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*Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1906 to date, 49,000 copies, an average of 8167 copies per week.*

### City Land Values as Affected by Transportation Facilities

One of the most interesting chapters in the history of modern transportation, which we hope to see published some day, will be that devoted to the effect of city and interurban electric railways on real estate values. We believe there is hardly an instance where any other great public benefit has been the recipient of such abuse and opposition on the part of the real estate owners and dealers, and of the citizens generally, as attended the effort to introduce electric railways in this country. At first thought it seems remarkable that the residents in one city cannot or do not learn anything from another in connection with this particular industry. Nevertheless, the experience in

Boston was duplicated in Philadelphia and Brooklyn, and that of both in New York, while San Francisco is still wrestling with the same problem. Perhaps one reason for this condition of affairs is that the real estate interests, from which such opposition would naturally come, are controlled by men whose property and, consequently, whose views are limited by local surroundings. The rise in real estate in a neighboring city usually has no more significance to them than if it had occurred in China or the Fiji Islands. The average property owner cannot see further than across the street when his own property is concerned, and he is usually opposed to all change, as if any alteration of existing conditions meant depreciation. For this reason the address by Mr. Vreeland, printed elsewhere in this issue, upon city land values as affected by transportation facilities, is most instructive. It analyzes some of the reasons advanced in opposition to the introduction and extension of electric railway service in New York, quotes a number of amusing examples of the way in which property owners fought against prosperity, and contributes some very valuable statistics as to the increase in the ratable value of real estate in various sections of the city. These additions to the value of the property, as Mr. Vreeland shows, were due directly or in main part to those improvements in the street railway system to which the owners were so strenuously opposed. We have never seen similar facts in regard to any other city placed in such succinct or so complete a way, and through this compilation Mr. Vreeland has placed the entire industry under an obligation to him. His address contains facts which should prove of great value to both city and interurban railway companies in securing franchises and rights of way.

### Location of Interurban Lines

The first interurban lines constructed were built to parallel already existing steam roads. The promoters depended on obtaining traffic by diverting some already in existence to the electric line, on account of its more frequent trains, cheaper rates and the fact that the interurban road could pick up and discharge passengers nearer the business portions of the towns. The power of interurban lines to create traffic was then not realized, nor was their ability to handle freight and express business fully appreciated. But it has been proven that the interurban line does create traffic, and that considerable revenue can be derived from freight and express business if this is properly managed. In other words, there are almost as strong reasons why interurban lines should be pushed boldly out into new country as there are for the building of steam lines into such regions. We believe that it is time for promoters to broaden their views as regards the possible locations of electric roads and to be more independent of already existing steam lines than has been the practice heretofore. They should endeavor to cut across regions between towns that are not now directly connected by steam lines. There are many places where at present, in order to get from one town of several thousand inhabitants to another of similar size, located probably 30 miles or 40 miles distant, it is necessary to go a round-about way on steam roads, with possibly a change of cars at a



junction point en route. The country along a line directly connecting the two towns may be a prosperous farming community or may have some peculiar advantages which will cause it to become a manufacturing center as soon as freight facilities are developed. Such possible locations might in a short time give better returns than those paralleling steam lines.

### Mayor Dunne Favors Private Ownership

Mayor Dunne, of Chicago, is generally recognized as the most prominent advocate in this country of I. M. O., which is an abbreviation now popularly used in Chicago to save time in referring to "immediate municipal ownership." Nevertheless, he is engaged in a controversy just at present with the Chicago City Council, as well as with the municipal authorities in Glasgow, because he insists on private ownership of what each of those bodies has always looked upon as a public utility. The incident has arisen as a result of the famous invitation extended to the manager of the Glasgow Tramways, Mr. Dalrymple, to visit Chicago last spring and make a report on the subject of municipal tramways in that city. Since the receipt of this report, soon after Mr. Dalrymple's return to Glasgow, it has been gathering dust in the archives of Mayor Dunne's office, although the City Council has been clamoring to hear what the expert had to say about the Chicago situation. Mayor Dunne excuses his refusal to make the report public on the ground that Mr. Dalrymple was invited to visit Chicago by the Mayor in his private capacity, that his expenses were paid by the Mayor himself, and that consequently the document is one of those few species of property which the Mayor still considers is subject to private ownership. This theory is strongly combatted, not only by the City Council, but also by the Lord Provost of Glasgow. In a recent letter to Mayor Dunne, the latter writes that the corporation "clearly understood that the request came from you not as an individual, but as the Mayor of the city, and this opinion is confirmed by the terms of the following cablegram sent to you in reply:

"Mayor, Chicago, U. S. A.—Corporation of Glasgow unanimously and cordially agree to request of your municipality. Tramways manager unable to leave before May 10. Letter follows.  
LORD PROVOST."

The Lord Provost further states that if it had been made clear to the Glasgow corporation that the request was made, as claimed by Mayor Dunne, as a private individual, there is little likelihood that the application would have been granted, and that the corporation fully expected that the report would have been accessible not only to the Council of Chicago, but to the members of the Glasgow corporation themselves. He concludes by stating that unless the Mayor is prepared to submit Mr. Dalrymple's report to the Council of Chicago or to show good reasons why it should not be submitted to them and to the members of the Glasgow corporation, the tramways committee will feel it has no alternative but to ask Mr. Dalrymple to send a copy of the report to the Chicago Council, as desired, and also to furnish a copy thereof to the members of the Glasgow corporation. As the Council has already passed a vote asking the Lord Provost for a copy of the report, it looks now as if it will not be long before this famous manuscript sees the light of day. It is needless to say that the controversy over the publication of this report and the desperate efforts made by Mayor Dunne to prevent its contents becoming known have greatly whetted the public curiosity and impatience to learn its import.

This incident is in one sense unimportant, but in another and in a broader sense it is of vital consequence, as it indicates

the character and disposition of one of the most prominent advocates of municipal ownership in this country. If there are drawbacks to the policy of immediate municipal ownership of the street railways in Chicago, the citizens are entitled to know them, and if the Mayor was not blinded by demagogism or fanaticism he would be the first to enlighten them with all the facts at his command. Incidentally he has shown his unfitness for the office which he occupies by endeavoring to suppress testimony which may throw some light upon this, to Chicago, most important subject. In this particular case the attempt to conceal the truth miscarried because the circumstances surrounding the effort were known to too many people, but the incident is sufficient to impugn the sincerity of the Mayor in his advocacy of any future municipal ownership measure.

### Testing Armatures in the Winding Room

Armature testing facilities are sadly lacking in a large number of shops throughout the country. When it is considered that quite a large per cent of shop maintenance expenses goes for labor and material in winding armatures, one would naturally think that the winding room would be provided with every facility obtainable for testing armatures and locating faults in them. Notwithstanding this, the writer has encountered shops where there were no testing devices in the winding room other than a lamp bank. This is well enough in testing for shorts between segments and between coils before the top leads are laid, and also for testing for a ground between the windings and the core, but after the top leads are laid a lamp bank is utterly useless for discovering shorts between segments, crossed leads and similar defects. Where such simple testing apparatus is used, there is no assurance when the armature leaves the winding room that it will not "go up" when put in a car. When this does happen the armature must be returned to the winding room, a few or probably many new coils inserted, and to the expense of doing this must be added the cost of putting it in the car and removing it. It is therefore an expensive procedure.

An incident which recently came under our observation illustrates the force of this remark. An armature was rewound completely after having been well torn up by a broken band. When placed in the car it made a few revolutions and then there was a puff of smoke. The car was jacked up, the motor was opened and the armature was returned to the winding room. Several coils were replaced and it was again placed in the motor shell. This time the previous performance was repeated. Once more the armature went through the winding room and was again placed in the motor. This time, however, the wheels of the truck were jacked up clear off the track and a water rheostat was connected in series with the machine. It was discovered that the motor would just start at 200 amps. For a fourth time the armature entered the winding room. Several of the leads were lifted, and after a series of tests it was discovered that the top leads were placed two segments beyond their proper position. This made three separate windings on the armature and resulted in a consumption of approximately nine times the normal amount of current. The point intended to be brought out by relating this incident is that all the trouble and expense would have been avoided had there been some systematic way of testing the armatures before they left the winding room. There are several desirable methods in use. That requiring the least outlay of money is probably the telephone test. All the apparatus necessary is an electric bell, a battery and a head telephone receiver. Terminals of the bell are placed



on segments, between which are three or four others. The telephone terminals are placed on two adjacent intervening segments. The buzzing of the receiver indicates the absence of short-circuits and the intensity of the buzzing, whether or not the coils are properly connected. If a milli-voltmeter is at hand, more satisfactory and more definite tests may be made. A quick method of testing for short-circuits is that employing a transformer so designed that it can be placed in such a position that the armature coils will act as the secondary windings. This method is employed in many shops.

Before leaving the winding room an armature should be given a high-voltage test, in addition to those for short-circuits, crosses and similar defects. Such tests are made by means of a transformer giving about double the normal working voltage. Were some of the methods of testing enumerated put in practice in shops where the trust-to-luck idea prevails, it is safe to say that the decrease in expenses of the winding room would be extremely gratifying to the shop superintendent.

### Street Railway Earnings

One of the vital questions that to-day confronts the manager of a street railway property is a consideration of ways and means for increasing his yearly earnings. To tell the truth, in some localities the situation is frankly disquieting, and quite recently the president of one large electric railway system has been widely quoted as proclaiming a rather gloomy prognosis of the subject. The price for nearly every commodity except transportation has risen, and people are beginning to ask themselves whether the business has not been overdone in some sections of the country, and whether the growth of traffic, and still more of profit, justifies the increase in investment. Undoubtedly there are very many properties that show increasing business, and will continue to do so year after year in virtue of the steady increase of population in the larger centers. Beyond these there is a large group of interurban properties that can show reasonably good earnings that are steadily increasing. On the other hand, there is no denying that a good many roads, serving small communities or linking them as interurban lines, have been making a showing that is by no means as good as it ought to be. The table of Ohio statistics which we published a few weeks ago, bears directly upon the point at issue. Of the eighty-six properties there tabulated, one-third, very nearly, showed a very trivial or no increase in gross earnings over those of the previous year, and twenty of them exhibit an actual decrease, generally small, rarely over 5 per cent. A somewhat smaller group showed a very marked and gratifying increase of earnings, while the rest showed improvement to the extent of but a few per cent.

It by no means follows, however, that the roads which reported a decrease of earnings were thereby put in a bad way financially. In fact, eleven of the roads showing a decrease were earning above \$3,000 per mile of track, some of them more than double this amount, while some of the lines with largely increased earnings were rather badly off on the track mileage basis. In a good many cases, then, one must conclude that the decrease was casual rather than significant of any vital condition. The distribution of population changes more or less from year to year, so that a given line may be quite accidentally affected by causes that have nothing in particular to do with its operation. There are fat years and lean years in the street railway business as in other things. Turning, for instance, to the report from Massachusetts in the same issue, it is to be

remarked that in average gross earnings per mile of track, the years 1901 and 1902 were decidedly subnormal. One must not therefore trust too implicitly in generalized statistics. On the other hand, there are certainly quite a few roads of which the earnings are undeniably meager, clearly not enough to put the finances on a sound basis. On the Ohio list there are ten roads earning less than \$2,000 per mile, and as many more earning little over that figure, while in the Massachusetts report, sixty-three out of the ninety-eight street railway companies were returned as paying no dividends. This is not exactly cheerful, but on the other hand, it is not as bad as it looks at first sight, for there are roads all over the country that are making a conservative return on the capital invested if they keep up their physical assets and pay the interest on their bonds. One is fully justified, therefore, in discounting rather heavily the somewhat sinister import of the published statistics, but, after all this is done, there are certainly left a good number of roads which for one cause or another are not making reasonably good earnings. Some of these roads have been promoted into locations where the traffic is not great enough at present fairly to support them. They may be able to hold on by desperate efforts until the tide turns in their favor, but some will unquestionably fall into the hands of new owners at a figure representing a sounder judgment of their earning capacity than that of their promoters.

