends or folds. This endows the door with strength for resisting heavy wind pressures and general hard usage. At the same time there are no pockets or recesses left for the accumulation of water, dirt, snow or sleet to produce rusting. The shutters are made of No. 22 sheet steel, and are formed in a specially built machine.

The construction of the hoisting mechanism can be readily understood from the sectional view, Fig. 3. The sprocket wheels are covered by a sheet steel hood, secured to the supporting brackets, the latter being fastened to the wall by means of expanding bolts. Where doors are utilized especially for fire protection they can be so constructed as to stand rolled up normally and operated by the melting of a fuse, the latter re-

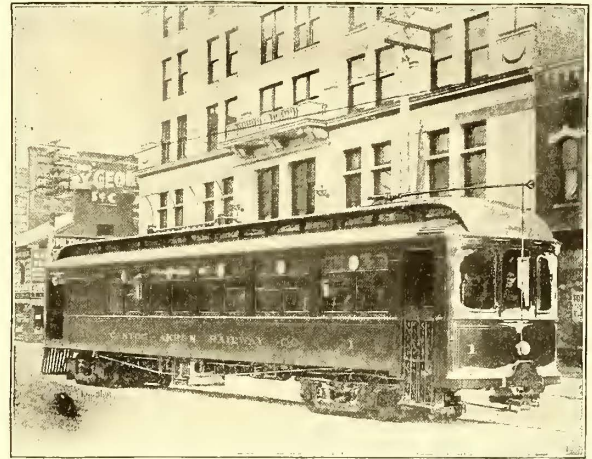
leasing a spring, which starts the door, and, aided by gravity, soon close it, shutting off the likelihood of fire being communicated from adjoining buildings.

Among the orders which the company has already filled are doors of the type for the new Columbus shops of the Pennsylvania line west of Pittsburg; for the shops and freight shops of the Hocking Valley Railway, at Columbus, Ohio, and for shutters and doors for several new car houses and power houses for interurban lines in Ohio, Indiana and Michigan. The demand for these doors has been so large during the time in which the company has been engaged in business that it has been found necessary to increase the force so as to run double time. Shortly, however, the new plant which the company is building will be available and this will facilitate the manufacture of these shutters.

The officers of the Columbus Steel Rolling Shutter Company are Samuel P. Elliott, president; J. W. Cartzdafner, vice-president; S. A. Webb, secretary; H. E. Miller, general manager and engineer, and Peter Ebener, superintendent.

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KNUTSON TROLLEY RETRIEVER

Interesting experiments have been conducted upon several railway lines in Ohio since the first of the year that confirm the claims made by the Trolley Supply Company, of Canton, regarding the Knutson trolley retriever. This device has proved efficient and reliable in operation through several snow and sleet storms during the last few months. The retriever is a disc 8½ ins. in diameter and 6 ins. deep over all. It is placed



KNUTSON TROLLEY RETRIEVER

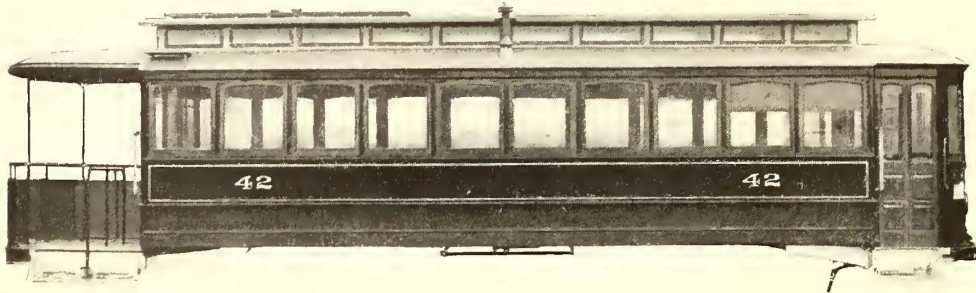
on the dash of the car out of the way of all car equipment, allowing it to be adjusted and taken apart, if necessary, from the outside. It consists of a heavy and weak spring, actuating disc and reel, adjustable to different trolley-pole tensions, and controlled by an automatic locking and releasing device. No matter what the elevation of the trolley pole may be when it jumps the wire, it is claimed that the sudden pull up of 3 ins. to 4 ins. will throw governors out and trip a heavy retriever spring, whose action will instantly bring down the trolley pole 6 ft. to 8 ft. below the trolley wire.

To wind the spring the rope is pulled out slowly until it is stopped by the automatic action of a locking bolt, when, by releasing the rope, the mechanism will release from engagement the heavy spring, leaving the weaker spring alone in action to keep the slack out of the rope. As soon as the locking device is tripped the reel will rotate in the opposite direction and bring down the trolley. The tension of this weak spring, which is to keep slack out of the rope, may be adjusted to suit conditions.

Cars have been operated at high speeds with these devices, and they have never failed to work satisfactorily. Several tests at 50 miles per hour were made upon Ohio interurban lines.

NEW CARS FOR TOLEDO

The long rear platform with dividing rail, popularly known as the Detroit platform, is coming into more extended use in many of the Western cities where the arrangement of terminals is such that the cars can be run as single enders. One of the latest cities to adopt this type of car is the Toledo Railways & Light Company, of Toledo, one of whose cars is illustrated in the accompanying engraving. The view shown was taken at the works of the Kuhlman Car Company, of Cleveland, Ohio,



TOLEDO CARS WITH DETROIT PLATFORMS

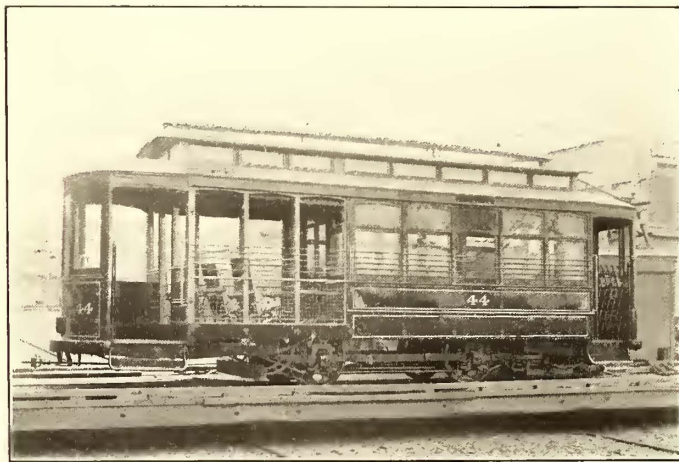
where the car was built, and before the trucks were placed in position. It is one of an order of thirty city cars awarded these builders, and which are similar to ten cars previously built by the Kuhlman Company, and which have been in operation for some time.

A number of cars of similar pattern are being manufactured by the same company for the Jackson Street Railway Company, of Jackson, Mich.

The body of the car is 28 ft. in length. It is finished in the interior in cherry, rubbed to a dull finish. The ceiling is painted green and is ornamented with gold trimmings.

COMBINATION SINGLE-TRUCK CAR

Combination cars of the double-truck type have become familiar sights in many cities, but single-truck combination cars are a comparative rarity. Nevertheless, for the conditions existing in Mobile, Ala., they are considered desirable, and one



COMBINATION SINGLE-TRUCK CAR

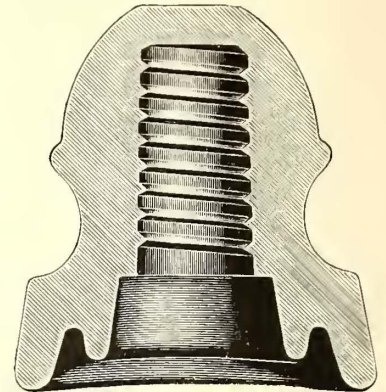
of several cars recently built for the Mobile Light & Railroad Company by the St. Louis Car Company is illustrated in the accompanying engraving.

The car has a length of 21 ft. over corner posts and of 31 ft. over bumpers. The maximum width of the car is 8 ft. 4 ins. The open end is shown in the engraving as supplied with six cross-seats, and the closed end with ten cross-seats. The seats are of the car builders' walk-over pattern. The interior finish is in mahogany.

Although the front end of the car is shown in the engraving as closed, it can be made into practically an open car by dropping both upper and lower sash into a sash pocket. The roof is fitted with a trussed trolley board.

RAILWAY LINE MATERIAL

Results of tests conducted by Professor Samuel Sheldon, of Brooklyn Polytechnic Institute, upon several forms of overhead line material manufactured by the Electrose Manufacturing Company, of Brooklyn, have been published. They are not



ROUND TOP HANGER

only very creditable to electrose material but they contain much valuable data upon the performance of this form of insulation.

The round-top hanger shown herewith consists of a malleable iron shell, which protects the insulation from blows of the trolley wheel. The outriggers are designed extra broad and strongly ribbed to take in without deflection the heaviest span wires. The screw stud is $\frac{5}{8}$ -in. drop-forged steel for No. 0 or No. 00 wire. For use with No. 0000 wire, $\frac{3}{4}$ -in. stud is used. In the test each hanger was suspended, free from draught, in an inverted position by means of a bronze ear, weighing 8 ounces, and being $5\frac{1}{2}$ ins. long, the ear clamping the middle of a round rod of soft iron, $\frac{1}{4}$ in. in diameter and 20 ins. long. From the hanger-top was hung a weight of 200 lbs. A current of 200 amps. was passed continuously through the rod for one hour. This maintained the rod at a red heat. This supply of heat, which is practically the same as would be given by a red-hot trolley wire of the same size in the same time, did not affect the electrose insulation to such an extent as to allow the 200-lb. weight to pull apart the metal parts of the hangers. "These tests show that these hangers meet the requirements of the present common methods of trolley line construction," is Professor Sheldon's comment.

Sheets of electrose, submitted as samples, were 12 ins. x 12 ins., and were marked with the letters "A," "B" and "C." The report says: "There were two samples marked with each letter of $\frac{1}{4}$ -in. and $\frac{1}{8}$ -in. thickness respectively. The samples were successively placed between two $\frac{3}{8}$ -in. spherical brass electrodes, which were subjected to an alternating voltage. This voltage was raised by steps until, at 75,000 volts, a surface discharge took place around the sample in each case. In no case was the insulation perforated. After the test the samples showed themselves to be in a condition of strong static electrification." The Western Electric Company will handle these specialties.

THE THIRD RAIL IN THE SNOW

General Manager Warren Bicknell, of the Aurora, Elgin & Chicago Railway, reports that his road went through the heavy snowstorm which occurred in February with flying colors. There have been no heavy snowstorms in that region this winter, and the one in February was the only one which could be called a test of the company's ability to fight snow. On this occasion a rotary snow-plow was run out, although its services were not really needed. Mr. Bicknell reports that there were places where the third rail were covered; but it was possible to run through these drifts with the momentum obtained on track which was not covered. There seems to be little difficulty in operating a third-rail road of this kind in snowstorms.

ST. LOUIS SUBURBAN ROLLING STOCK

As a result of the recent fire at St. Louis, which destroyed the Suburban Railway sheds at De Hodiamont, patrons of that road may now ride in the company's two palatial private cars, "Suburban" and "Kinloch." So many of the regular cars were burned that the management has been obliged to bring into regular service all available rolling stock to handle the passengers, and among other things it put on the private cars.

The "Kinloch" cost about \$10,000, and is considered one of the finest private street cars ever operated on an electric road. The "Suburban" is also a handsome car, having cost more than \$6,000. In these cars many of the distinguished guests of St. Louis and the World's Fair Company have been hauled. They



RUINS OF ST. LOUIS CAR HOUSES

have also been used for trolley parties, and have always attracted attention.

The Suburban fire destroyed sixty-three passenger cars, of which fifteen were new and twenty were remodeled. Messrs. Lucas and Houseman, of the St. Charles road, are running their cars on the Suburban. Captain Robert McCulloch, general manager of the Chicago City Railway, ordered the St. Louis Car Company to turn over to the Suburban twenty new cars built for his company, as they are the same type as the Suburban's new cars. In addition, the St. Louis Car Company will deliver immediately ten reconstructed cars. These arrangements have enabled the Suburban to operate more new cars than it had prior to the fire.

As it is, cars are being run at intervals of five minutes, and oftener during the busy hours morning and evening.

According to the official report of the company losses to the insurance companies by the fire were: On the rolling stock, \$145,000; on building, \$25,000; on other property, \$5,000. The value of the property destroyed is about \$235,000, but the salvage will probably reduce this amount to about \$190,000.

As soon as the insurance is adjusted the company will immediately begin the erection of new sheds at De Hodiamont of fireproof materials.

The old car sheds, 350 ft. x 125 ft., are a mass of ruins, with only portions of the walls standing, while the interior presents a scene of wreck and ruin difficult to describe.

The early hour, 5 o'clock in the morning, at which the fire broke out, found the sheds occupied almost to their full capacity, and in spite of the efforts of the employees to run the cars out of the building only a few were saved.

In the total of sixty-seven cars destroyed fourteen were of the handsome new green cars recently built. These cost from \$4,500 to \$5,500 each. The other cars ranged in cost from \$800 to \$3,000.

The St. Louis Transit Company, through the courtesy of General Manager Grant, immediately tendered the use of twenty cars, and as many more cars as were wanted.

QUICK WORK AT STEUBENVILLE

The Steubenville Traction & Light Company, which lost its generating station recently by fire, has already under way plans for the restoration of the plant on a much improved scale. In spite of the almost complete loss of the power plant, part of the traction service was resumed the day following the fire, store and house lighting a week later and the street lighting two weeks after. An idea of the havoc wrought by the fire is conveyed by the accompanying illustration reproduced from a photograph of the ruins. The enterprise of the management of the company was appreciated by the people of the city, and the



RUINS OF ELECTRIC POWER PLANT AFTER FIRE AT STEUBENVILLE

City Council tendered a vote of thanks to the company and its officers for the prompt action taken in restoring the service after the fire.

Work on removing the ruins of the plant was begun as soon as it was safe for workmen to invade the site, and a temporary roof was erected over the engine and dynamo room within thirty-six hours. By generous use of the long-distance telephone, telegraph and express service an alternator was secured, and house and store lighting was resumed within seven days after the date of the fire. The company also obtained a number of Brush arc machines, and the street lighting service was resumed within fourteen days after the fire. For about twenty-two days another company furnished sufficient power to operate one-third of the regular cars, and by that time the repairs were completed on a small generator which had gone through the fire. The service, of course, is still quite seriously crippled, although it is being improved as fast as possible. The inter-urban division is more seriously affected than the city lines. Repairs to the Crocker-Wheeler generator are about completed, and service will soon be entirely resumed.

The new dynamo and engine room will be as nearly fire-proof construction as is possible to make it—tile floor, slate roof and steel trusses, there being eight for 50-ft. span. These were made up and delivered within two weeks from time order was given.

New generating machinery will consist of two 400-kw Crocker-Wheeler machines, directly connected to 24 x 30 Belmont-Corliss engines, in addition to which will be the Crocker-Wheeler-Corliss set of same size which is being repaired, a 250-kw Westinghouse machine, directly connected to a Westinghouse engine, and a 150-kw Siemens-Halske belted-type machine, three No. 12 Brush arc machines and two 150-kw compensated type General Electric alternators. All of the switchboards were totally destroyed and new ones of modern type have been ordered. The Westinghouse Company will furnish the traction board, the General Electric Company the alternating board, and the Western Electric Company the arc board.

FINANCIAL INTELLIGENCE

The Money Market

WALL STREET, March 11, 1903.

Within the fortnight the money problem has again become an acute one. The tremendous loan expansion during February, which was chiefly a reflection of demands for new security flotations, combined with a heavy drain of cash through the Sub-Treasury, and the usual spring requirements for currency in the interior, have virtually exhausted the surplus reserve of the New York banks. The surplus held over and above what was required against all deposits had fallen by last Saturday to \$666,000. If advantage were taken of the Treasury ruling of last autumn, in which government deposits were exempted from the reserve provision, the surplus available would still be \$10,666,000. But the Clearing-House managements have so far not cared to accept this privilege, and, unless an emergency should arise more serious than the present one, their operations will be gaged by the status of the surplus account against all liabilities public and private. The situation has demanded instant relief, and it has been sought in the manner usual on such occasions, first by abruptly raising the rates for money, and, second, by extensive calling of loans. Borrowers, who, up to a short time ago, were able to secure accommodation freely at $4\frac{1}{2}$ per cent and under for all periods, are now bidding 6 per cent, while call funds on the Stock Exchange are quoted as high as 7 per cent, with a large business doing at 6. As always happens, the curtailment of credit has been most seriously felt in the quarter whence it can be effected most easily—namely, in the speculative portion of the stock market. Another and more novel phenomenon is the placing of large sums by foreign bankers, which has had an equally powerful influence upon the reduction of domestic bank loans, with the local speculative liquidation. It also appears that trust companies and out-of-town banks which keep deposits with the Clearing House association, are lending them out directly, and are thus shouldering a considerable part of the credits hitherto carried by the banks. These are the several processes upon which the money market must depend to maintain equilibrium until currency begins to flow back from the country, as it may be expected to in the course of another month or six weeks. In the meantime there is not likely to be much of any relaxation in money rates. On the other hand no serious stringency, beyond what now exists, is to be feared.

The Stock Market

Urgent and heavy liquidation, a rapid fall in prices, and general uneasiness and despondency have been the characteristics of the Stock Exchange dealings during the fortnight. These are plainly enough the results of the tight money market and the misgivings aroused by the excessive offerings of new securities which have so far outstripped the investment resources of the community as to produce a bad congestion in the market. If any attempt were made to explain the recent decline by causes of a more substantial nature relating to the country's industrial conditions, it would certainly fail to convince any intelligent person. No unhealthy symptoms are visible anywhere in the commercial situation, nor are there any signs of reaction from the great trade activity and enormous earnings of business enterprises. We are still far removed from a state of over-production. Railway equipment is taxed to the utmost to provide for the traffic offered. Net earnings, it is true, are falling generally behind those of a year ago, owing to the higher prices of fuel and higher wages, but so long as everything points to maintenance of a tremendous volume of business, and so long as rates for transportation are on the increase, these decreases excite no uneasiness. The true reasons for the downward movement on the Stock Exchange lie in the necessity for the immediate future at least of regarding the money market exigencies as of greater importance than any outside considerations of value. It is not illogical, therefore, from this point of view, that the severest losses have occurred among the better class of securities, those having the readiest market being the ones most strongly pressed for sale. The truth is now the same as it was last November and December, that the seasoned securities have been forced to sacrifice, in order to protect the newer capital issues which cannot easily be realized upon. The course of the general market for the next few weeks will unquestionably depend entirely upon the course of bank reserves, with the single qualifying remark, that the violent and protracted fall in prices which has

taken place since the middle of February must have gone far toward discounting the weak points of the situation.

The traction shares have naturally suffered with the remainder of the list during the recent decline. Manhattan Elevated has held better than the others, because of the action of the directors in placing the stock on a 7 per cent annual dividend basis, with an extra disbursement of 1 per cent. Previous to this announcement the shares enjoyed a sharp recovery from below 140 to 146, but the greater part of this gain was subsequently lost. The superior attractions of Manhattan, as an investment at going prices, however, have not been overlooked, even during the confusion and demoralization of the past week. Brooklyn Rapid Transit has had fair support on the decline, the buying being influenced plainly enough by the rapidly increasing earnings of the property. On the other hand Metropolitan has continued very weak, and no effort seems to have been made at all to hold up the price.

Philadelphia

The traction shares in Philadelphia have moved with the course of the general market, but have suffered slightly as compared with other classes of securities. Rapid Transit fell from $14\frac{1}{2}$ to $13\frac{3}{8}$, around which figure it seemed to be receiving good support. Union Traction reached its low point at $46\frac{1}{2}$, but was not pressed for sale. Philadelphia Traction sold up to 100 ten days ago, then "ex" dividend dropped to 97. A few scattering lots of American Railways were thrown over, carrying the price down from 51 to 50. Dealings on the whole were very light, and showed an absence of demand, rather than a desire to liquidate. Minor transactions reported were Railways General at $4\frac{1}{2}$, Rochester Passenger at 71, Reading Traction at 30, United Traction of Pittsburg preferred at 51, and Indianapolis Street Railway at 82.

Chicago

Liquidation and general decline have been the features of the Chicago market, the same as elsewhere. Trading has been extremely light, and has consisted entirely of selling by disconsolate holders in a market where there is little support. All talk of a consolidation or any other sort of deal among the surface interests, has been indefinitely postponed until times get better. The City Railway shares, which recently went as high as 235, have fallen to 215. West Chicago sold down from $86\frac{1}{2}$ to 84. Union Traction common scarcely developed any business at all around 10, nor did the preferred around 42. South Side, after advancing to 110, dipped to $107\frac{1}{2}$ and recovered to 109. Northwestern Elevated common was very weak, selling down to 29. Metropolitan issues also broke sharply, the common from $34\frac{1}{4}$ to 33, the preferred from $83\frac{1}{2}$ to $82\frac{1}{2}$. Lake Street reached the lowest price yet recorded, $5\frac{3}{4}$, later rallying a trifle. Deposits of the bonds under the reorganization plan are coming in slowly. When a sufficient amount is received, the reorganization committee will proceed with its arrangements.

Other Traction Securities

Boston Elevated ran off rapidly from 150 to $147\frac{1}{4}$ on small sales. The tendency to sell high-priced securities in the tight money market was the obvious reason for the decline. Massachusetts Electric issues received rather better support. The common, after selling at $36\frac{1}{4}$, did not go below 35, while the preferred held firm around 92. West End common dropped from $96\frac{3}{4}$ to 96, and the preferred from $115\frac{1}{2}$ to 115. In Baltimore liquidation was apparent in the United Traction issues, the stock getting down to $13\frac{1}{8}$, the income bonds dropping from $68\frac{1}{4}$ to $67\frac{1}{2}$, and the general 4s from $93\frac{3}{8}$ to $93\frac{1}{2}$, Lexington Street Railway shares sold at 50, and Nashville Railway at $4\frac{1}{2}$. Bond sales comprised Baltimore City 5s W. L. at $122\frac{1}{2}$, Newport News & Old Point Comfort 5s at 108, Anacostia & Potomac 5s at 100, and City & Suburban (Washington) 5s at 99. Weakness has been very general among the New York curb securities during the fortnight. San Francisco 4s, interest on, fell heavily from 80 to 78, and New Orleans $4\frac{1}{2}$ s from $76\frac{1}{2}$ to 75. These were the two most active issues. On smaller transactions Washington Traction 4s sold down from $80\frac{3}{8}$ to $79\frac{3}{4}$, Interborough Rapid Transit (full-paid stock) from 112 to 111, and American Light & Traction from 59 to $57\frac{1}{2}$. Other reported sales were Washington Traction stock at 11, Brooklyn Rapid Transit 4s at 86, St. Louis Transit $29\frac{1}{8}$, St. Louis Transit 5s at $95\frac{1}{2}$, and Twenty-Eighth & Twenty-Ninth Street Crosstown 5s at 112.

Traction sales on the Cincinnati 'Change last week amounted to

about 4200 shares and about \$120,000 worth of bonds. Northern Ohio Traction & Light had the heaviest run in the stock, sales numbering 1556 shares, at from 27½ to 28. It is believed it will go higher. The Northern Ohio Traction & Light 4 per cent bonds sold to the extent of \$28,000 worth, all at 63½, while the 5s of the same company brought 77½ and 77¾ for \$10,000 worth. About 900 shares of Cincinnati Street Railway sold at from 141½ to 142½, latter the closing figure. Cincinnati, Dayton & Toledo 5s continue to be popular, \$40,000 worth selling at 89. Columbus, Delaware & Marion 5s are steady at 101, \$30,000 worth selling at this figure, which is considered remarkably good for a new road. About 200 shares of Cincinnati & Hamilton common sold at from 43 to 45, and 800 Cincinnati, Newport & Covington common at from 38½ to 39. Other sales were 255 shares Cincinnati, Dayton & Toledo 36½ to 38¾, and 316 Central Market Street preferred (Columbus) at 96 to 97.