### Mergers and the Standardization of Parts

A few years ago an attempt was made by the American Street Railway Association to bring about the standardization of car equipment apparatus. A committee was appointed and rendered two reports, but practically all that was done, or that could be done at that time, was to recommend certain standards. As yet the street railway companies have not felt any urgent necessity for standards in car parts, but the merging of lines under one operating company, as has occurred at Indianapolis and at other places, and the interchange of cars over the several systems merged, which will no doubt be done, will make the adoption of standard apparatus and repair parts much more urgent. The variety of parts carried in the storerooms of any one of these systems is in many cases so numerous as to cause a heavy dead investment and a great deal of book-keeping. To repair any car that may come on any of the lines when cars are interchanged freely over different systems, unless some provision is made for standardizing repair parts, each repair shop will necessarily carry an enormous amount of stock. No doubt one of the first moves the merged companies will make will be to standardize as much as possible the wearing parts or those subjected to breakage. In some instances this will not be a very difficult matter. With other parts, however, it will be almost impossible. The greatest difficulty will probably be met when it is attempted to make parts of trucks interchangeable. Journal boxes and bearings have to an extent been standardized, yet there are many trucks of old design having these parts of such odd shape that it will be almost impossible to make standards to replace them. Center bearings and side bearings will be equally hard to standardize. Probably the only way the difficulty can be solved will be to sell those trucks, controllers and motors of which the fewest number are in service and replace them with apparatus adopted as standards. No matter what course may be pursued, it is safe to say that the merging of different systems will tend to bring about the long desired standardization of car equipment apparatus.



### REPAIR SHOP PRACTICES OF THE TORONTO RAILWAY

The Toronto Railway Company, of Toronto, Can., has one central repair shop and car building plant and four operating car houses at which minor repairs are made. The shops and all car repair and maintenance work are under the direct

cumulation of refuse, as well as keeping the pits sweet and clean. One of the many improvements effected by the present master mechanic soon after he took charge was the installation of a wheel-grinding plant in one of the pits. Wheels having a flattened or "skidded" tread are subjected to the wheel-grinding process and the defective part repaired. The result has

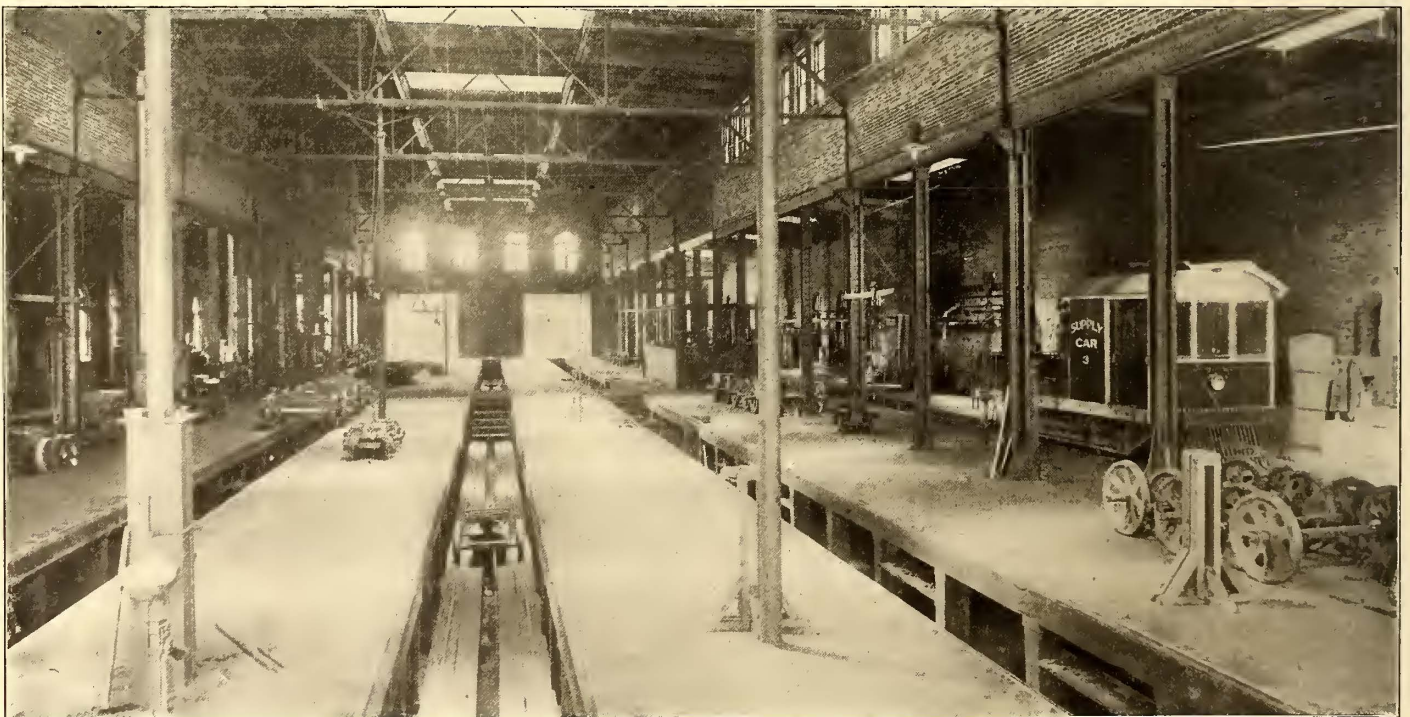


GENERAL VIEW OF FIELD AND ARMATURE ROOM, TORONTO RAILWAY SHOPS

charge of John Donnelly, master mechanic, who, since he assumed the office, has been able to effect a number of important economies and improvements in the mechanical department.

The repair shops cover considerable ground, the motor and truck shop alone being 212 ft. long x 75 ft. wide. From the

been a decided decrease in the number of wheels discarded as being "flat" and unfit for use. The shop is fitted with eight fixed cranes with chain falls attached, for the purpose of lifting armatures, machines, etc., from the pits. Standard four-wheel trucks are supplied for the carriage of armatures to and



REPAIR PITS, TORONTO RAILWAY SHOP

adjoining streets five lines of track run through the shop, and cars, after they have been repaired, are run direct to a separate car house adjoining the shops, where they are kept until placed in service.

The pits in the motor and truck shop have concrete floors, and furnish accommodation for ten pit crews. It is the practice to flush the pits at regular intervals with water from the fire hose, it being found that this effectually prevents the ac-

cumulation of refuse from the various parts of the shops. The pits are all equipped with hydraulic lifting jacks, as described elsewhere in this issue.

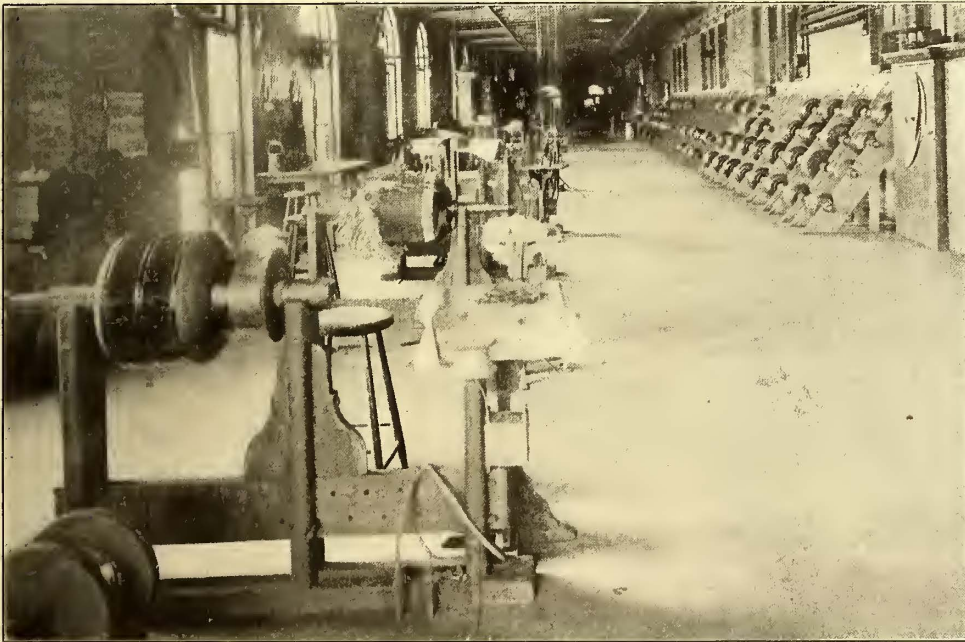
The lighting arrangements at these shops include eight large wire-glass ventilators in the roof, as well as side windows set high up. By night both arc and incandescent lamps supply the necessary light. In common with all the shops in this building, heat is supplied by the Sturtevant system of hot air, the plant



for this being situated in a separate building. A small store containing sufficient supplies for 24 hours is situated in the shop, it having been found that a considerable saving of time is effected by always having supplies on the spot. The supervision of all repairs to cars is entrusted to two foremen, the one being responsible for the work done on the electrical equipment of cars, and the other for work on the trucks and mechanical parts.

The system of reporting cars for repairs is as follows: When a car becomes crippled upon any part of the line, it is run to the nearest divisional operating station, or to the motor shop if that is nearer, and a ticket is attached stating what is the nature of the repairs required. By a rule of the shops no car is considered to be crippled unless it has this ticket attached. After the necessary repairs have been made, the men who have done the work fill up and sign the ticket, giving full particulars of the work performed, together with the time completed. This ticket is then forwarded direct to the office of the master mechanic, where the work is noted and charged against the car. By these means a complete record is kept of all repairs made to each car, which is always available for future reference.

Adjoining the motor shop and communicating with the same by iron doors are the machine and blacksmith shops. The former is fully equipped with eight lathes, three drill presses, a bolt cutter, radial drill and planer, two shapers, a wheel press and boring drill, and a complete brass finishing plant. The blacksmith shop is furnished with six forges, a large steam hammer capable of delivering a blow of 800 lbs., and a heavy punch and shears. The draft for the furnaces is supplied by a



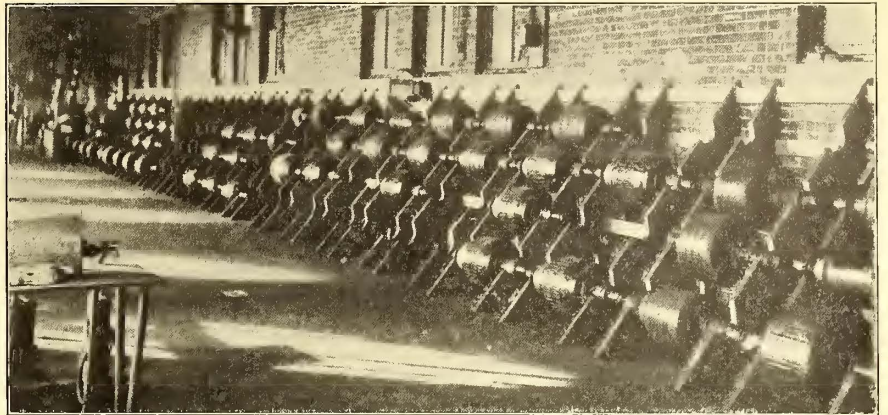
STANDS FOR WINDING ARMATURES, ARMATURE RACKS IN BACKGROUND, TORONTO RAILWAY SHOPS

40-in. Sturtevant fan. These two shops are under the respective charge of a foreman machinist and blacksmith, and both of these foremen, as well as those in the motor, truck and armature departments, are directly responsible to the master mechanic. The armature room, a description of which is given elsewhere, is on an upper floor and on one side of the motor shop. Easy access to this department is obtained by an electric elevator.

The following is a description of some of the methods, practices and devices in use in these shops:

#### MAKING FIELD COILS

The process of making field coils is as follows: The coils for all motors except Westinghouse 3 and W. P. 50's are formed of covered magnetic wire, cotton-covered wire being used for the last-mentioned type. After the coil is wound it is placed in the oven and baked at a temperature of about 200 degs. F. for four



RACKS FOR HOLDING ARMATURES, TORONTO RAILWAY SHOPS

hours; it is then soaked in Sterling varnish for three hours and again baked at the same temperature for from nine to ten hours.

The leads are then soldered on and the coil is wrapped with four thicknesses of "Glace" belting or cotton web tape in strips  $1\frac{1}{4}$  ins. wide. The coil is again baked at 200 degs. for three or four hours, after which it is soaked in Sterling varnish for four hours and baked again for nine or ten hours. When the coil is cool it is further insulated with one thickness of "Competition" rubber tape wound with half laps. It is then painted by means of a brush or an atomizer with P. & B. compound, and after air drying is ready for service.

As an additional protection to field coils, it is the practice to place a piece of No. 6 duck canvas, which has previously been thoroughly soaked in P. & B. compound, between each field coil and the motor frame. The canvas layers are cut on a form with a hole in the center to permit the piece to fit down snugly around the pole piece. The addition of these layers of canvas has materially reduced the number of field troubles.

#### MAKING ARMATURE COILS

Armature coils are wound on forms with cotton-covered wire. The coil is then dipped in Sterling varnish for a short time and is hung up to drip and to air dry. It is then insulated with one wrapping of oiled linen tape wound with half laps.

Cotton webbing is used for covering the leads. Over the oiled tape is laid one wrapping of dry linen tape, which is also laid with half laps. The coils of each type are made up in sets and placed in closets until such time as they are wanted. Before they are placed in an armature they are dipped in Sterling varnish and baked for about  $1\frac{1}{2}$  hours. The portion of the coil that sets into the slot of the armature core is dipped in paraffine wax to smooth it up so it will go into the slot readily. After an armature has been wound with a new set of coils it is painted all over with Sterling varnish and baked in the oven



at 200 degs. F. for ten hours. The commutator is then turned down and the complete armature is tested with a millivoltmeter for short circuits, bad connections, or open circuits. It is then given a 1000-volt a. c. transformer test. The bands are then put on and the armature is painted all over with P. & B. compound and allowed to air dry until it is ready to go out.

The stands on which the armatures are wound are shown in one of the engravings. It will be noticed that to each stand is brought a gas pipe and a compressed-air pipe, by which each workman can form a blow torch for soldering, etc.

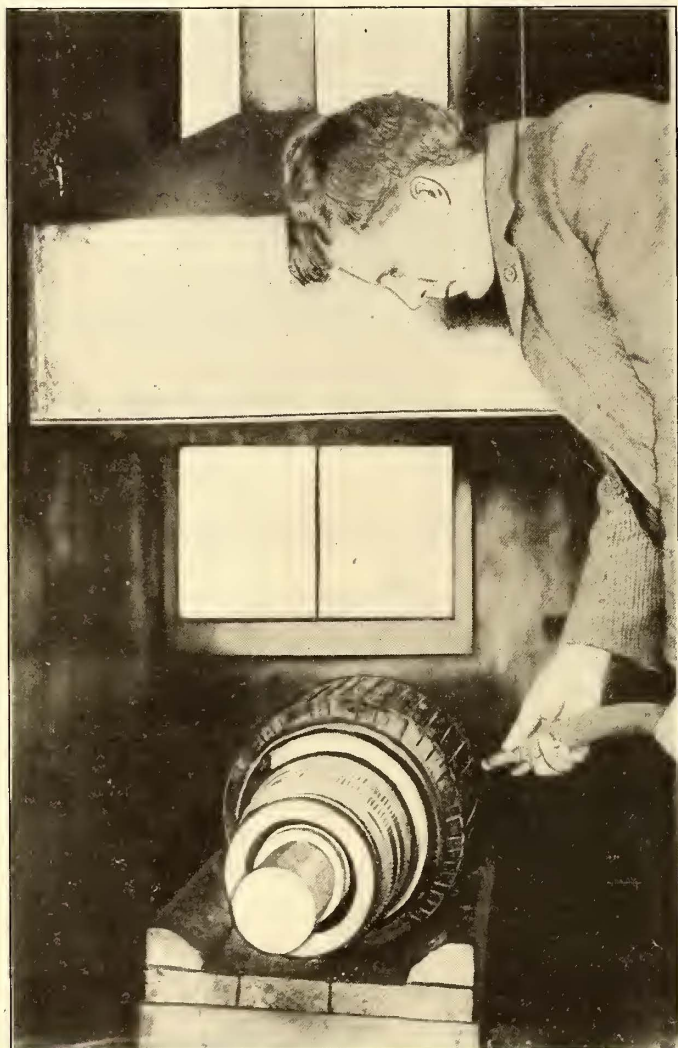
Through the courtesy of G. H. Sweetlove, the foreman of the armature department, and of the master mechanic, Mr. Donnelly, the following statistics as to the cost of producing

COST OF LABOR AND MATERIAL FOR MAKING FIELD COILS COMPLETE—TORONTO RAILWAY SHOPS

	West. No. 3 Field	G. E. 67 Field	G. E. 1000 Field	G. E. 800 Field
Wire.....	\$12.69	\$13.00	\$14.80	\$21.90
Glace belting.....	.85	.85	.85	1.25
No. 6 CC cable.....	.35	.35	.35	.35
Tape, Competition.....	.60	.60	.60	.82
Varnish.....	.85	.85	.85	1.00
P. & B. Compound.....	.25	.25	.25	.25
Soft Sheet Copper.....	...	.05	...	...
Labor.....	.50	.50	.50	.50
Total.....	\$16.09	\$16.45	\$18.20	\$26.07

COST OF LABOR AND MATERIAL FOR WINDING ARMATURES COMPLETE—TORONTO RAILWAY SHOPS

	West. No. 3 Armature	G. E. 1000 Armature	G. E. 800 Armature
<b>LABOR</b>			
Stripping and cleaning core.....	\$2.50	\$2.50	\$2.50
Winding.....	1.25	2.00	2.00
Connecting.....	1.25	1.25	1.25
Binding and heads.....	.75	.50	.50
Insulation and insulating core.....	.25	.50	.50
Winding and taping coils.....	3.00	3.00	3.30
<b>MATERIAL</b>			
Duck.....	.43	.51	.51
R. R. paper.....	.35	.15	.15
Press Board.....	...	.30	.30
Competition tape.....	.41	.82	.82
Solder.....	.20	.20	.20
Asbestos.....	...	.15	.15
Binding wire.....	.20	.20	.20
Linen tape.....	4.00	3.40	3.40
Webbing.....	.12	.12	.12
Varnish.....	.85	.85	.85
Linen.....	.46	.69	.69
Glue.....	.10	...	...
Wire.....	9.84	13.25	9.60
P. & B. Compound.....	.25	.25	.25
Total.....	\$26.10	\$30.64	\$27.29



BLOWING OUT ARMATURE WITH COMPRESSED AIR, TORONTO RAILWAY SHOPS

field and armature coils of various types, as taken from shop records, are here given:

It is understood the cost of materials will rise and fall with the market, but the figures given are good averages. Mr. Sweetlove states that the labor item can be reduced on armatures if taping machines are used for taping coils and if banding machines are used for banding armatures. The armature cores must be in good condition, or it will take more time to prepare them for winding. At the Toronto shops each winder prepares his own armature core for winding, including stripping, cleaning and filing. He also winds and connects his own armature. By this method it is possible to hold each man responsible for all the work on each armature.

ARMATURE RACKS

For holding armatures while they are in the shops, racks are provided along one wall in the armature room, as shown in

one of the illustrations. The side pieces of these racks are 2-in. x 16-in. timbers, set with one end on the floor and the other against the side of the wall, the racks somewhat resembling short ladders. The side pieces are braced from below and have notches cut to receive the armature shafts. Each rack will hold four armatures. The line of racks is served by an overhead traveling crane, to which is attached a chain drop and fall for carrying armatures to and from the racks. It is a rule of the shops that when an armature is not having actual work done upon it, it must be placed on a rack. This avoids having armatures lying around indiscriminately on the shop floor, and has resulted in eliminating all damage to armatures while passing through the shops.

CLOSETS FOR FIELD AND ARMATURE COILS

In line with the policy of providing a place for everything in the shop, the winding room is fitted with closets or lockers, in which are kept the stock of completed field and armature coils until they may be needed. The closets for armature coils are divided by shelves into compartments, each compartment giving room for one set of coils. The closets have dust-proof doors and there is a separate closet for each type of coil. These rows of closets, with each type of coil neatly piled in proper place, present a striking contrast to the more common sight of coils heaped in some out-of-the-way corner covered with dust and never at hand when wanted in a hurry. With the closets each class of coil is kept by itself, and as the closet doors are all marked on the outside, any one can readily find the particular type wanted. Moreover, by hastily glancing through the row of cupboards, the master mechanic is able to tell at once what stock he has on hand and what coils are running low.



BLOWING OUT ARMATURES

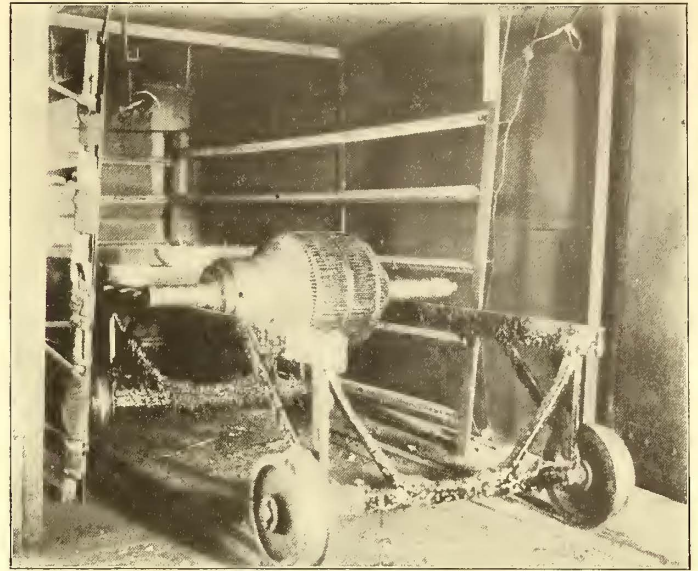
It is the practice at these shops to clean those types of armatures that are wound with air spaces between the laminations of the core by means of compressed air. For doing this work a small closet has been partitioned off from the main armature room. The armature to be blown out is wheeled into this closet on a low truck and placed under a galvanized iron canopy, which is connected with the suction of the ventilating system of the shop. By means of a flexible hose and nozzle a stream of air is directed into the spaces between the armature windings and all the dust is sucked up into the canopy and carried away. An armature can be thoroughly cleaned out in this way in a very few seconds, and without filling the main room with dust. The canopy is suspended with counterweights and can be raised and lowered as desired. One of the engravings makes clear the process of blowing out armatures by this method.