About 2800 shares of tractions sold on the Cleveland Exchange. The run on Northern Ohio Traction & Light which started two weeks ago was again the leading feature of the week. About 1400 shares sold during the week. The opening was strong at 27¾, but it failed to hold, and sold off to 26, and one small lot at 25. At the close it was bid 27¾. It appears that many people who bought the stock two weeks ago around 20 are not yet disposed to let loose. Elgin, Aurora & Southern was quite active, 700 shares selling at from 53 to 55¼, the former the closing figure. The coming completion of the Aurora, Elgin & Chicago is causing renewed activity in this stock, and 211 shares sold at between 29 and 30. Lake Shore Electric recovered somewhat from the scare of two weeks ago, when it was thought the road might be foreclosed, and 225 shares sold at 12½ to 13. Cleveland & Southwestern sold at 30 for 100 shares, but it is held at considerably more than this figure. One hundred Cleveland City brought 102. Western Ohio 5s were in strong demand and \$86,000 worth sold at 83¾ to 84; recently they sold as low as 80. Northern Ohio Traction & Light 4s sold to the extent of \$24,000 worth at 62¾ to 63¼. Monday, \$10,000 Western Ohio 5s sold at 83½, ten Aurora, Elgin & Chicago stock at 29, and 250 Northern Ohio Traction & Light at 25¼ to 25¾.

Securities Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Closing Bid	
	Feb. 24	March 10
American Railways Company	51	50
Aurora, Elgin & Chicago	a32	28½
Boston Elevated	150¾	—
Brooklyn R. T.	68¾	63¾
Chicago City	220	*210
Chicago Union Tr. (common)	10	10
Chicago Union Tr. (preferred)	44	40
Cleveland Electric	84¼	78
Columbus (common)	70	—
Columbus (preferred)	105	—
Consolidated Traction of N. J.	64¾	64
Consolidated Traction of N. J. 5s.	108¼	108
Detroit United	86	84¾
Electric People's Traction (Philadelphia) 4s.	98	97¾
Elgin, Aurora & Southern	51½	52¼
Lake Shore Electric	—	11¼
Lake Street Elevated	6¼	5½
Manhattan Railway	141¾	141½
Massachusetts Electric Cos. (common)	36¼	35¾
Massachusetts Electric Cos. (preferred)	92	92
Metropolitan Elevated, Chicago (common)	34	33
Metropolitan Elevated, Chicago (preferred)	84½	82½
Metropolitan Street	137¼	132¾
New Orleans Railways (common)	14½	13
New Orleans Railways (preferred)	42	a42
North American	116	104½
Northern Ohio Traction & Light	23¼	25½
Northwestern Elevated, Chicago (common)	31	29
Philadelphia Rapid Transit	145	14
Philadelphia Traction	99	97
St. Louis Transit (common)	29	28
South Side Elevated (Chicago)	109	108¾
Syracuse Rapid Transit	a32	a25
Syracuse Rapid Transit (preferred)	a80	a79¼
Third Avenue	124	124
Toledo Railway & Light	a36	a34¾
Twin City, Minneapolis (common)	119	—
United Railways, St. Louis (preferred)	—	—
United Railways, St. Louis, 4s.	84¼	84½
Union Traction (Philadelphia)	47¾	46½

a Asked. * Ex-Div.

Iron and Steel

The usual spring increase in activity has begun to appear in the iron trade. All branches are recording a larger volume of business, that in steel rails being especially noteworthy. The Iron Age states that orders have been placed at Pittsburg for 100,000 tons, which includes a considerable tonnage from suburban electric lines, "an element now becoming an important factor in the rail trade." Some advance in prices has accompanied these increasing demands, the most important being in wire products and tin plate. Quotations are as follows: \$22 for Bessemer pig, \$30 to \$31 for Bessemer steel, and \$28 for steel rails.

Metals

Quotations for the leading metals are as follows: Copper, lake, 14¾ cents; tin, pig, 29¾ cents; lead, pig, 4⅞ cents, and spelter 5⅞ and 5¼ cents.

STRIKE DEVELOPMENT AT WATERBURY

Every night for the past two weeks, at Waterbury, Conn., where the employees of the local lines of the Connecticut Railway & Lighting Company are on strike, there has been carried on a series of assaults that has terrorized the entire community. Attacks too numerous to mention have been made on cars. The city attorney, led into ambush by a decoy message, has been waylaid and murderously attacked, and on March 8 a band of masked men boarded a car in the outlying district, assaulted the motorman and conductor, and shot through the heart a policeman who was guarding the car.

The first of the recent serious attacks occurred Feb. 27, when a non-union motorman and conductor were taken to the hospital suffering from severe injuries. The attack on this car was made two miles from the center of the city, while the car was waiting at a turnout. There were no passengers on the car. According to the conductor of the car, four of the six men who conducted the attack were masked. Threatening the motorman and conductor with pistols, they compelled them to desert the car, and then attacked the men.

The attack on City Prosecuting Attorney Harold Riggs Durant was made on March 2. As previously stated, the city attorney was led into ambush by a decoy message. The assault was conducted in a part of the city not frequented at night. One man engaged Mr. Durant in conversation, while another came up from behind and assaulted him. The entire gang then joined in the attack. Mr. Durant was not seriously injured, but he suffered severely from kicks in the face and the groin. On the same day that the attack was made on Mr. Durant cars on which General Superintendent Sewall and Superintendent Neth were riding were attacked. Pistols were discharged at the car on which Mr. Sewall was riding, but only stones were thrown at the car on which Superintendent Neth was riding.

The scene of the attack in which the policeman was killed was at Forest Park, the terminus of the North Main Street line. The spot is an isolated one. The car had reached the end of the line, and the crew had made preparations for the return trip. Immediately after the conductor had turned the trolley, and the motorman changed his controller handle, eight masked and armed men sprang from the cover of the roadside, entered the car and discharged their revolvers. The officer who was guarding the car fell at the first report, shot through the heart. The motorman, struck on top of the head with the butt of a revolver, made his escape, followed by some of the gang. The conductor, however, was thrown to the floor of the car and pounded and kicked until he was almost unconscious; he managed later to run the car into the city. The motorman, after he left the car, ran for the swamps nearby and managed to conceal himself from his pursuers. They gave up the search for him, and when he thought it safe he made his way to the city.

Waterbury is thoroughly aroused now, and the citizens are determined that there shall be no more assaults. Furthermore, the shackles of unionism are to be thrown off. No longer will the threat of boycott have any effect, for it has been voted to ride on the boycotted cars and to resent the interference of the local unions with legitimate business. But this action has come rather late. A less timorous people than those at Waterbury would have taken this action long before now.

FINDINGS OF THE JURY IN THE NEWARK ACCIDENT

The coroner's jury which has been engaged since Feb. 19 in investigating the collision between a car of the North Jersey Street Railway Company, and a train of the Delaware, Lackawanna & Western Railroad at Clifton Avenue, Newark, in which nine

pupils of the Newark High School were killed, returned its verdict Saturday, March 7. It is found that the trolley car was heavily overloaded, and that "there were eight, and probably ten, passengers on the car at the time of the collision which must necessarily have interfered with the motorman in the performance of his duty." It is also found that "the Delaware, Lackawanna & Western Railroad is violating the city ordinance by running its trains at a much higher rate of speed within the city limits than is permitted by the ordinances; also for not stopping all trains at the Broad Street crossing, all of which are in violation of such ordinances."

Among the recommendations of the jury are:

"We would recommend that the Board of Street and Water Commissioners co-operate with the City Council in revising all city ordinances having for their object the regulation of all steam and street railway companies operating within the city, the object being that such ordinances shall more nearly conform to the requirements of our rapidly growing city.

"Such ordinances should be clear and specific and leave no doubt or uncertainty as to their meaning or application.

"We would recommend, further, that all citizens unceasingly labor for the abolishment of all grade crossings of the steam railroads within the city limits."

FRANCHISE VALUES FIXED IN NEW YORK STATE

The State Board of Tax Commissioners of New York has announced the final valuations of special franchises for the current tax year under the special franchise tax act in New York, Buffalo, Rochester, Gloversville, and Ithaca. The aggregate of the valuations in these cities as compared with the aggregate last year is as follows:

	1903	1902
New York city	\$235,142,825.	\$220,620,155
Buffalo	12,607,200	13,164,430
Rochester.	4,793,575	4,716,140
Gloversville.	255,400	253,850
Ithaca	163,780	159,570

The commission explains that the increase of nearly \$15,000,000 of valuation in New York city represents the year's improvements and extensions of tangible property located within the streets of that city. The reduction in Buffalo is due largely to the decreased revenue of the traction company following the exposition.

BRITISH RAILWAY MEN HERE TO STUDY AMERICAN METHODS

There arrived on the Oceanic, which docked at New York on March 6, a delegation of English and Scotch traffic and engineering officials, who have come to this country to study American methods of handling freight and passengers, signaling and speed. It is the party's intention to stay a month in the United States, in which time they expect to visit the chief railroad centers of the country. The visitors represent the London & North-Western system and the Caledonia Railway, of Scotland. In the delegation are Frank Ree, chief freight agent; E. H. Thornhill, traffic superintendent; Mr. Webb, chief engineer; Mr. Thompson, signaling superintendent; H. C. Craseman, goods manager; H. Trevetick, G. Fletcher, Jr., F. H. Dent, H. Goulborn, Robert Evans and D. Matheson.

WAGES RAISED ON LAKE STREET & NORTHWESTERN ELEVATED ROAD IN CHICAGO

The employees of the Lake Street & Northwestern Elevated Railroad Company in Chicago have received substantial increases in wages all along the line. These men now receive the highest wages paid by any elevated company in the country. First-class motormen get 28 cents an hour and second-class motormen 25 cents an hour. Conductors get 21 cents an hour and guards 18½ cents an hour. The increase affects all the employees.

NEW YORK & PORTCHESTER CHARTER UPHELD

A decision has just been handed down by the Appellate Division of the Supreme Court of the State of New York, in session at Albany, upholding the decision of the Railroad Commissioners of the State in granting a charter to the New York & Portchester road about a year ago. It will be remembered that the hearing before the commissioners on the necessity of this road was a very long one, and the petitioning company introduced expert testimony as to the practicability of the operation of the road by electricity, and other points which were in dispute. A considerable portion

of this testimony was published in this paper at that time, and among the witnesses called in favor of the proposition were Messrs. Sprague, Potter, Parke, McDonald, Gotshall, Mailloux, Thatcher and others. The opponents of the charter at the hearing were the New York, New Haven & Hartford Railroad Company, which, after the decision was rendered, took an appeal in certiorari proceedings to the Appellate Division of the Supreme Court. The decision rendered at Albany, March 10, was the result of this appeal, and was unanimous in favor of granting the charter to the Portchester company.

B. J. ARNOLD'S CHICAGO ADDRESS

The Chicago chapter of the American Institute of Electrical Engineers and the Western Society of Engineers has arranged for a meeting on Tuesday evening, March 24, at which Bion J. Arnold, who is a member of both organizations, will give an illustrated lecture and resume of his report on "The Chicago Transportation Problem." As this meeting will probably be attended by many engineers and also by many others interested in this problem, it will be held in a larger hall than the usual meetings. Fullerton Hall, in the Art Institute, has been selected. The meeting will be open to all street railway men interested.

PERSONAL MENTION

MR. C. O. MAILLOUX, of New York, will give a series of lectures at Harvard University this spring on the subject of train resistance. Mr. Mailloux is also giving some lectures at Lehigh University on the same subject and on the movement of heavy high-speed electric trains, as well as on the subject of electric wiring, as mentioned in a recent issue. Mr. Mailloux is also engaged in translating from the French a book on induction motors, which will be finished in the course of a few months.

MR. FRANK A. LAPHAM, who was formerly connected with the Cleveland Frog & Crossing Company, of Cleveland, Ohio, died suddenly of heart disease at his home in New York, Feb. 18. Mr. Lapham was born in Moscow, N. Y., on March 10, 1850, and his early life was passed there and in Geneseo, N. Y. Mr. Lapham was known in the street railway field principally through his connection with the Cleveland Frog & Crossing Company, with whom he was associated for a long time. About four years ago, with others, he organized the National Steel Company, and later he became general sales agent for the Tennessee Coal, Iron & Railroad Company. At the time of his death he was general sales agent of the Lackawanna Iron & Steel Company. Mr. Lapham was a member of the Manhattan Club, of New York.

MR. J. S. HAMLIN has resigned his position as manager of sales of the Neal duplex brake for the United States Steel Company and is again connected with the Christensen Engineering Company, of Milwaukee, with which he was identified before becoming master mechanic of the Union Traction Company of Indiana. He is one of the best-known electric railway brake salesmen and experts in the country. His position will be that of special agent at the New York office, 135 Broadway.

MR. F. L. FULLER, general manager and assistant to the president of the United Power & Transportation Company, of Philadelphia, has severed his connection with that company, to take effect March 15. Mr. Fuller is one of the best-known managers of street railway properties in this country. He was a member of the executive committee of the American Street Railway Association in 1901-1902, and has always taken great interest in the proceedings and welfare of the association. Mr. Fuller's connection with street railways dates from January, 1888, when he entered the service of the St. Paul City Railway Company, at which time he was appointed foreman of the Selby Avenue cable line, just then put in operation. In the following year the company decided to substitute electricity for horses on the greater part of its system, and at that time Mr. Fuller was appointed assistant superintendent. He remained with this company until the consolidation with the



F. L. FULLER

Minneapolis system in April of 1893, when he resigned and entered the service of the West Chicago Street Railway Company, of Chicago, as assistant superintendent. At this time the latter company had two cable lines in operation, but on the rest of the line horses were employed. In 1894 it was decided to change all the line not operated by cable to electric, and Mr. Fuller was appointed superintendent. In 1895 he was made general superintendent, and remained in that position until 1899, when he became connected with the United Power & Transportation Company. In this capacity he has been obliged to direct the operations of this extensive company, whose property extends over a large part of three States, including the cities of Reading, Wilkesbarre, Chester, Pa.; Wilmington, Del., and Trenton, N. J. Under Mr. Fuller's management the system has been brought up to a high state of efficiency, and many improvements and important extensions have been made. During his connection with the company Mr. Fuller has not taken a vacation, but is now planning to take a trip to the West Indies to enjoy a short rest, after which he plans to enter the operating field again.

MR. EDWARD R. MASON, who has been connected with Porter & Berg, Chicago, manufacturers of and dealers in electric railway supplies, has acquired an interest in that company and has been elected vice-president. Mr. Mason was for several years associated with his father, W. R. Mason, in the electric supply business, giving particular attention to railway specialties. He afterwards became connected with McGill & Pomeroy, whose business was acquired about a year ago by Porter & Berg, and he has since been identified with that company.

STREET RAILWAY PATENTS

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

721,147. Overhead Trolley; J. E. Byers, Butler, Pa. App. filed April 11, 1902. Means for retaining the trolley wheel in contact with the wire.

721,163. Street Car Fender; L. R. Devers, Dayton, Ohio. App. filed Sept. 18, 1902. Details.

721,279. Street Car Switch-Operating Mechanism; R. A. Brock, Springfield, Ohio. App. filed Nov. 1, 1902. A tilting bar is mounted between the rails, having flanged anti-friction rollers mounted thereon and means whereby the switch tongue is thrown when the bar is tilted. Also means for actuating the tilting bar from the car by spring-actuated push rods.

721,350. Car Fender; G. E. Wright, East Fairfield, Vt. App. filed April 21, 1902. The upper surface of the fender is adapted to travel rearwardly for the purpose of picking up and conveying to a place of safety a person or other object in the path of the car, the fender being so arranged that the traveling platform will not be moved until the motorman adjusts its operating mechanism.

721,382. Railway Track Structure; H. B. Nichols, Philadelphia, Pa. App. filed Dec. 6, 1902. Relates to means for readily securing the wear-plate to and removing it from a track structure.

721,416. Street Railway Switch; W. J. Bell, Los Angeles, Cal. App. filed July 14, 1902. A lever through which the switch is moved is normally inactive to throw the switch, electrical means being provided to move a fulcrum for the lever to render it active.

721,484. Switch for Overhead Trolley Tracks; P. F. Werner, Williamsett, Mass. App. filed July 11, 1901. In a flat-bar track a switch-plate to which the ends of two converging lines of track are secured, a switch member pivotally mounted in said plate to swing in a vertical plane into and out of registration with one of said tracks; a second switch member slidable horizontally on said plate in a straight line into and out of registration with the other of said tracks; means of engagement between said plate and said sliding switch member located substantially at right angles to the track, and track portions on said switch members, each constituting a continuation of one of said tracks.

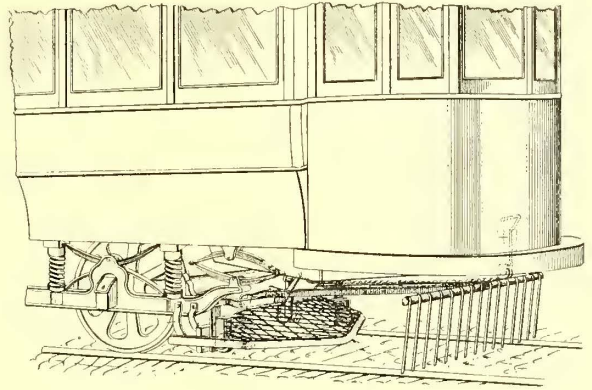
721,503. Automatic Trip Brake; E. L. Cridge, Passaic, N. J. App. filed April 23, 1902. A trip mechanism is thrown to position simultaneously with the setting of the semaphore at "danger," said trip mechanism being adapted to engage a lever on the car to thereby apply the brakes.

721,504. Track Attachment; W. H. Crossley, Bloomsburg, Pa. App. filed July 19, 1902. Details of a bridge adapted to be placed on the track over lines of fire hose.

721,526. Brake-Shoe; O. M. Stimson and P. Parke, Chicago, Ill. App. filed Nov. 14, 1902. Comprises a hard-metal insert provided with V-shaped ribs formed of two parts extending in opposite directions.

720,529. Trolley Pole Reverser for Electric Tramways; F. E. Ward, Cheltenham, Eng. App. filed Dec. 22, 1902. A branch or

shunt from the main wire is formed with a V-shaped, upwardly pointing track on to which the trolley wheel runs and which permits the pole to occupy a vertical position when the wheel reaches the apex of the track, so that the car can then move in either direction and the pole automatically incline to the rear.



PATENT NO. 721,607

721,607. Car Fender; J. Roelandt, New York, N. Y. App. filed Nov. 1, 1902. Mounted in advance of the fender is a row of contact fingers which, when coming in contact with a person or object on the track, causes the fender to fall to operative position.

UNITED STATES PATENTS ISSUED MARCH 3, 1903

721,688. Switch Actuating Mechanism; J. H. Fitch, Ludington, Mich. App. filed April 28, 1902. Relates to apparatus whereby a railway switch can be quickly and easily thrown from the car.

721,697. Snow Excavator for Railways or the Like; O. B. H. Hanneborg, Christiania, Norway. App. filed July 8, 1902.

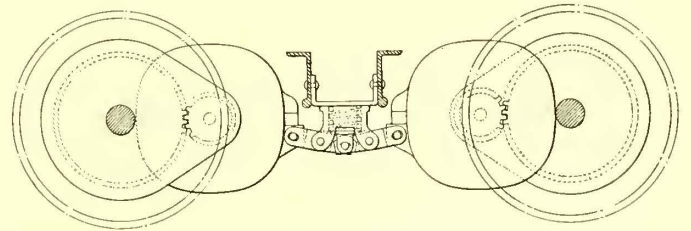
721,734. Wire Holder for Trolley Wires or Electric Railways; L. Von Orth, Berlin, Germany. App. filed Dec. 26, 1901. Details.

721,794. Trolley; W. H. Goodyear, Wilkesburg, Pa. App. filed March 18, 1902. Means for preventing accidental displacement of the trolley wheel.

721,877. Railway Motor Ventilating System; J. H. Fedeler, Schenectady, N. Y. App. filed Dec. 6, 1902. To cool the motor, air is directed through the motor casing, and the air, being thus heated, is then led into the car for heating purposes.

721,960. Means for Removing Sleet, Snow and Ice from Third Rails; P. Lindemann, Westchester, N. Y. App. filed Jan. 7, 1903. A blast of sand is directed onto the contact surface of the third rail.

722,036. Trolley Stand; W. B. Norton, Detroit, Mich. App. filed May 26, 1902. Relates to an improved ball-bearing support for the trolley pole socket.



PATENT NO. 722,063

722,063. Motor Suspension; W. O. Webster, Philadelphia, Pa. App. filed Dec. 4, 1902. A device for yieldingly supporting the free ends of a pair of electric motors hung from car axles, so as to provide means whereby reactive tendency of one motor to rotate as a whole in a given direction around its axle shall be made to neutralize the reactive force of the other motor.

722,097. Car Platform Vestibule; G. Gibbs, New York, N. Y., and H. Pearson, Springfield, Mass. App. filed Oct. 2, 1902. A compartment for the motorman on the platform of the car can be formed by sliding doors.

722,187. Snow-Removing Flanger; J. W. Russell, Boston, Mass. App. filed April 28, 1902. Relates to the construction of a double-ended flanger and method of operating the same.

722,189. Trolley Wheel for Electric Tramcars; A. Selz, Flemingsburg, Ky. App. filed Nov. 14. The trolley wheel is mounted upon an elongated axle, along which it can travel against springs when the car is rounding a curve.

12,093. Side Bearing; J. C. Wands, St. Louis, Mo. App. filed Nov. 11, 1902. Consists of a casting having grooves opening respectively through its bottom and top wall and inclined ways connecting said grooves, in which the balls travel.

NEWS OF THE WEEK

CONSTRUCTION NOTES

NEW DECATUR, ALA.—The motive power of the Decatur Street Railway is to be changed to electricity. The company is to ask for new franchises in Decatur and New Decatur.

SAN BERNARDINO, CAL.—George M. Cooley has been granted a franchise to construct an electric railway here.

SAN FRANCISCO, CAL.—The Butte County Railroad Company has been incorporated under the laws of New Jersey, with a capital stock of \$1,000,000, to build an electric or steam railroad in Butte County. Edward D. Newcomb, Palmer House, East Orange, N. J., is one of the incorporators.

SANTA ANA, CAL.—The Santa Ana & Newport Beach Electric Railroad has applied to the Council for a franchise. The company plans to build an electric railway from Santa Ana to Long Beach. The identity of the promoters has not been disclosed.

LOS ANGELES, CAL.—The Pacific Electric Railway Company has secured a franchise from the city of San Pedro to connect the wharf franchise along the west jetty with the main land.

OAKLAND, CAL.—It is stated that J. H. Macdonald has applied for a franchise to construct a street railway along Pleasant Valley Avenue. Bills for the franchise will be received March 30.

LOS ANGELES, CAL.—Work has commenced on the new power house which the Los Angeles-Pacific Railway Company is erecting on West Sixteenth Street just outside the city limits. This power house, when completed, will have a capacity of 1800 kw. Increased traffic has made the new power house an absolute necessity.

LOS ANGELES, CAL.—The Pacific Electric Railway Company opened its new interurban line to Monrovia on Sunday, March 1. The distance from this city to Monrovia is about 17½ miles. Double track has been laid for more than 12 miles, and, as far as the rails are down, the roadbed has been carefully ballasted.

LOS ANGELES, CAL.—Cars of the Los Angeles-Pacific Railway Company are now running regularly from here to Redondo via Playa del Rey. The opposition line, the Los Angeles & Redondo Railway Company, has also completed work at its Redondo terminus.