A CONVENIENCE FOR PIT MEN

For the convenience of men working in the pits, and for inspectors who may be making inspections from the pits, the car number is painted on the bottom of each car as well as on the sides. Pitmen and inspectors are often bothered about knowing just what car they are working under, and frequently have to come up out of the pit to find out the car number. This is especially true where there is a long line of cars standing over a pit track, and there is always a possibility of mistakes creeping into records and reports by reason of the men putting down the wrong car number. This is one of the little things in shop system, but the practice of having the car number painted under the floor where it can be read from the pit has been found to materially facilitate the work of the repair men, and it is a convenience they all appreciate.

Another little "wrinkle" in vogue in these shops is giving

the end of the truck frame. If for any reason it is desired to know who did the work on any particular truck or motor, the stenciled number at once indicates what workman last over-

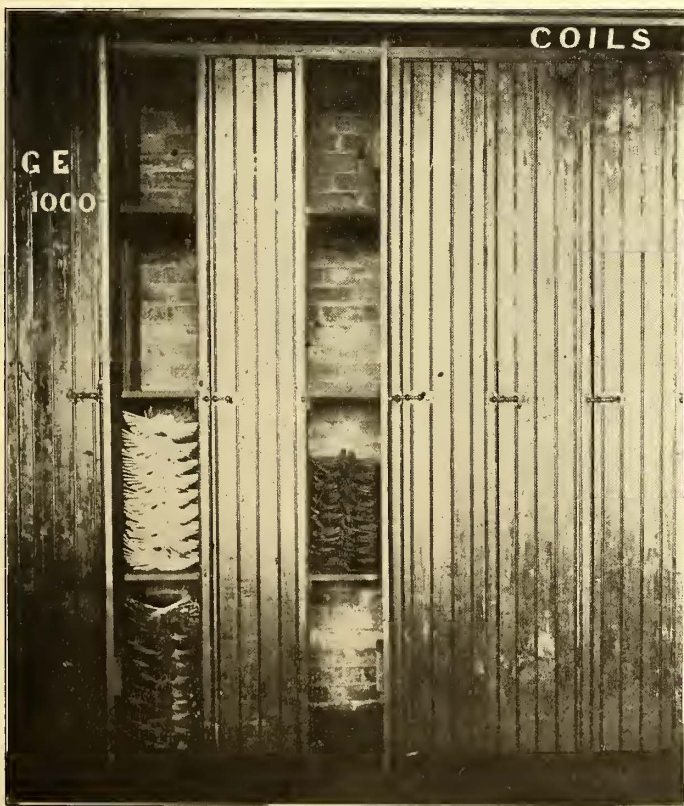


INTERIOR OF OVEN, WITH TRUCK FOR HOLDING FIELDS AND ARMATURES WHEN BAKING, TORONTO RAILWAY SHOPS

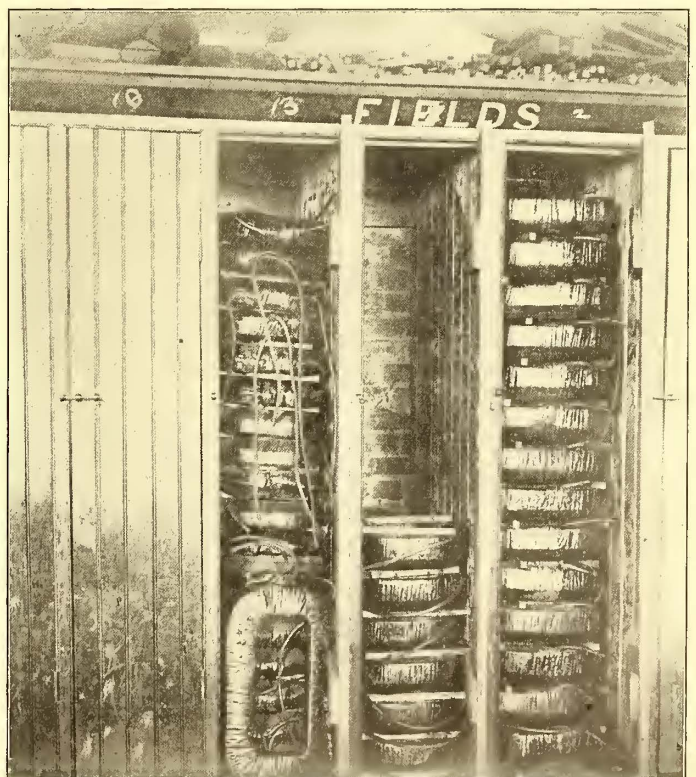
hailed that end of the car. This serves to place the responsibility for all pit work just where it belongs.

OBJECT LESSONS FOR CAR HOUSE MEN

The master mechanic of the Toronto railway for some time had considerable trouble in getting the night repair and inspection men to realize the importance of avoiding low bearings in motors and the necessity for frequent and thorough inspec-



CLOSETS FOR STORING ARMATURE COILS, TORONTO RAILWAY SHOPS



CLOSETS FOR STORING FIELD COILS, TORONTO RAILWAY SHOPS

each of the pitmen a number. The men with the odd numbers always work on No. 1 and No. 3 motors under the cars and the even numbered men work on No. 2 and No. 4 motors. When a man has finished inspecting or overhauling the machine to which he has been assigned, he stencils his number on

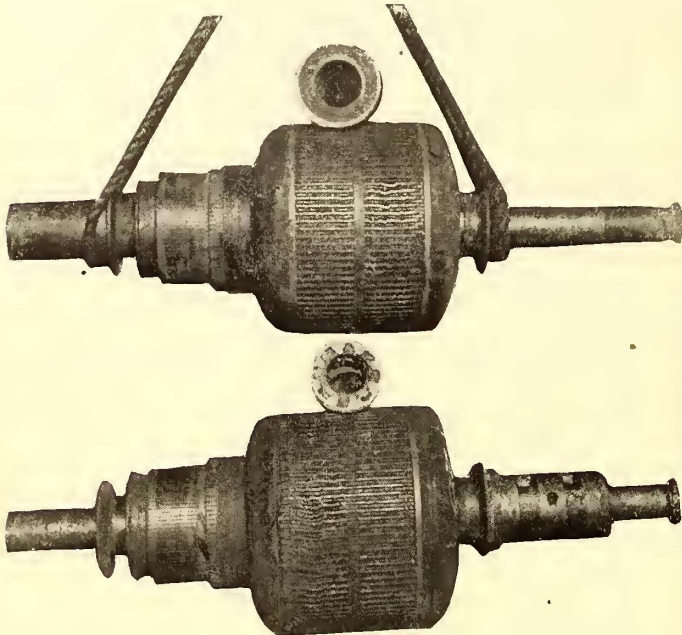
tion of all bearings. He finally hit upon the plan of photographing two armatures that had come into the shop badly damaged by reason of rubbing on the pole pieces, due to low bearings. To make clear the relation between low bearings and damage to the armature windings, the worn bearings as



taken from the shafts were placed on top of their respective armature and photographed in this position. The photograph was hung in the shop as a reminder to the men of the importance of avoiding low bearings. The photograph is reproduced in this connection as an effective way of teaching an important lesson.

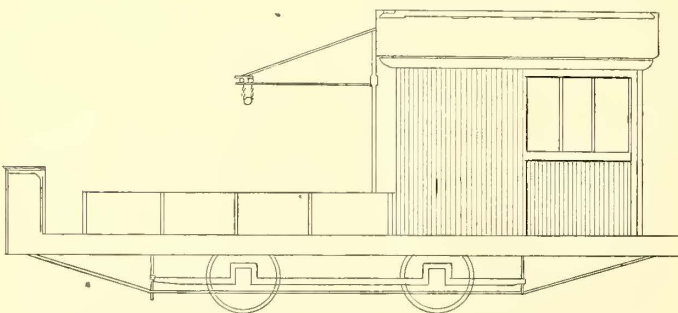
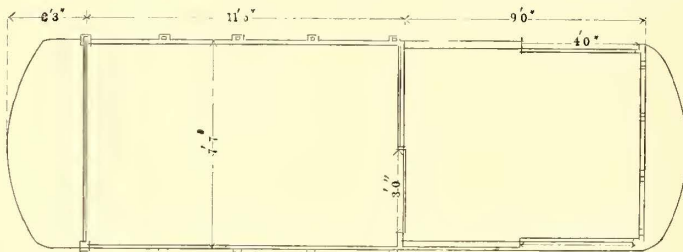
HYDRAULIC PIT JACK

For expediting repair work each shop pit is equipped with a



PHOTOGRAPH TAKEN TO SHOW CAR-HOUSE EMPLOYEES BAD EFFECTS OF LETTING ARMATURE BEARING WEAR LOW, TORONTO RAILWAY SHOPS

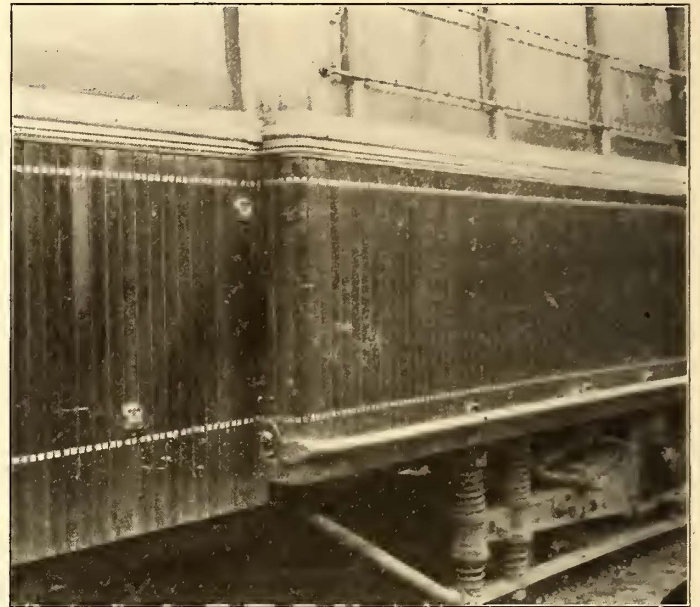
hydraulic lifting jack of home manufacture. Although the design of the jack embodies no radically new principle, the working drawings showing details are reproduced in this connection as of possible value to other master mechanics. The jack



DETAILS OF SUPPLY CAR, TORONTO RAILWAY

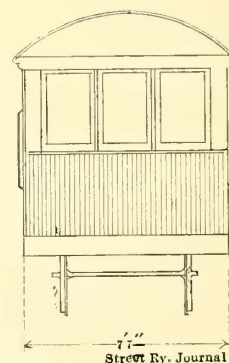
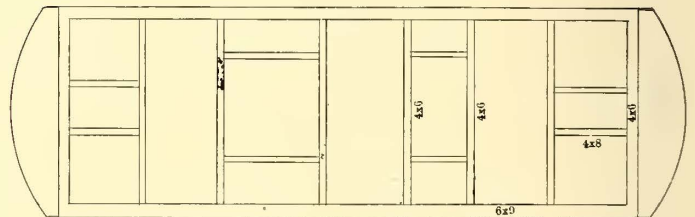
is operated with a hand pump, the pump and lifting table being mounted on a flat truck arranged to run on narrow-gage track rails laid on the bottom of the pit. The hand pump comprises a water chamber 13 ins. square and about 3 ins. high, inside measurement. This chamber is formed of 3/4-in. plates and serves as a base for the pump. When the chamber is filled with water, the act of raising the pump handle draws a charge

of water up through a 11-16-in. pipe and allows the charge to flow into a 3/8-in. cross channel. The act of pushing the pump handle downward forces this charge forward through a 7/8-in. pipe toward the cylinder of the lifting piston, upon which is carried the jack table. The successive raising and lowering of the pump handle continues this process, a small charge of water being forced forward into the lifting cylinder at each downward motion of the handle. It will be understood by tracing



SIDE RAIL USED ON CARS IN TORONTO TO PROTECT CAR-BODY FROM SIDE SCRAPES

the course of the water from the drawings that the valves are all arranged to open only one way, so that the direction of the water is always forward into the lifting cylinder, and the water cannot return by this course. The jack table is lowered by



opening the return valve (operated by a small hand wheel), thus allowing the water to flow backward through the by-pass into the water chamber. The same water is used over and over again. This type of jack has proven satisfactory if reasonable care is exercised in keeping the valves in good condition.