LOS ANGELES, CAL.—Citizens of Covina are busy securing a right of way for an electric railway to this city, upon the assurance of H. E. Huntington, president of the Pacific Electric Railway Company, that he will build the road if a right of way is provided. In case the Covina citizens are successful the company will extend its Alhambra line from San Gabriel to Covina, a distance of about 12 miles.

SALT LAKE CITY, UTAH.—All arrangements have been completed for financing the Salt Lake & Suburban Railroad, and the announcement is made that bids are about to be received for constructing the road. Meyers & Company, W. D. Boyce & Company, Westinghouse, Church, Kerr & Company and Brazec, Howard & Company are to bid for the contract.

FLORENCE, COL.—Thomas Whitted, of Denver, consulting engineer of the Florence & Canon City Electric Railway, is authority for the statement that work will be begun immediately. From 400 to 600 men will be employed, and Mr. Whitted, who will have charge of all line work, has already engaged most of his men. A. C. Kelly, of Florence, will be in charge of the civil engineering, and a corps of surveyors will be put in the field at once.

HARTFORD, CONN.—The Senate has passed the bill granting a charter to the Naugatuck Valley Railway Company, which plans to build an electric railway from Naugatuck to Seymour, running through Beacon Falls.

NORWICH, CONN.—It is unofficially reported that the Worcester & Connecticut Eastern Railway Company, which operates between Worcester, Mass., and Central Village, Conn., will this summer begin the construction of an electric railway between Norwich and Jewett City. The line, so the report says, will subsequently be extended from Jewett City to Central Village, forming a continuous electric railway between Norwich and Worcester.

ANSONIA, CONN.—The Connecticut Railway & Lighting Company has prepared plans and specifications for the extension of its system from Ansonia north through the Naugatuck Valley to Seymour, and bids will soon be invited. The company is now securing from the General Assembly a charter for a line from Seymour through Beacon Falls to Naugatuck, where connections will be made with its lines in Waterbury. The building of the link between Ansonia and Naugatuck will make a continuous electric railway from Waterbury to Stamford.

NEW CASTLE, DEL.—It is said that surveys have been completed for the Elkton, New Castle & Eastern Shore Railroad. This line is to extend from Elkton to Delaware City via Newark.

WASHINGTON, D. C.—The Washington, Arlington & Falls Church Railway Company has filed with the Commissioners a copy of an agreement entered into between that company and the Great Falls and Old Dominion Railroad Company with regard to the laying of a single track across Aqueduct Bridge in Georgetown. The plans are to widen the superstructure of the bridge by building a lateral addition running the full length. This work will probably be delayed, as pier No. 5 must be reconstructed by Col. Allen before the widening can occur, or at least before the cars can be used on the structure. This may take many months. The proposals for the work of reconstructing the pier will be opened March 30. This work will be done by the United States Government. The survey for the extension of the Wash-

ington, Alexandria & Falls Church Railway from West End, Falls Church, to Fairfax Court House has been made and the right of way is now being secured.

ATLANTA, GA.—The Atlanta & Marietta Street Railway Company, which plans to build between Atlanta and Marietta, is seeking incorporation. The company has just been granted a franchise by the Council of Marietta. It is said that interests identified with the Georgia Railway & Electric Company are promoting the new company.

BOISE, IDAHO.—The Intermountain Electric Railway Company has begun work on its proposed line here.

EAST ST. LOUIS, ILL.—It is the intention of the East St. Louis & Suburban Railroad Company to extend its lines during the coming year so as to make a complete circuit of all towns on the East Side within a radius of 25 miles of St. Louis.

DIXON, ILL.—The City Council has granted a franchise to G. H. T. Shaw to build an electric railway into the city from DeKalb and Lee Center. This does not conflict with the franchise granted to the Sterling, Dixon & Eastern Electric Railroad, both agreeing to use the bridge across Rock River and to have interchangeable tickets. The franchise is for twenty years.

ST. ELMO, ILL.—The St. Louis & Eastern Electric Railway is seeking incorporation. The plan of the company is to build from St. Louis to St. Elmo, though the ultimate object is to build to Terre Haute, Ind. Johnston Brothers, of St. Elmo, are interested.

BLOOMINGTON, ILL.—The Pontiac City Council has granted the Bloomington, Pontiac & Joliet Electric Railway Company a fifty-year franchise.

GALESBURG, ILL.—Galesburg capitalists have made plans to construct an interurban electric railway from Galesburg to Aledo, a distance of 36 miles.

CHICAGO, ILL.—An ordinance has been introduced in Council for the extension of the Southwestern Elevated Railroad. Provision is made for connection with the proposed branches of the "Alley L" line to the Stock Yards.

RICHMOND, IND.—The Richmond Traction Company has been granted a franchise to build into Dublin.

FORT WAYNE, IND.—The work of securing the right of way for the Fort Dayne, Van Wert & Lima Traction Company has been begun. As yet the company has secured no franchises.

MUNCIE, IND.—The announcement is made of the merging of the Muncie, Hartford & Fort Wayne Traction Company and the proposed Muncie-New Castle Electric Railway.

CRAWFORDSVILLE, IND.—The City Council has granted a franchise to the Indianapolis & Northern Traction Company. The grant was opposed by the Consolidated Traction Company, which sought to compel the Indianapolis & Northern Company to use its tracks. It seems that the question of streets on which the companies are to operate has not yet been settled.

FORT WAYNE, IND.—General Manager Nelson, of the Fort Wayne & Southwestern, has received orders to commence work at once on the branch from the parent line to Marion, Ind. The new line will be known as the Fort Wayne & Southern. Grading is to be started at once. Materials are being purchased.

MADISON, IND.—Richard Johnson and Nicholas Haruff have applied to the County Commissioners for a franchise to build an electric railway from Madison through the northern limit of Jefferson County, connecting at Osgood, Ripley County, with the Baltimore and Ohio, thence on via Greensburg, Decatur County, to Indianapolis.

MARION, IND.—The Indiana Northern Traction Company has filed articles of incorporation with the Secretary of State. The preliminary capital stock of the company is \$25,000. The plan is to build a line to connect Marion, La Fountain, Wabash, North Manchester and Warsaw. The directors of the company are: R. Breed, B. F. Burke, G. A. H. Shidler, E. H. Neal and George Breed.

INDIANAPOLIS, IND.—C. L. Henry, president of the Indianapolis & Cincinnati Electric Railway, has opened an office in the Stevens Block, and announces his readiness to contract for the grading and bridge building of a double track electric railway between Indianapolis and Rushville.

BOISE, IDAHO.—The Intermountain Railway Company has been granted a franchise by the County Commissioners of Ada County. It is said that the plan of the company is to build from Boise to Meridian.

CHICKASHA, I. T.—The Chickasha Warehouse & Terminal Company has been incorporated to build steam and electric railways, telephone lines, etc. It is said that the immediate plan of the company is to build a 15-mile electric railway from Chickasha. M. M. Beavers and L. D. Stone, of Chickasha, are interested.

SIoux CITY, IA.—The Sioux City Traction Company has had several experts investigating the question of the feasibility of constructing a third rail on its system so as to bring the gage to standard, or of reconstructing the lines entirely, making them all standard gage. The experts have submitted their report, and they recommended the latter plan, although the cost will be several times greater. It is reported that the company will accept the conclusions of the experts and will start the work of standardizing some of the lines this year. It is also reported that the reason for making this extensive improvement is that the company has decided on the construction of several interurban lines to neighboring towns, with Sioux City as headquarters. A standard gage in Sioux City will be a necessary preliminary to the execution of this plan.

LOUISVILLE, KY.—The Louisville & Interurban Electric Railway has applied to the Fiscal Court for a right of way over the Preston Street Road, between the city limits and the Bullitt County line, which is a distance of about 10 miles. The Fiscal Court has approved the sale of the right of way over a portion of the Taylorsville Pike for the upset price of \$500 to the company.

LOUISVILLE, KY.—The Louisville Interurban Railway Company, which plans to build an electric railway between Louisville and Mount Washington, has perfected its organization, electing the following officers: Charles Doherty, president; John Russell, vice-president. The company has authorized an increase in the capital stock from \$400,000 to \$500,000. It is said that the company has arranged with the Louisville Railway Company for using 6 miles of its track from the heart of the city.

LEXINGTON, KY.—The Cumberland Valley Interurban Railroad Company has been incorporated to build an electric railway between Monticello, in Wayne County, and Somerset and Burnside, in Pulaski County, a distance of about 20 miles. The incorporators of the company are: W. J. Loughbridge, D. Gray Faulconer, E. B. Ellis, Rudolph Harting, J. H. Carter, W. C. Goodloe, Jr., and E. P. Farrell, of Lexington.

COLUMBIA, KY.—Granbery Jackson, of the engineering firm of Jackson & Ombery, of Memphis, after viewing the survey of the proposed electric railway between Columbia and Campbellsville, has reported to the projectors of the line that it will cost about \$300,000 to construct and equip the line.

LOUISVILLE, KY.—It is stated that within a few weeks the Louisville Railway Company will begin work on its interurban line to Jeffersonton. The survey has been accepted and nearly all the rights of way have been secured. The line extending out the Preston Street Road 6 miles or 8 miles will also be begun in the near future. All the rights of way have been secured for this line.

JONESPORT, MAINE.—The Jonesport Railway Company is seeking incorporation. The purpose of the company is to build an electric or steam railway to connect Jonesport, Jonesboro, Addison, Columbia Falls, Columbia and Harrison. Edward B. Sawyer, George F. Mansfield and William P. Faulkingham are interested.

FREDERICK, MD.—It is announced that the Baltimore & Frederick Electric Railway Company has awarded the Westinghouse Company a \$400,000 contract for equipment. The plan of the company is to build from Baltimore to Frederick, a distance of about 45 miles.

BOSTON, MASS.—The Railroad Commissioners have issued an order approving locations granted the Hartford & Worcester Railway Company in the towns of Wales, Holland, Brimfield, Sturbridge and Leicester, and have also granted authority to build over private lands in Leicester.

WORCESTER, MASS.—The Blackstone Valley Street Railway Company, now operating between Worcester and Whitinsville, is considering the advisability of extending its line through Northbridge to South Sutton, Manchang and East Douglas.

SPRINGFIELD, MASS.—The Western Massachusetts Street Railway Company, which will eventually connect with the Berkshire Company at Lee, has franchises through the various towns to the west, beginning at the Woronoco Park terminus of the Woronoco Street Railway Company, and surveys are now well under way. If the present plans mature the company will be able to build and equip the road as far as Chester this year.

ATTLEBORO, MASS.—The interests behind the Attleboro & Mansfield Street Railway Company, which has secured a location in Attleboro, have taken out articles of association of the Foxboro & Sharon Street Railway Company, which is to build the link in the Boston-Providence through line, connecting the Attleboro-Mansfield Road with the Norwood, Canton & Sharon Road at Sharon. This through line is made up of a number of separate street railways, all of which, however, are controlled by the same interests.

FALL RIVER, MASS.—The Fall River & Taunton Air Line Street Railway Company has filed its acceptance of the ordinance passed by the City Council, and has filed a bond of \$2,000 to insure compliance with the terms of the grant.

NORTON, MASS.—The Selectmen have given the Norton & Taunton Street Railway Company two valuable locations, supplying the needed links in the chain of railways from East Providence to Boston by way of Easton.

SPRINGFIELD, MASS.—The Springfield Suburban Street Railway Company is about to apply to the Council for a franchise to construct an electric railway within the city limits. The plan of the company is to build from Ludlow to Springfield over a route about 16 miles long. The temporary directors of the company are: B. D. Rising, W. H. Dexter, D. E. Miller, Charles F. Grosvenor, Fred. T. Ley, Harold A. Ley and A. J. Purinton.

HUBBARDSTOWN, MICH.—The Alma Sugar Company is said to be interested in a plan to build an electric railway from Hubbardstown to Alma. It is to be a freight and passenger road, according to report.

BATTLE CREEK, MICH.—Plans have been completed for double tracking the Michigan Traction Company's line between this city and Lake Gogouac. A new depot 100 ft. x 40 ft. is to be erected at the lake. It is said that the plans for the company's new car house on River Street, Battle Creek, have been completed.