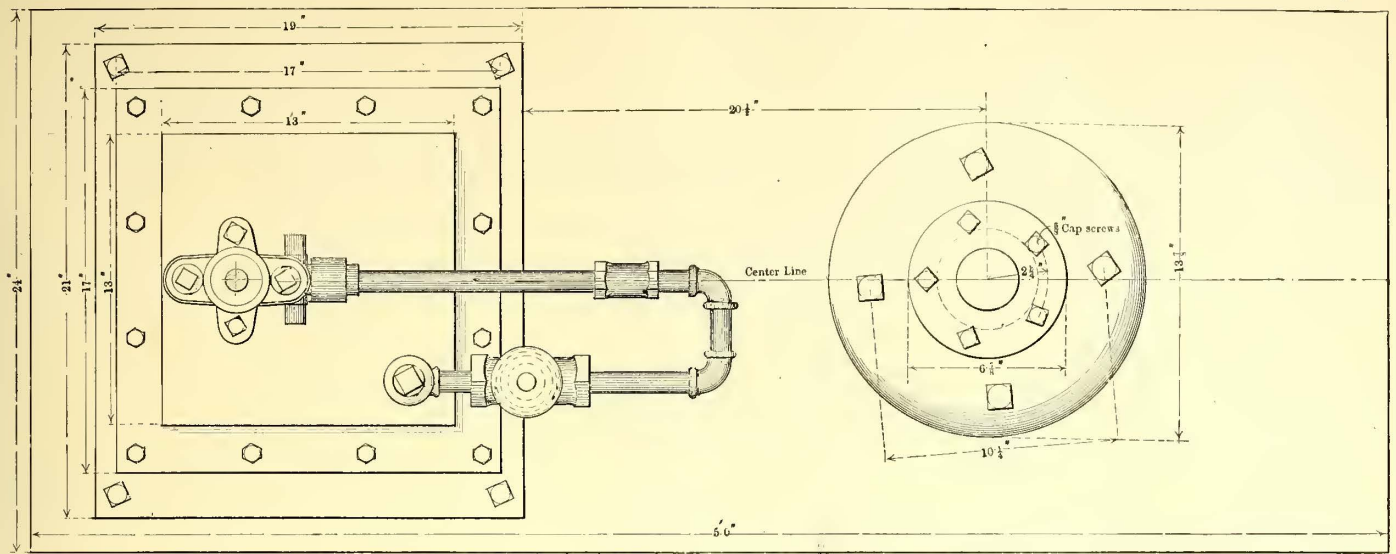
The jack table on which the material or apparatus to be



handled is carried is so mounted as to give an adjustment of several inches either side from the center. This is accomplished by mounting the table on a sliding plate, which is hung

SUPPLY CAR

One of the important accessories to the mechanical department is a home-made supply car for distributing material and



Street Ry. Journal

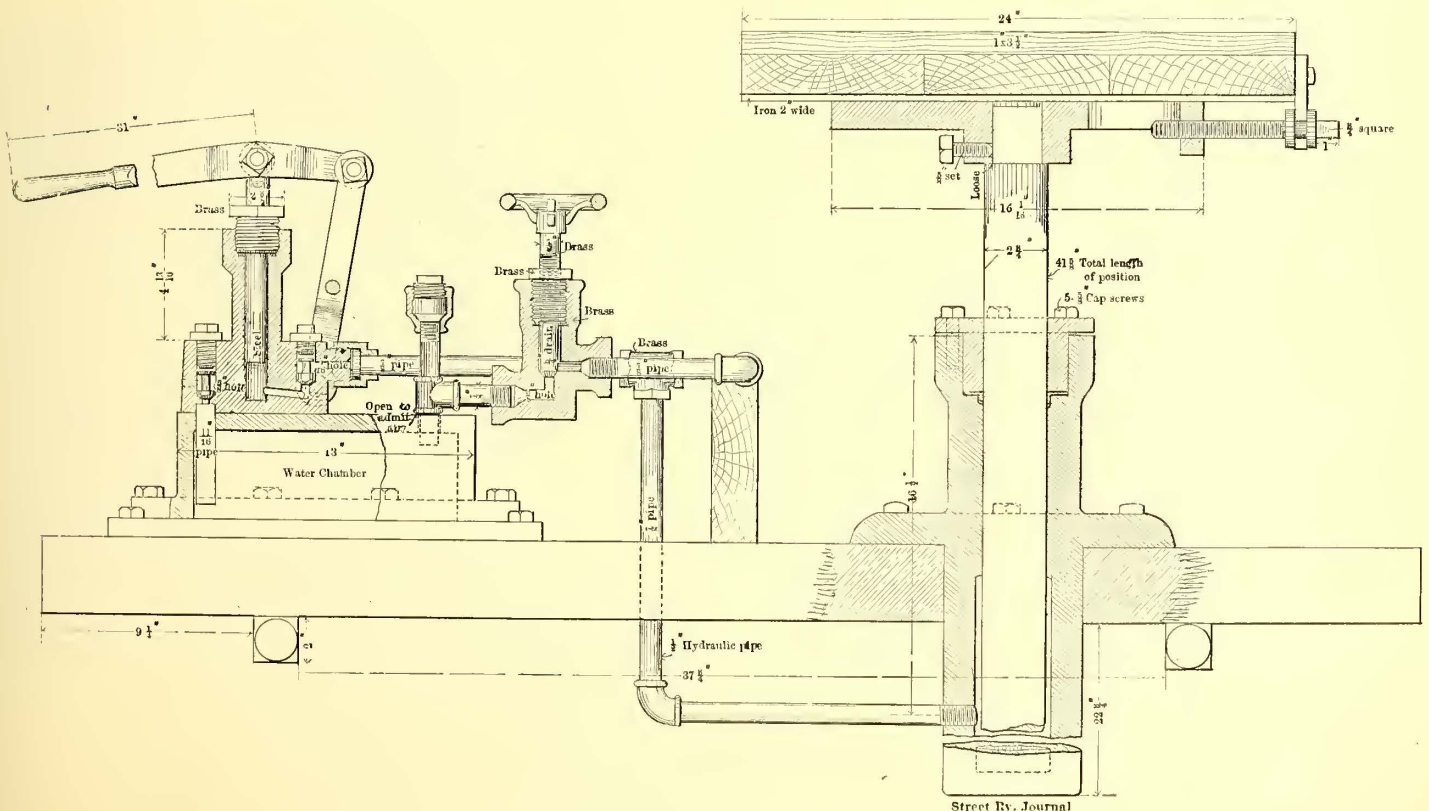
PLAN OF HYDRAULIC PIT JACK, TORONTO RAILWAY

by bolts traveling in slots so that the plate can be moved either way through a considerable range by means of thumb screws.

CAR HORSE

At the Toronto shops, when work is to be done on trucks, the trucks are first run out from under the car body. The bodies are lifted by hand jacks, and when raised are supported on horses, the details of which are shown in accompanying en-

supplies to the different car houses. Before Mr. Donnelly took charge of the shops it was the practice to bring all cars to the main repair shops, even for trivial repairs. One of the first reforms instituted by the new management was the building of the supply car, and now instead of hauling cars to the shop for minor work, the supplies, such as armatures, fields, etc., are sent to the various car houses, and much of the repair work is done by car house men at the different stations. This



Street Ry. Journal

SIDE ELEVATION AND PARTIAL SECTION, TORONTO HYDRAULIC JACK

gravings. The body rests directly on cross timbers, reinforced longitudinally with iron rods, and the ends of these timbers are supported on bolts on the horses, the bolts being adjustable to hold the car body at any height.

has reduced to a great extent the dead car mileage, and also decreases the length of time defective cars are kept out of service. The supply car has a flat platform with adjustable sides and an anchored cab at one end. It is equipped with

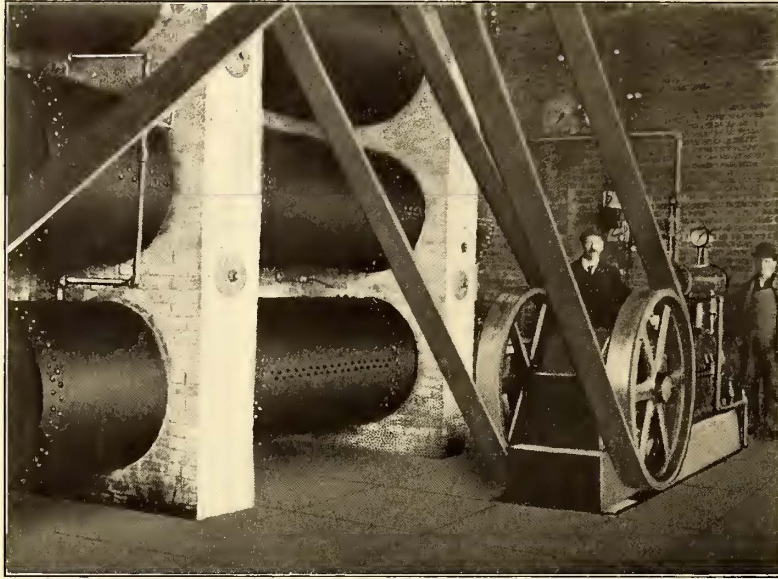


swinging crane for the loading and unloading of material.