BATTLE CREEK, MICH.—The Michigan Traction Company has completed a survey of its proposed line between Battle Creek and Lansing.

LAPEER, MICH.—The Council has declared forfeited the franchise granted in 1900 to the Detroit, Lapeer & North Branch Electric Railway Company. The company secured franchises in Oakland, Lapeer, Tuscola and Bay Counties, but has done no construction work.

DETROIT, MICH.—The Detroit United Railway Company will build two new depots and a car house in Flint. The company will also build an extension from that city to the Oak Park addition, where large carriage factories are located.

LANSING, MICH.—A bill has been introduced in the Legislature providing for the construction by the State of an electric railway from the State Capitol in Lansing to the Michigan Agricultural College, or for the granting of a franchise by the State for such a line. The distance is about 3 miles. The college is a very important State institution, and is attended by about 700 students, a great many of whom, from necessity, live or board in the city, and as the State has invested in the property between \$600,000 and \$700,000 the position taken by the Legislature seems to be that this rather unusual course of procedure is fully justified by the necessities of the case and the importance of the State's interests.

LANSING, MICH.—A bill is now being considered by the Michigan Legislature providing for a transfer of business from electric to steam roads at all connecting or junction points, and requiring steam railroad companies to make the same provision and arrangements with electric railways at such points for the transfer of passengers and freight as are now required to be made by two railroad companies. At a number of points it is claimed there is discrimination against the electric lines.

LANSING, MICH.—A bill has been introduced in the Legislature providing for the appointment of an additional deputy in the office of the Commissioner of Railroads, who shall be an electrical expert, and who shall have jurisdiction over all matters in connection with the construction and operation of electric railways.

DULUTH, MINN.—It is said that the Duluth-Superior Traction Company will enlarge its power station.

HIBBING, MINN.—The Missable Electric Railway Company has petitioned for a franchise for an electric railway through this city to be extended to Virginia, Elveheth and Chisholm.

MANKATO, MINN.—Hord & Keator, of Mankato, have been granted a franchise for the construction of an electric railway through Kasota. It is said that this franchise closes all the rights for the construction of a line from Mankato to St. Peter.

SCRANTON, MISS.—The Pascagoula Street Railway & Power Company has begun work on its proposed line to connect Scranton, Pascagoula and Moss Point.

LIBBY, MONT.—J. H. Greiger is reported to be interested in a plan to build an electric railway from Libby south into the Fisher mining district.

GREAT FALLS, MONT.—The Marcus Daly estate has purchased the controlling interests in the Boston & Great Falls Land Company, the Great Falls Street Railway Company, and the Boston & Great Falls Electric Company. It is reported that the new management will spend \$75,000 in improvements.

OMAHA, NEB.—It is said that plans are making for the construction of an electric railway east from Council Bluffs and Omaha through Pottawattomie, Cass and Adair Counties, connecting with the line already constructed from Des Moines to Winterset.

CONCORD, N. H.—The Legislature has passed bills incorporating the Hampstead & Haverhill Street Railway, the Epping, Brentwood & Kingston Street Railway and the Goff's Falls, Litchfield & Hudson Street Railway.

DOVER, N. H.—Rails have been distributed all along the proposed route of the Dover, Eliot & York Beach Electric Railway. A large car house is now being built near the Eliot Bridge at a point where the South Berwick is to connect with the main line. The building will be of brick, 100 ft. long and 60 ft. wide. Eliot Bridge is also undergoing extensive repairs and changes preparatory to the laying of rails over the structure.

ATLANTIC CITY, N. J.—The Delaware Valley Traction Company has applied to the Council for a franchise covering about 4 miles of streets. The route of the Delaware Company covers many of the streets in the route that was filed by the Pennsylvania Company. The Pennsylvania Company was granted a franchise, but refused to accept it because of the street paving conditions. The People's Traction Company also has an application pending before the Council. The application of the People's Company covers part of the routes of both the Pennsylvania and Delaware Companies.

CAMDEN, N. J.—It is announced that the South Jersey Gas, Electric & Traction Company's proposed line from Mantau to Clayton will be built through Barnsboro, Pitman, Alsyon Park, Glassboro and Clayton.

CAMDEN, N. J.—The Camden & Suburban Railroad Company has opened a new line on Westfield Avenue. It is the intention to run this line to Palmyra, there to connect with the Camden & Trenton Railroad Company, thus giving through service between the two latter cities. At present the line runs only to Dudley, and cannot be completed until provision is made for crossing the Pennsylvania Railroad tracks.

ELIZABETH, N. J.—The Essex Cross Railway Company, which plans to build an electric railway between Newark and Elizabeth, has been granted a franchise in Vailsburg. The application has been under consideration for nearly a year. Francis M. Epply, of Orange, is interested.

PLEASANTVILLE, N. J.—The Atlantic City & Suburban Traction Company has commenced to lay its tracks over the meadows to connect the mainland with Atlantic City. The contract for the power house has been given out, and work will be begun on it immediately.

TRENTON, N. J.—The Philadelphia & Trenton Rapid Transit Company has been incorporated at Harrisburg, Pa., for the purpose of extending the Philadelphia, Bristol & Trenton Street Railway from its westerly terminus at Torresdale to Frankford Avenue and Dyre Street, Philadelphia. The capital stock of the company is \$42,000, but it is understood that this will be increased soon. The incorporators of the company are: J. W. Ellard, of Blackwell & Company, Baltimore; Samuel A. Boyle, Jr., and W. H. Drayton, third, of Toland & Company, bankers, Philadelphia; J. D. Orme, of Balti-

more, Md., and W. F. Sadler, Jr., of Trenton, N. J. George Q. Horwitz, counsel for the company, has drafted an ordinance which he will submit to the Philadelphia City Councils. This will afford a continuous line from Frankford, Philadelphia, to Trenton, under the control of allied interests. The Interstate Railways Company, which controls the Holmesburg, Tacony & Frankford Electric Railway through the United Power & Transportation Company, may file objections because the proposed line will parallel the Holmesburg, Tacony & Frankford.

NEW YORK, N. Y.—Work has been started on the distribution of rails and ties for the subway. Two sections are now prepared for the track-laying. A few temporary tracks are now being laid to hasten some of the work. The first sections of track to be laid will be between Forty-Third Street and Howard Street and between Thirty-Second Street and Howard Street.

GLEN COVE, N. Y.—The application of the Glen Cove Street Railroad Company for permission to construct an electric railway on the highway leading from the Cedar Swamp Road to Sea Cliff station has been granted by the Oyster Bay Commissioners of Highways.

JAMAICA, N. Y.—The South Shore Traction Company has just been incorporated, with a capital stock of \$2,000,000, to build an electric railway 60 miles in length in Suffolk and Nassau Counties extending from Jamaica, through Rockville Center, Hempstead, Babylon, Amityville, Islip, Patchogue and Brook Haven. The directors of the company are: L. Lee Slingluff, of Baltimore, Md.; Arthur C. Hume, James A. Hawes, S. B. Thompson and C. G. Perot, of New York; F. D. Schaffer, of Hamilton, Ohio; Samuel Worthington, of Kearney, N. J.; Edward Phillips, of Brooklyn, and Charles Hall Davis, of Petersburg, Va.

ROCHESTER, N. Y.—It is stated that the Rochester Railway Company is considering the advisability of building a new car house in the rear of the Sodus Bay station, on Main Street East.

RIVERHEAD, N. Y.—The plan to build an electric railway to connect Riverhead, Quogue and other south side villages on the east end of the island has been revived. Wm. J. Martin and Joseph Martin are said to be interested.

BINGHAMTON, N. Y.—The Binghamton Street Railway Company has submitted to the citizens' committee of the towns of Union and Maine a proposition for extending the company's line to Maine. This proposition deals with the right of way, sites for a terminal at Maine, and a pleasure resort in that locality.

SYRACUSE, N. Y.—William G. Holbrook, secretary of the Standard-Gage Company, Industrial Building, Syracuse, has applied for a street railway franchise in Onondaga. It is understood that Mr. Holbrook represents a company about to be incorporated.

MAYVILLE, N. Y.—The Chautauqua Traction Company, capitalized at \$500,000, has been incorporated to build the proposed electric railway from Chautauqua Avenue, Lakewood, to Mayville. The road will be about 17 miles long. Among the stockholders of the company are: William Broadhead, R. N. Marvin and W. R. Reynolds.

BALLSTON, N. Y.—The plan of the Ballston Terminal Railroad Company to issue \$1,200,000 of first mortgage, thirty-five year 5 per cent gold bonds, of which \$800,000 are to be issued at once, besides providing for the refunding of \$385,000 of outstanding bonds, will provide funds for completing the company's lines through Johnstown and Gloversville. Provision is also made for the construction of a line to Amsterdam.

SCHENECTADY, N. Y.—The Schenectady Railway Company has completed the plans for the new power house which it will build in Dock Street adjoining the present plant on the South Side. When completed and equipped the old and new plants combined will have a capacity of 6000 hp, it is said.

PATCHOGUE, N. Y.—The rumor is again revived that an option has been secured on the property of the Patchogue Electric Company by the interests that have in contemplation the construction of the proposed electric railway between Patchogue and Port Jefferson. The new option is said to expire April 1.

RIVERHEAD, N. Y.—John H. Perkins, of Riverhead, is securing the right of way for an electric railway from Riverhead to Orient Point. The road will be about 30 miles long, and will extend through Riverhead, Aquebogue, Jamesport, Laurel, Mattituck, Cutchogue, Peconic, Southold, Greenport, East Marion and Orient.

CLEVELAND, OHIO.—C. H. Hubbell and R. A. Williams, of Cleveland, are securing right of way for an electric railway from Cleveland to Medina. It is proposed to follow the Wooster Pike, which was the route of the road proposed two years ago by Joseph Roof and others. Much of the route has already been graded by the old company.

HAMILTON, OHIO.—The construction of the Cincinnati & Interurban Railway within Hamilton is rapidly nearing completion. The road has operated to the city limits for two years, but has been kept out of the center by numerous injunctions.

MANSFIELD, OHIO.—Parties interested in the proposed Mansfield, Mifflin & Ashland Railway propose to establish a summer resort at Petersburg Lake. It is stated that a steamer is to be put on the lake, that a casino is to be built and that a hotel is to be erected. Numerous other improvements are to be made.

CINCINNATI, OHIO.—The Council has granted a franchise through the waterworks property to the Interurban Railway & Terminal Company for its Cincinnati & Eastern Railway. The road has been operating through the grounds on a grant made by the Waterworks Commissioners, but the Supreme Court recently held that this was not sufficient and that a grant must be secured from the Council.

TOLEDO, OHIO.—The Toledo & Monroe Railway will build a line to Stoney Point, 9 miles northeast of Monroe, on the lake. This is a beautiful resort, which heretofore has had no railway communication. A number of improvements will be made to the resort.

TOLEDO, OHIO.—The Toledo & Indiana Railway is securing figures on large quantities of rails and ties with which to complete its line to Bryan. The road is now in operation to Delta, and is making a fine showing.

MILFORD, OHIO.—The Council has granted franchises through town to the Cincinnati, Milford & Loveland Traction Company, the Cincinnati, Milford & Eastern Traction Company and the Cincinnati & Columbus Traction Company. The three roads have been fighting for a route through town, and the Council settled the matter by granting franchises to all.

CINCINNATI, OHIO.—The Cincinnati, Milford & Eastern Traction Company, controlled by George H. Chamberlain and W. F. Roudebush, has absorbed the Cincinnati, Milford & Goshen Traction Company, a rival project headed by W. C. Compton.

TOLEDO, OHIO.—The Toledo & Chicago Interurban Railway Company has opened offices in the Spitzer Building, this city. This is the company which will build an extension of the Toledo & Western Railway from Pioneer to Goshen, Ind., with a view of ultimately forming a through line to Chicago. The first step in the project will be to take over the Garret, Auburn & Northern Railway, which has commenced work over a portion of the desired route.

DAYTON, OHIO.—The Dayton, Springfield & Urbana Railway is planning to make a number of important improvements at Tecumseh Park, on its line near Springfield. The company has ordered several new summer cars to handle the park traffic.

YOUNGSTOWN, OHIO.—The Youngstown & Southern Railway Company, which proposes to build from Youngstown to East Liverpool, has obtained options on 1100 acres of coal lands near West Point. Leases are being closed all along the proposed route. The line will be essentially a coal road.

SANDUSKY, OHIO.—It is understood that the Sandusky, Clyde, Tiffin & Southern Railway Company is considering a proposition to consolidate with the Sandusky Southwestern Railway, which proposes to build over a similar route.

MARYSVILLE, OHIO.—The Delaware & Magnetic Springs Electric Railway Company has been incorporated, with \$200,000 capital stock. The promoters have purchased the Park Hotel property at Magnetic Springs. Improvements will be made at the park.

YOUNGSTOWN, OHIO.—The Pennsylvania & Mahoning Valley Railway Company and the projected Stambaugh Jackson Company have each offered the County Commissioners \$20,000 for the exclusive right to cross the new Mahoning Avenue Bridge.

TOLEDO, OHIO.—The Interurban Construction Company, which will build the Toledo, Lakeside & Port Clinton Railway, has placed contracts for 5000 tons of 70-lb. rail, to be delivered along the route in June. Grading will start as soon as possible.

INDIANAPOLIS, IND.—The Northern Indiana Traction Company has chosen the following officers: R. E. Breed, of Marion, president; B. F. Burk, of Marion, vice-president; G. A. Shideler, of Marion, secretary-treasurer; H. F. Coleman, of New York, general manager; George Breed, of Philadelphia, consulting engineer. The company, proposes to build from Marion to Warsaw. The power house will probably be at Lafontaine.

URBANA, OHIO.—The Dayton, Springfield & Urbana Railway proposes to erect a sub-station in Urbana to assist in feeding its northern extension.

YOUNGSTOWN, OHIO.—The Council has passed an ordinance establishing a street railway route to be known as No. 6. The franchise will be sold to the highest bidder. It is wanted by what is known as the Stambaugh-Jackson Company, which proposes to build a line to the steel plant east of the city.

SPRINGFIELD, OHIO.—The Springfield Railway Company is planning a number of improvements to its system besides providing new amusements at Spring Grove Park. It is probable that the company will build a new line out Greenmount Avenue, which would reach a number of shops and form a loop line with the present Lagonda Avenue line.

NORWALK, OHIO.—The Buckeye Traction Company, which proposes to build a line from Norwalk to Bucyrus by way of Plymouth, is reported to have placed a contract with the Westinghouse, Church & Kerr Company for the electrical equipment for the first section from Norwalk to Plymouth. The Buckeye Traction Company has received somewhat of a setback through the repeal by the Norwalk Council of the franchise of the Norwalk, Ashland & Southern Railway Company, whose route the Buckeye Company proposed to utilize in entering Norwalk.

YOUNGSTOWN, OHIO.—The Pennsylvania & Mahoning Valley Railway Company is preparing to relay its East Federal Street line with 90-lb. rails.

CLEVELAND, OHIO.—Directors of the Stark Electric Railway made an inspection of the property Sunday, March 3. The car was the first to be operated over the new track into Canton. The company has a large force at work ballasting, and the line will be in operation throughout by April 1.

CLEVELAND, OHIO.—The Cleveland, Geneva & Meadville Railway Company has been chartered, with \$1,000 capital stock, by D. E. Warner, O. C. Pinney, M. E. Patterson, W. K. McConnell and Thomas Davidson, of Cleveland. The company proposes to build from Geneva to Meadville, Pa., by way of Jefferson. Work of securing right of way has started. An option has been secured on a water power at Mechanicsville, with a view to utilizing it for operating the road.

WAPAKONETA, OHIO.—The Sandusky Southwestern Railway Company has applied for a twenty-five year franchise to enter Wapakoneta on the main street. The line will eventually extend to Sandusky.

SHREVE, OHIO.—The Wooster & Mansfield Railway Company has secured a right of way connecting Wooster, Millbrook, Loudonville, Perrysville, Douglass, Robinson and Mansfield, a distance of 44 miles. Work is to be begun at once. The officers of the company are: W. A. Craig, of Shreve, president; J. B. Keys, of Shreve, vice-president and general manager; David Collier, of Plimpton, secretary; J. C. Chresrown, of Shreve, treasurer.

PATASKALA, OHIO.—Citizens of Pataskala are endeavoring to induce the Columbus, Buckeye Lake & Newark Traction Company to build a spur line from Etna, and offer an immediate franchise. The company is making two surveys for its proposed extension to Zanesville, but the exact route has not yet been settled.

FINDLAY, OHIO.—It is announced that the original promoters of the Findlay & Southern Railway Company have sold their right of way from Findlay to Columbus, to Cleveland, Cincinnati and Toledo capitalists, and that the new owners will commence construction work as soon as the weather permits.

DELTA, OHIO.—The Toledo & Indiana Railway Company has leased the Thompson block and will operate it as general offices, passenger waiting room and freight station. General Manager Warren and Auditor Frink will remove their offices to Delta.

ZANESVILLE, OHIO.—The Zanesville Railway, Light & Power Company has placed contracts with the General Electric Company for the equipment for the proposed power plant, as well as for the equipment of ten new cars. Work on the plant is to start at once.

CANTON, OHIO.—The directors of the Canton-Akron Railway Company have decided to increase the capital stock of the company for the purpose of making improvements. Contracts have been let for the construction of new car houses, and some of the lines of the company are to be double tracked. Other improvements are to be made.

CELINA, OHIO.—The People's Rapid Transit Company, which proposes to build from Toledo to Greenville, is to locate its power plant at Celina. President Morgan, of the company, claims that the entire right of way has been secured and that construction work will be begun at once.

BATAVIA, OHIO.—The Cincinnati, Milford & Eastern Traction Company has secured the right of way of the old Cincinnati, Milford & Hillsboro Railroad, graded years ago, and the County Commissioners have granted a franchise enabling it to use the road. The purchase of this grade saves an immense amount of work.

SPRINGFIELD, OHIO.—The syndicate headed by ex-Governor Bushnell has applied for a franchise through Champaign County for its line from Springfield to Piqua. It is stated that the syndicate has acquired the franchises and rights of way of the Springfield, Sidney & Piqua Traction Company.

DAYTON, OHIO.—A syndicate headed by Col. D. B. Corwin, of Dayton, is said to be planning an electric railway from Dayton to Lebanon by way of Centerville, Springboro and Red Lion; also a spur line from Waynesville to Wilmington.

CLEVELAND, OHIO.—The Cleveland & Sharon Traction Company, which is building from Middlefield to Sharon, is planning to build a spur line from Orangeville to Greenville, Pa. This would give a direct route from Greenville to Cleveland.

YOUNGSTOWN, OHIO.—The Pennsylvania & Mahoning Valley Railway Company has completed its large car houses near Hasleton. The car houses will hold nearly one hundred large cars, and there are quarters for the men and a dispatcher's office. Adjoining the car houses the company is erecting a repair shop. This will be completed in the near future.

NEWARK, OHIO.—The Columbus, Buckeye Lake & Newark Traction Company has purchased a 3-acre tract of land in Newark, on which it will erect a car house and repair shop for the new extension being built from Newark to Zanesville.

CLEVELAND, OHIO.—The National Bonding & Trust Company, of Cleveland, is arranging for the financing of the proposed Norwalk-Shelby line, which, in connection with the Shelby-Mansfield line, will afford connection with Mansfield. Surveys have been started.

CINCINNATI, OHIO.—Henry W. Huggins is the promoter of an electric railway to extend from Maysville, Ky., through Georgetown and Ripley to Hillsboro, Ohio, where connection will be made with the Cincinnati & Columbus Traction Company for Columbus.

PHILADELPHIA, PA.—The Philadelphia Rapid Transit Company, through the West Philadelphia Passenger Railroad Company, a subsidiary, has applied to the Council for a franchise to construct a number of lines in West Philadelphia. The northern end of the Tenth and Eleventh Streets line of the Philadelphia Rapid Transit Company is to be extended from Eleventh and Cambria Streets to Glenwood Avenue. Work will begin on this extension within a few weeks.

WAYNESBORO, PA.—W. A. MacDonald, of Philadelphia, has been awarded the contract for constructing the proposed electric railway from Greencastle to the top of the Blue Ridge Mountains at Pen Mar. The line will be 14 miles in length, with its terminus at the excursion resort, Pen Mar Park. Work will begin at once, and the road will be completed before Aug. 1. The contract price is \$300,000.

CHESTER, PA.—The Chester Traction Company has secured a new franchise on the Providence Road, and will build an extension from Twenty-Fourth Street, Chester, to Palmer's Corner.

CLEARFIELD, PA.—The Centre & Clearfield Street Railway Company, which proposes building an electric railway connecting all the towns on the eastern side of Clearfield County with Philipsburg, has organized as follows: J. G. Platt, president; O. L. Schoonover, vice-president; H. B. Hartwick, secretary; James Passmore, treasurer; James Passmore, Jacob Swires, A. J. Graham, George W. Hawort, C. E. Murray, J. H. Turnbach, John G. Platt, C. H. Rowland, H. M. Hughes and O. L. Schoonover, directors.

YORK, PA.—Resolutions providing for extensions of the York Haven Street Railway and the York & Gettysburg Street Railway have been entered for record at the Court House in this city. The York Haven Company will not build its line over the route first laid out, for the reason that it does not desire to cross the Northern Central Railway tracks twice, but will build from

near Emigsville northwardly a distance of 2888 ft. The York & Gettysburg Road will be built from East Berlin, Adams County, through Bigmount, Admire, Kroner, Weiglestown to York, passing through Paradise and Dover Townships. The directors have decided to begin work on the new line at once. The officers of the company are: C. C. Basehoe, president; S. C. Liggett, secretary; E. J. Wilkes, treasurer, and J. S. Shapley, solicitor.

CHAMBERSBURG, PA.—Burgess Hamilton has approved the ordinance granting an extension of time for the completion of the Chambersburg & Gettysburg Electric Railway within the borough limits. The old ordinance made the limit eight months from July 2, 1902, which would be March 2, 1903, while the new ordinance fixes the limit at six months from March 2, 1903, or Sept. 2, by which time the company is to be operating its line in town or forfeit its franchise. The company has secured the right of way through Fayetteville on condition that its tracks be laid in the center of the pike.

MONACA, PA.—James H. Welch has applied to the Borough Council for a franchise for a street railway. The ordinance granting him a franchise has passed first reading. A charter will be asked for and operations begun immediately following the granting of the franchise. Local capitalists are financing the project.

POTTSTOWN, PA.—It is now thought that the projected West Chester & Pottstown Electric Railway, about which there was so much talk a year or so ago, will be built this year. At a meeting of the company, held here a few days ago, much enthusiasm was manifested in the enterprise. The proposed route traverses northern Chester County, a rich agricultural section, tapping a number of small towns, and will give West Chester a direct outlet to the coal regions and up-State points, as it would connect at this place with the main line of the Philadelphia & Reading and Schuylkill Valley Division of the Pennsylvania Railroad. No heavy grading work would be encountered.

CORRY, PA.—The Erie, Cambridge, Union & Corry Electric Railroad Company is about to apply to the Council of Corry for a franchise. The lines of the company will shorten the distance between Corry and Erie about 5 miles and avoid practically all grades, and the distance between Corry and Cambridge will also be shortened. At Erie and Cambridge connections will be made with other systems, and from Corry it is expected a connecting link will be built connecting the system with the Jamestown and Warren systems.

SHAWNEE, OKLA.—Plans are being discussed for building an electric railway from Shawnee to Tecumseh. Wm. Edwards, attorney for the Orient Railroad, is said to be interested.