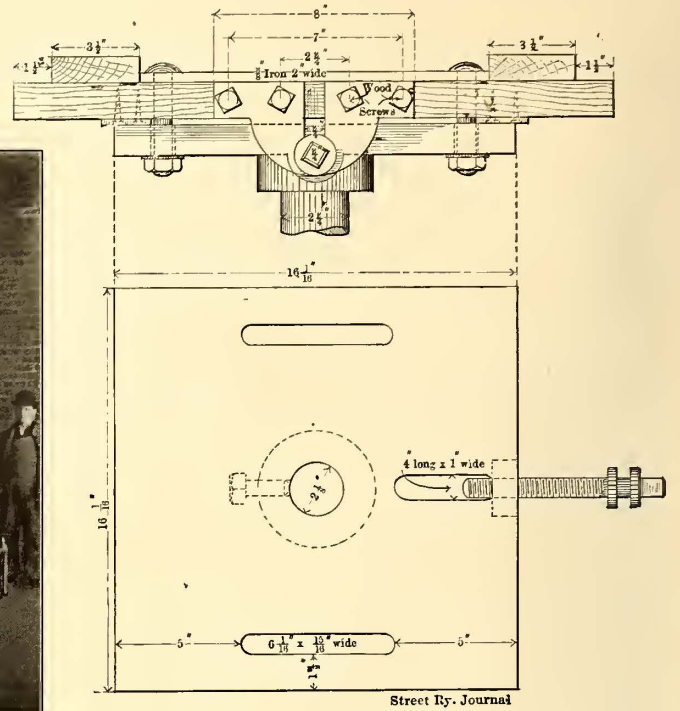
GUARD FOR SIDE OF CAR

The standard Toronto cars all have straight sides, sheathed on the outside with narrow, vertical matched strips, the chief advantage of this design, of course, being found in the rapidity with which, in case of injury to the side of the car, any strips that may be damaged can be readily replaced without disturbing those that are sound. Although a straight-sided car of this

same as hitherto sold by the Detroit company, with one or two improvements. For supplying air to the storage tanks on the cars, the Toronto Railway Company has installed at each f



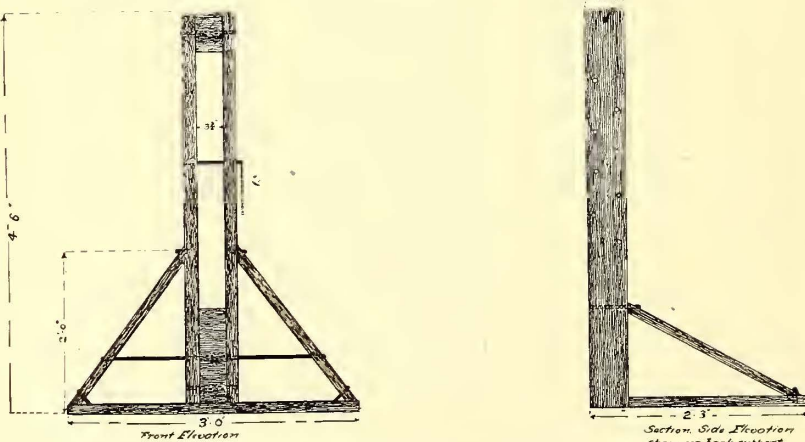
AIR-COMPRESSING PLANT FOR SUPPLYING AIR TO MAGANN AIR BRAKES, TORONTO RAILWAY



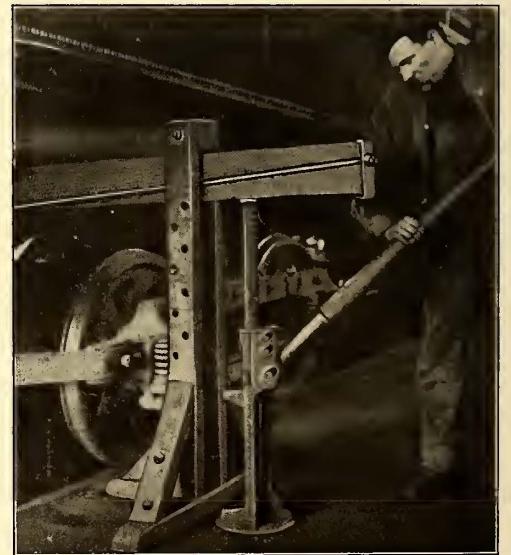
PLAN AND SECTION OF TABLE ON TORONTO HYDRAULIC JACK

design is more easily and cheaply repaired, this advantage is to some extent nullified by the greater number of side scrapes the car receives from passing vehicles that a car with receding panel sides would ordinarily escape. To overcome this dis-

advantage, the Toronto cars have a complete air-compressing plant, consisting in each case of motor driver, compressor and storage reservoirs. Charging boxes for supplying cars with air for the oper-



CAR HORSE FOR SUPPORTING CAR-BODY WHEN TRUCKS ARE REMOVED, TORONTO RAILWAY SHOPS



HORSE FOR SUPPORTING CAR-BODIES WHEN TRUCKS ARE REMOVED, TORONTO RAILWAY SHOPS

advantage, the Toronto cars are fitted with guard rails composed of iron pipe, placed along the sides near the bottom in the manner indicated, and these have been found an effective protection against damage to the woodwork.

INSTALLING STORAGE AIR BRAKES

The Toronto Railway Company is equipping 330 of its cars with the Magann storage air brake system, formerly made by the G. P. Magann Air Brake Company, but now owned and controlled by the Magann Air Brake Company, Ltd., of Toronto. The system used on the Toronto cars is practically the

ation of the air brakes are situated at five points on the system, as well as a central plant placed in the main repair shops. It is estimated that the time taken in charging a car up to its capacity does not exceed ten seconds.

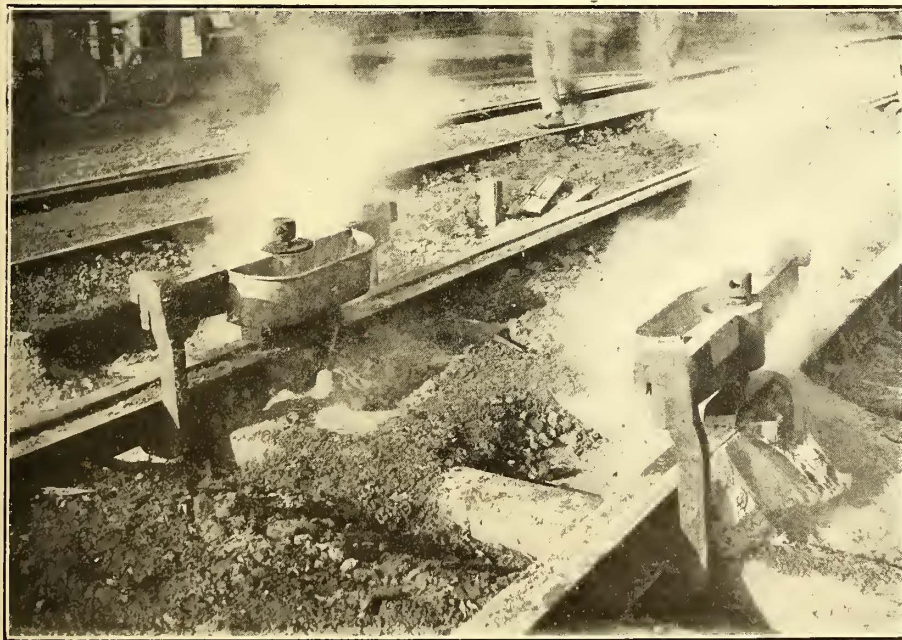
A 2-cent fare railroad bill is now before the State Legislature of Ohio, and the electric lines for once are co-operating with the steam lines in an effort to defeat the measure, which would mean severe competition for the electrics.



**BONDING AND OTHER TRACK IMPROVEMENTS ON THE CALUMET ELECTRIC RAILWAY**

In an article published in the STREET RAILWAY JOURNAL, Jan. 7, 1905, descriptive of the method of cast-welding rail-joints on the Calumet Electric Street Railway, of Chicago, it was stated that while H. M. Sloan, general manager of the company, did not believe the heating of the rails in casting the joint had as great a softening effect on the head as is usually attributed to this cause, he nevertheless took the precaution to put the greater bulk of the metal of the joint about the base of the rail, and thereby avoided an intense heating of the wearing surface.

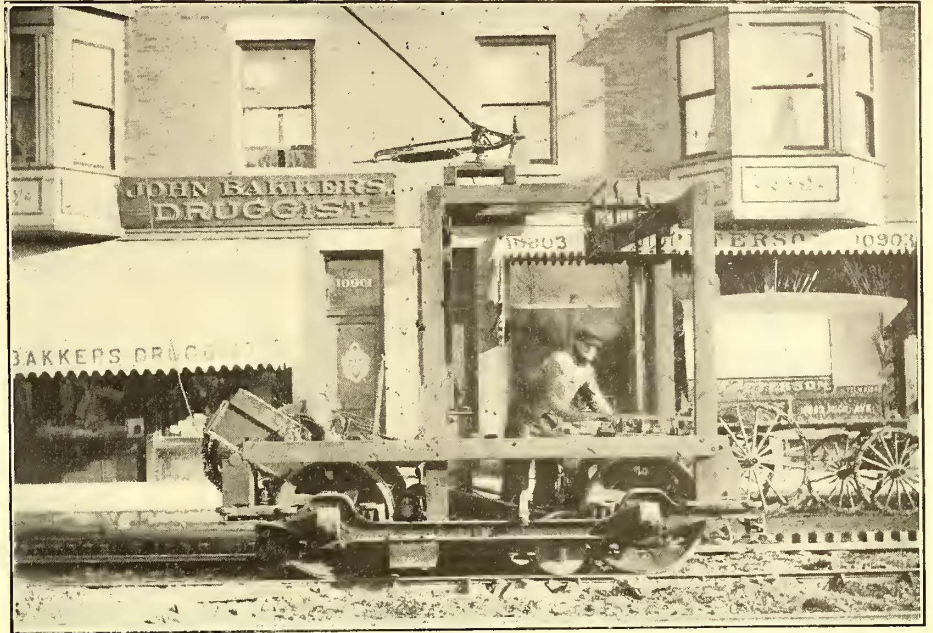
Since the publication of the article referred to, Mr. Sloan has changed his method of casting the joints somewhat, making provision for keeping the temperature of the rail down to a point that precludes all possibility of softening effects. The former custom was to run the metal to a point just below the ball of the rail. Now, however, it is not allowed to come to a point above 2 ins. from the top of the rail. This in itself would tend to prevent the wearing surface becoming intensely hot, but a further precaution is taken by flooding the top of the rail with water soon after the joint is cast. The illustration shows the method of doing this. As quickly as possible after the metal has been run, and before the heat has had time to rise to the top of the rail, the segmental-shaped pans are hooked over the clamps holding the rails in position. A workman fills the pan with water, which, passing through perforations in



WATER PANS FOR KEEPING RAIL JOINTS COOL

the bottom of the pan, floods the top of the rail. The wearing surface never gets to a temperature above that at which it may be touched with the naked fingers without burning. It might be supposed that the water would run down on the cast metal, chilling the joint and increasing the liability of its breaking. The rate of flow, however, is such that practically all of the water is evaporated on the top of the rail. What little runs over does not come in direct contact with the molten metal,

as the latter is still covered by the molds. To prevent the metal rising beyond the desired point, the molds for the 7-in. girder rails have a hole drilled in them at the proper height. At the present time, when casting joints on 6-in. girder rails, it is necessary for the workmen to watch the height of the metal in the mold and cease pouring when the desired height is obtained, as these molds have not been drilled.



TRACK GRINDER ON THE CALUMET RAILWAY

In the proceedings of the American Railway Mechanical and Electrical Association Mr. Sloan is quoted as saying that he made his molds 4 ins. wide. The statement is misleading. What he did say was that the weld was 4 ins. wide at the top, but widened to 13 ins. at the base of the rail, where the greater portion of the metal is placed.