ELIZABETH, PA.—It is stated that the building of the Elizabeth & Donora Electric Railway will be commenced at once. The route is from Elizabeth to the Monongahela River at Dogg's Ferry, thence along the river to a point opposite Donora. The line will probably connect at this point with the system running into Pittsburg. There is talk of the extension of the Calhoun-Clairton line to West Elizabeth.

SHAMOKIN, PA.—The Shamokin & Edgewood Street Railway Company has determined that the extension to Trevorton will be built within the next three years. From Trevorton the line will ultimately be further extended to Herndon.

FAYETTESVILLE, PA.—The Chambersburg & Gettysburg Electric Railway Company has secured a site at this place for a power house.

PORTLAND, ORE.—An ordinance has been introduced in Council granting a franchise to the West Side & Suburban Railway Company.

ALLENTOWN, PA.—Councils have granted permission to the Allentown & Kutztown Traction Company to make short extensions on Seventh and Walnut Streets.

WILLIAMSPORT, PA.—The Riverside Street Railway Company has been incorporated by M. B. Rich, C. H. Rich and T. M. Stevenson. The plan of the company is to build from Lock Haven to Oak Grove, passing through Lockport, Dunnsdown, Chatham's Run and other places. The power house will be located at Chatham's Run, about midway on the line, and the machinery will be operated by water power. There are two pretty park sites along the proposed line. All the rights of way have been obtained. The line will be about 9 miles long. It is stated that the Susquehanna Traction Company will transfer its right of way over the Lock Haven Bridge to the Riverside Company upon being given assurance that the line will be built.

CHAMBERSBURG, PA.—Thirteen carloads of rails for the Chambersburg Street Railway are being distributed along the route of the line. The line is to be in operation by July 4, it is promised.

WAYNESBORO, PA.—The Chambersburg, Greencastle & Waynesboro Electric Railway Company is securing its rights of way a second time, the old rights having lapsed. No trouble is expected in this matter, and Contractor W. A. McDonald, of West Chester, expects to begin active construction work on the line between Waynesboro and Pen Mar in a few weeks. Contracts for all the material for the new line have been made.

YORK, PA.—The Eberton Loop is to be the first extension built this year by the York Electric Railway Company. It will connect with the Princess Street line at Dewey Street, and will cross the Western Maryland and Pennsylvania Railroad tracks by an overhead bridge. Contractor Dobbins will build the new extension.

TAMAQUA, PA.—Work on the extension of the Tamaqua & Lansford Electric Railway is progressing rapidly, the rails being laid from Nesquehoning to the intersection of the turnpikes to Nesquehoning and Hudsonale. Much of the roadbed has been hewn through solid rock. Contractor McQuade has two gangs of men working from opposite ends of the line, and expects to finish his contract in about one month.

NEWPORT, R. I.—It is reported that Colonel Frank S. Arnold, of Providence, and John Eldred, of Boston, are interested in a plan to build an electric railway to run the length of Conanicut Island, connecting Conanicut Park at the north end with Jamestown at the south and the ferries for Newport and Saunderson.

PROVIDENCE, R. I.—The Pascoag & Providence Street Railway Company is seeking incorporation. The plan of the company is to build an electric railway to connect Burillville, Gloucester, Smithfield, Johnston and North Providence. Waldo A. Hopkins, of Pascoag; Samuel Miller, of Gloucester, and Nicholas S. Winsor, of Greenville, are interested in the company.

DALLAS, TEX.—Stone & Webster, of Boston, have approved the plans for the improvement of the Dallas Consolidated Electric Street Railway Company as recommended by their representative, J. Peyton Clark. The improvements to be made extend to all parts of the system and call for the expenditure of a large sum.

BEAUMONT, TEX.—Walter A. Myrick, who has recently been working in the interest of a projected electric railway in this vicinity, has made public part of his plans. According to Mr. Myrick, application has already been made to the County Commissioners of Jefferson County for a franchise, and application is to be made at once to the City Council of Beaumont for a franchise. It is planned to build 40 miles of line outside of Beaumont to connect Spindle Top Heights, Port Arthur and Beaumont.

RICHMOND, VA.—The Virginia Passenger & Power Company has awarded W. B. Newell the contract for building its new power plant on Twelfth Street.

ROANOKE, VA.—It is reported that the Roanoke Railway & Electric Company will build extensions, including a line to Fincastle, 18 miles.

NORFOLK, VA.—The Chesapeake & Ohio Railway is reported to be behind an electric railway that will traverse every coast resort in this section, will tap the fertile truck farms of Tidewater Virginia, and whose terminus will likely be at Sewall's Point, facing Hampton Roads, where it is reported vast piers will be constructed, where eventually ocean-going steamships may load for foreign ports. A. Johnston Ackiss is the local representative.

RICHMOND, VA.—The Virginia Passenger & Power Company now has under consideration the advisability of constructing a new bridge over James River from Richmond to Manchester, on which it is proposed to run the cars of the Richmond and Petersburg line into Richmond.

SPOKANE, WASH.—The City Council has granted Jay P. Graves a franchise to construct an electric railway on Washington Street.

WHATCOM, WASH.—The Lynden Electric Railway & Improvement Company has been incorporated to build an electric railway from Whatcom to Lynden. The capital stock of the company is \$160,000.

SPOKANE, WASH.—The City Council has passed an ordinance granting a street railway franchise to the Washington Water Power Company.

PARKERSBURG, W. VA.—The Parkersburg, Marietta & Interurban Railway is preparing to enlarge its power station to install a new 500-hp unit. The company is putting on a number of large cars for its interurban service.

MORGANTOWN, W. VA.—The Morgantown Electric & Traction Company has begun work on its proposed road here. Westinghouse, Church, Kerr & Company are the engineers.

HUNTINGTON, W. VA.—The work of securing the right of way for an electric railway from Washington to the Falls of the Potomac, a distance of 20 miles, has been begun. It is said that Jos. S. Miller, president; John Graham, of the Camden Interstate Railway, and George F. Miller, president of the First National Bank of Huntington, are interested.

MOUNDSVILLE, W. VA.—Plans are being made for building an electric railway from Moundsville to Williamstown. Guy A. Wagner, of Wheeling, is said to be interested.

WHEELING, W. VA.—The Pan-Handle Traction Company has applied to the Council for a fifty-year street railway franchise. A former application by this company was defeated by the Council.

JANESVILLE, WIS.—The Janesville Traction Company, in which interests identified with the Rockford, Beloit & Janesville Railroad are interested, has perfected its organization, electing the following officers: H. H. Clough, president; T. S. Nolan, vice-president; R. W. Hill, secretary and treasurer. Application for a franchise in Janesville is to be presented to the Council on March 16.

SHEBOYGAN, WIS.—The Sheboygan Light, Power & Railway Company is said to be negotiating a loan of \$1,000,000 to provide for the refunding of outstanding bonds and for the improvement of the company's property in general. It is said that a new power house is to be built, and that the road is to be extended to Plymouth on a private right of way.

JANESVILLE, WIS.—The Southern Wisconsin Interurban Railway Company, recently incorporated, has applied to the Council of Janesville for a franchise. The plan of the company is to build between Janesville and Madison.

JANESVILLE, WIS.—The Beloit, Rockford & Janesville Electric Railway Company has decided to continue the line north to Madison via Edgerton, Stoughton and McFarland. The company is now running the line from Rockford to Janesville. Application for a franchise will be filed with the Janesville Council at once.

CANADIAN NOTES

TORONTO, ONT.—The Toronto & Mimico Electric Railway & Light Company is applying to the Legislature for permission to change its name and to extend its line to Hamilton.

WINNIPEG, MAN.—The Winnipeg Street Railway Company plans to build several extensions within the city during the summer.

NIAGARA FALLS, ONT.—The Niagara, Queenstown & St. Catharines Electric Railway Company is to seek incorporation at the next session of Parliament. The plan of the company is to build an electric railway from St. Catharines through Grantham and Niagara to the town of Niagara, in Lincoln County; thence to Queenstown and Grantham to St. Catharines.

CHATHAM, ONT.—At the next session of Parliament application is to be made for a charter for the Chatham, Wallaceburg & Lake Erie Railway Company. The plan of the company is to build an electric railway to connect Chatham and Wallaceburg, and Chatham, Raleigh and Harwich. The company will also build from Wallaceburg to Petrolia.

GUELPH, ONT.—Donald Guthrie, solicitor of Guelph, has given notice that application is to be made to Parliament at its next session for a charter for the Guelph & Georgian Bay Railway Company. The purpose of the company is to build electric railway lines from Guelph to Eldora, Fergus, Arthur, Mount Forest, all in Wellington County, and thence through Grey County to Owen Sound or Medford. The company will also seek power to build from Guelph to Erin, in Wellington, and to Orangeville, in Dufferin County.

BRANTFORD, ONT.—The Grand Valley Electric Railway Company has completed the plans for the summer theater to be erected in its park between Brantford and Paris.

ALYMER, ONT.—The contract for construction of the Alymer & North Shore Railway has been awarded to the Detroit Construction Company.

EMBRO, ONT.—The Embro Electric Railway is seeking incorporation. The plan of the company is to build an electric railway extending to St. Marys, Stratford, Beechville and Woodstock.

INGERSOLL, ONT.—The Southwestern Traction Company is seeking a franchise for fifty years and exemption from taxation for twenty-one years from the town of Ingersoll.

TORONTO, ONT.—H. B. Giveren, of Ottawa, is applying to the Dominion Parliament for a charter for another electric railway between Toronto and Hamilton.

CHARLOTTETOWN, P. E. I.—A. F. Gerald, of Fairfield, Maine, has been looking over the ground with a view to building an electric railway in this vicinity.

STRATFORD, ONT.—Application will be made to the Ontario Legislature for an act incorporating a company to construct an electric railway in and through the city of Stratford, along the Huron Road, through Sebringville to Mitchell, and also from Stratford along the center line of the township of Downie and through Blanshard, or some other convenient route, to the town of St. Marys and through the townships of Dewnie and West Zorra to Embro Station, on the Canadian Pacific Railroad, with a branch line to the village of Embro.

NEWS NOTES

DENVER, COL.—Among the bills introduced in the Colorado Senate this session is a measure to compel the various street railway companies of the State, as well as all railroad companies operating in Colorado, to preserve a reasonable standard of sanitation in their cars. It will be necessary to clean every car twice a week with steam or compressed air, keep the floors moist with an antiseptic solution and provide spittoons.

CHICAGO, ILL.—The employees of the South Side Elevated Railroad have been given a voluntary increase in wages. The motormen are increased to 29 cents an hour from 25 cents, conductors are raised to 21 cents from 20 cents, and the guards are raised to 18½ cents from 16½ cents.

SPRINGFIELD, ILL.—A bill has been introduced in the House to place interurban electric railways under the jurisdiction of the Railroad and Warehouse Commission. It does not apply to street railways, but gives the Commission jurisdiction over electric railways outside of the corporate limits of cities, villages and incorporated towns, or connecting two or more cities, villages or towns, and of lines partly within and partly outside of a city.

INDIANAPOLIS, IND.—A bill has been introduced in the Senate to require interurban railway companies to employ train despatchers.

INDIANAPOLIS, IND.—There has been introduced in the Assembly a bill providing that any street railway company operating any street railway, interurban street railway, or suburban street railway, by electricity or other power, shall have the right to intersect, join and unite its lines with any other street railway in this State or in adjoining States; such companies having the right to merge and consolidate the stock of their companies. In addition to this bill, an agreement has been reached on the steam road consolidation bill by which consolidations shall be subject to regulations the same as domestic corporations, and the State may at any time repeal the law and revert to the original conditions.

SOUTH BEND, IND.—The strike of the employees of the Indiana Railway Company has been called off, the men realizing the hopelessness of continuing the struggle. About thirty of the strikers are under arrest charged with rioting and destruction of property. A fine of \$25 has been imposed in each of six cases where pleas of guilty have been entered.

INDIANAPOLIS, IND.—A bill has passed the Senate which extends the voluntary incorporation act of Indiana to persons desirous of organizing "to promote, finance, construct, equip, rent and operate street and interurban railways and to do all other things needful or connected therewith." Local interests are inclined to scent a "deal."