The work of cast-welding the tracks of the Calumet system was begun about five years ago. At that time, according to O. G. Talmage, roadmaster of the system, who has had direct charge of the work, a great deal of the track was ready for the scrap heap. The result of cast-welding, and also of improving the bed underneath the track, has been to put these portions of the track in an excellent condition, so that the heaviest cars of the system are run over them without evidence of the rails having once been ready for the scrap pile.

Up to the present time more than 20,000 joints have been welded. The work is carried on intermittently, as it is done in connection with other track improvements. In carrying out the work, the cupola car is set at the central point of a section of track embracing forty joints. The joints are then cast in both directions from the cupola, the forty joints often being cast in one

hour. The cupola is then moved to another section of track, the joints of which have been previously cleaned by a sand blast. After the molds and clamps have been removed, the joints are ground down by the grinder shown in the accompanying illustration. This grinder is manufactured by the Annable-Fitzgerald Engineering & Manufacturing Company, of Grand Rapids, Mich. The whole is mounted on a single truck, a top frame rising above to carry the trolley base and



the resistance frames. A railway motor mounted on the frame drives the emery wheels and the slow-speed gears for moving the machine direct. By means of a magnetic clutch, the same motor moves the machine at an increased speed for traveling from one joint to another. The two emery wheels, one on either end of a long shaft extending between the two rails, may be moved, either vertically or horizontally, by levers and hand wheels. These wheels are placed in such positions that the operator, who occupies a seat in the center of the car, has a clear view of the position of the wheels on the rail. A K type of railway controller is employed, the resistance frames being sufficiently large to allow the motor to run continuously on resistance notches. In operating the machine but one rail is ground at a time. When the work on one joint is completed, the operator turns to the other side of the car, where a duplicate set of levers and hand wheels permits him to control the movements of the other grinder.

Some interesting reconstruction work is just being completed on about 1½ miles of double track where the rails are being bonded. About five years ago the tracks were laid directly on an 18-ft. clay fill. Throughout the intervening period of time, these tracks have continually settled, falling in some places a total of 16 ins. or 18 ins. This has necessitated considerable work from time to time in raising them. The work of improvement has consisted in digging out the clay and placing a bed of slag 18 ins. thick under the ties. A total of 9000 yds. of clay was removed from beneath the 1½ miles of track and hauled to points about 5 miles distant.

The clay at the bottom of the excavation was well rammed and a sand cushion was spread over it. Slag obtained from the Illinois Steel Company was then thrown in and rolled to a depth of about 9 ins. The rolling was accomplished by the use of a 14-ton steam roller. During this process the bed of slag was well flooded by water obtained from the city hydrants. Another layer of slag was placed on top and rolled and flooded in a similar manner, after which Indiana bank sand was washed into the 18-in. bed. Hemlock ties were laid directly on the slag and were filled in between with cinders. The whole bed was then rolled with a 4-ton horse roller. The slag used is the same as that employed in the Buffington plant of the Illinois Steel Company in the manufacture of Portland cement. When rolled hard, as has been done under the tracks of the Calumet system, it in time cements together in a monolithic mass, forming an almost perfect roadbed. Some track laid on beds of this character on Ninety-Third Street, South Chicago, ten years ago, are now in excellent condition, and there have been practically no depressions formed in the paving up to the present time.

## RE-WINDING HIGH-TENSION LIGHTNING ARRESTER COILS

BY ARTHUR B. WEEKS

Fig. 1 shows the drawings of a jig for winding the high-tension lightning arrester coils which are used in many power houses for transmission lines. The parts of this jig are all made of wood. *A* and *B* are the bearings. An improvised horse can be set up on a couple of boxes and an iron strap or pipe cleat nailed over the top of the bearings. The coil is wound or unwound on the center core *C*. The copper terminal, which is at right angles to the coil, is to fit in the slot *D*. The size of the inside core *C* is made to suit the individual case.

The copper coil is made up of several strips of flexible copper ribbon soldered together at the ends, and to these ends are secured the terminals. The individual layers are not insulated, the entire ribbon being treated together. It is first insulated with mica, pasted over the copper with synthetic shellac, used very sparingly. If sufficient mica is used on the top, it is, of course, unnecessary to place any beneath, since the layers over-

lap with each winding. No mica is required at the sides of the layers.

When ready to begin winding, tie one end with its terminal in place in the slot *D*. With the entire coil unwound on the floor, place a heavy weight on the further end to give it tension. Just in front of the jig, nail a piece of wood to a box; this piece of wood should have a slot to act as a guide for the copper winding. This will produce an evenly wound coil.

Over the mica, wind ¼-in. plain cotton or linen tape, lapped

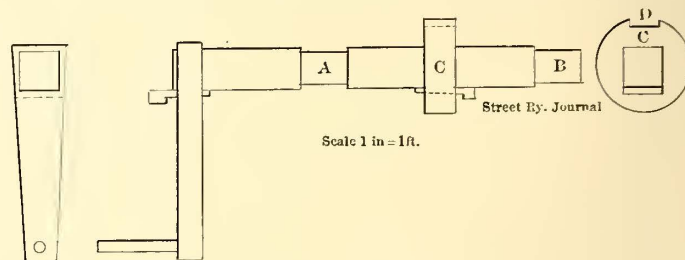


FIG. 1.—JIG FOR WINDING COILS

half way. Continue to wind and tape till the winding is completed; then, while the tension is still on, drive small wooden wedges between the layers in several places, to admit twine for the purpose of binding the several layers, to prevent the least tendency toward unwinding.

The linen tape is wound from a large coil into small ones,

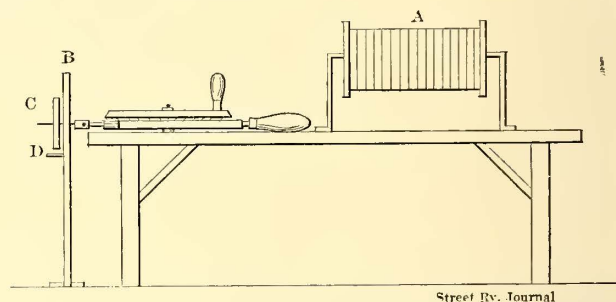


FIG. 2.—BENCH FOR WINDING COILS

to admit of more easy handling. To do this readily, where no lathe is at hand, fasten an ordinary breast drill to a bench, as shown in Fig. 2. *A* is the large coil of tape; *B*, the board used as a guide for the wire, is also used as a guide for the roll of tape *C*. *D* is a nail used as a gage for size of coils of tape.

If more convenient, place coil *A* on the floor or box in front of the operator. This handling of tape in small rolls of about 3 ins. in diameter will greatly facilitate the taping operation.

After winding, dip the completed lightning arrester coils in a good insulating varnish. Bake well to a deep brown, if clear varnish is used. Dip and bake again. They can then be painted black with a good air-drying finishing plant, if desired.

Albert Eastman, superintendent of employment for the Public Service Corporation, of New Jersey, sends the following example of a reference letter recently received at his office.

The letter is addressed to "The Company of the Trolley Car, Hoboken," and reads: "I heard that Mr. John Smith made application to get the Position on the car so I notice you that I know him Personally since the last Three Years for a honest man, his character is first class where it is very seldom to find a man like him I am sure that every one will give a good reference about him, as Mr. John Smith is all over known for a Gentleman."

The Milwaukee Electric Railway & Light Company is installing ten 500-hp Edgemore boilers in the basement of its new office building in Milwaukee. These boilers will furnish steam for a central steam-heating system, and during the peak of the lighting also will supply steam for three 1500-kw turbo lighting units which the company has just ordered from the Allis-Chalmers Company.



**SINGLE-PHASE RAILWAY IN PARIS**

BY P. LETHEULE

Single-phase traction is now being attempted in Paris, with motors of the Latour type. The essential difference between this motor and motors of the series and repulsion types is shown by Fig. 1. Briefly, the Latour motor differs from the straight series motor by the addition of a pair of short-circuited brushes which are at right angle with the main brushes of a series motor.

The Compagnie Générale Parisienne de Tramways, which is conducting the experiment with single-phase traction, is one of the largest operating companies in Paris and has reserved 1 mile of track on its Malakoff division for the experiment. The rest of the system is supplied with direct current at 500 volts. The experimental section of line receives single-phase current at 25 cycles and 500 volts from a motor generator fed with direct current from the trolley wire. The

the transformer amounts to 1100 kg (2400 lbs.), and it carries seven secondary taps.

The controller is illustrated by Fig. 4. It has a knife or disc commutator provided with seven notches, and carries a cylinder type reversing switch enclosed in the same casing. As the controller is connected only with the low-tension winding of the transformer, there is no difficulty in raising the trol-

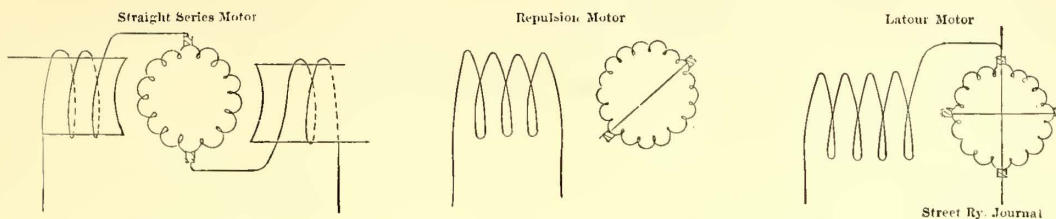


FIG. 1.—DIAGRAMS SHOWING CONNECTIONS OF DIFFERENT TYPES OF SINGLE-PHASE MOTORS

ley voltage as high as convenient. Tests have been made with load varying from 3 tons to 4 tons, and the starting torque has exceeded three times the full load running torque.

Sparking tests have been made by hauling the car with one motor only, and by starting directly under 300 volts. The sparkless commutation obtained under these conditions has shown that the service to be performed would allow of an appreciable reduction in weights and dimensions. The combined efficiency is stated to be 84

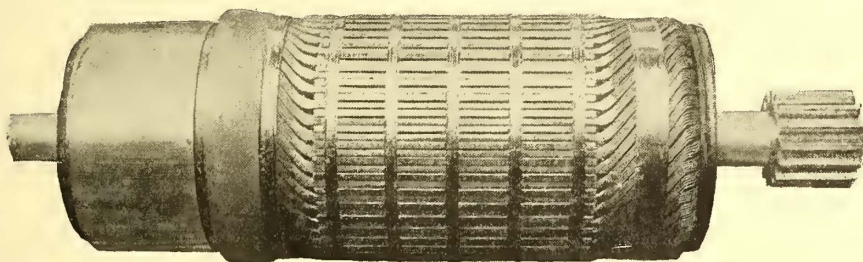


FIG. 2.—ROTOR

car is similar to the usual d. c. cars, and differs from them only in the motors and the controllers. The truck is equipped with two Latour motors, which are geared to the axles with a gear reduction 1:4, 6.

Each motor has four poles, is of 50 hp, and is wound for 300 volts, 25 cycles, a. c. The actual weight per motor is 1350 kg (2970 lbs.). The rotor (Fig. 2) bears a great resemblance to the usual armature of d. c. motors. The gap is much less, being only 2 mm (0.08 in.) clearance between the rotor and the stator. The stator is shown in Fig. 3. No special feature is to be found in it, and the good characteristics of the Latour motor seem to be due to the combination of the series motor features at starting and of the repulsion motor features at the high speed. Good commutation is obtained by properly proportioning the commutator and brushes. There are four short-circuiting sets and four collecting sets of these brushes—i. e., eight sets in all.

Both motors are permanently connected in multiple with the divided secondary winding of a transformer, the oil bath of which is suspended under the center of the car. The maximum secondary voltage is 300 volts, and the remaining taps of the secondary winding are progressively connected to the motors for starting and regulating the speed. The actual weight of

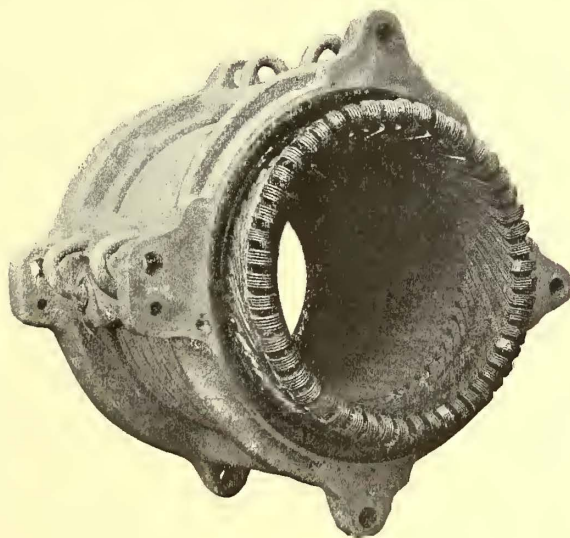


FIG. 3.—STATOR

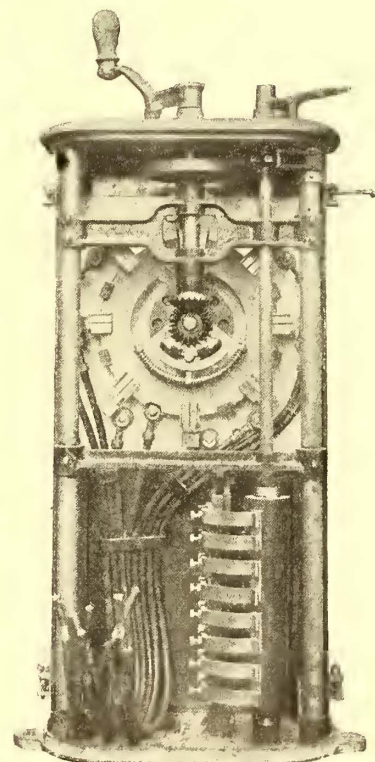


FIG. 4.—CONTROLLER

per cent, though no details are available on the conditions and method of measurement.

The Cleveland & Southwestern Traction Company, at its annual meeting, elected F. T. Pomeroy, president; A. E. Aikins, first vice-president; S. C. Smith, second vice-president; E. F. Schneider, secretary, and J. O. Wilson, treasurer. Mr. Wilson succeeds F. C. Fuller, who recently retired to devote his attention to other business. The gross receipts for the year were \$543,227, as compared with \$475,361 for 1904.



THE QUESTION BOX

The answers this week refer to breakdowns in streets, brake-shoes, car painting, line cars, bond testing and devices for the track department. Additional answers to any of the questions will be acceptable.

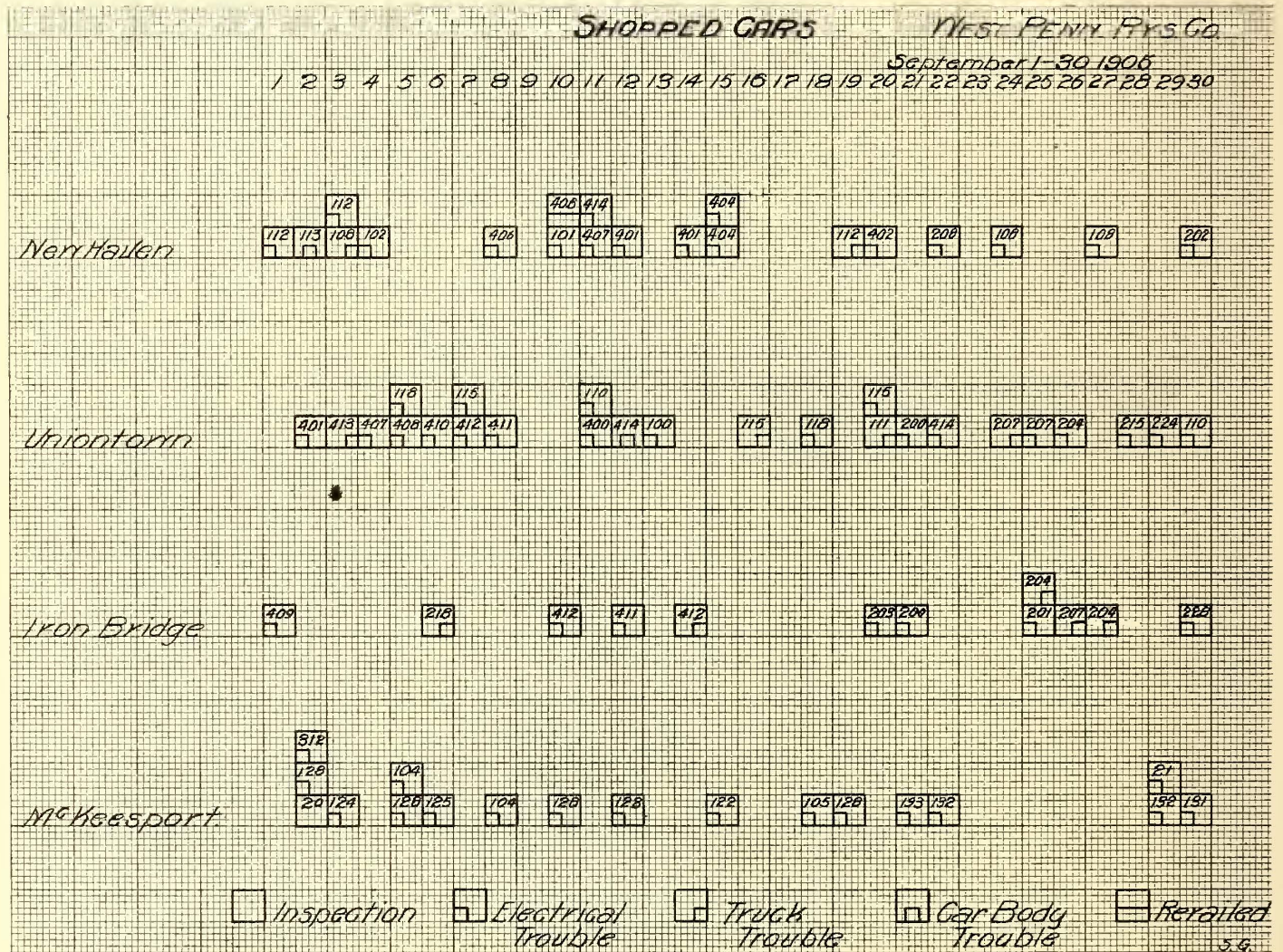
MECHANICAL

AVOIDING BREAKDOWNS IN STREETS

CI.—What percentage of the total cars in service on your road during the average day have to be pulled in from service owing to defects or breakdowns developing while the car is on the street? What are you doing to reduce the number of cars that have to be taken from service on this account?

We are operating four car houses at present on our system. On our interurban lines, a car is liable to be shopped at some

near of rolling stock and shops, where they are entered on a sheet which contains all of the car-house records. In this manner, car operations over the entire system can be closely watched, and any letting down in careful work is quickly noted and definitely located. At the end of the month, blue prints are made of this sheet and a copy sent to each car house foreman, and this copy is posted on the bulletin board. The car house foreman can thus see his entire record at a glance, and also compare his work with that of other foremen. On this graphic record each car is represented by a square. The number of the shopped car is printed in the square, and the square is further marked in accordance with symbols shown at the bottom of the page, so that the particular cause of trouble can be readily noted. This graphic record system of "shopped cars," besides keeping every one interested accu-



DIAGRAMMATIC METHOD OF KEEPING RECORD OF SHOPPED CARS, WEST PENN RAILWAYS

other car house than that from which it was started out. As it would be manifestly unfair to charge up against a car house a shopped car that did not belong there, each car house foreman is instructed to mark down on his daily "shopped-car register" report a record as to what car house a shopped car belongs. Failing in this, the car is marked up against him. There is also a column in the "shopped-car register" form for name of motorman who was operating car when it was shopped, and these records kept over some time show how surprisingly few cars are turned in by some men and how surprisingly many are turned in by others, emphasizing what a strong factor a good motorman is in keeping down petty car troubles. Each car house foreman makes out daily the "shopped-car register" report, and these are each day sent to the office of the engi-

neer posted, has also built up a good, healthy competition between the different car house foremen, and has had a marked influence in diminishing number of delays to service.

J. W. Bridge, Engr. of Rolling Stock,  
West Penn. Rys., Connellsville, Pa.

One per cent; interurban cars are inspected once every two days, or about 600 miles' run between inspection; city cars are inspected every third day, or about 500 miles' run between inspection. If inspection shows anything that is liable to develop into a cause for breakdown, it is repaired at the time of inspection.

Dayton, Springfield & Urbana Elec. Ry.

Our records show that the average for the first six months of last year was 2 per cent. We have a man stationed at a



central point on the system who is capable of making slight repairs and adjustments, such as can be made without interrupting the service. We think this the most effective and economical means to avoid pulling cars off the road for defects of a trivial nature.

W. A. McWhorter, M. M.,  
Birmingham Ry., Lgt. & Power Co.

The average number of breakdowns in the street on this division is less than 1 per cent; our methods of overcoming this serious condition have been to require that every car go through the shops, under a system of inspection and general repairs, every tenth day; by so doing we anticipate reducing the breakdowns to a minimum. The average varies, rising and falling in accordance with the weather conditions. In the summer time lightning has much to do with this condition, and in the winter time heavy snows and frosts interfere greatly.

H. A. Johnson, Ch. Engr.,  
Public Service Cor., So. Jersey Div.

**BRAKE-SHOES**

*C2.—What are you doing with the brake-shoe question? What type of shoe are you now using, and what mileage are you getting? What have you done to reduce the cost of brake-shoes per 1000 miles?*

We are using ordinary cast-iron brake-shoes on Peckham trucks on our interurban cars. The shoes weigh 33½ lbs. Our average mileage for two years has been 21,751 miles per shoe. The cost per thousand car-miles (8 wheels) has been 23.9 cents, or about 3 cents per thousand wheel-miles.

Toledo, Fostoria & Findlay Ry. Co.

We are using the diamond S shoes on inside brakes, and are getting 6000 miles on 40-ton interurban cars and 10,000 miles on 20-ton city cars. Brake beams are kept in good alignment and heads are renewed when worn out.

Dayton, Springfield & Urbana Elec. Ry.

The price of brake-shoes per thousand miles varies materially with the type of car and class of service. For the cars that we have running on our long-distance suburban lines we prefer to sacrifice the shoe for the braking effect, and in this case a soft shoe is used. In the case of city service and slower speeds, a shoe of high texture is used and an endeavor made to increase the mileage of the shoe. We find that great extremes can be gone to in this respect; a shoe of a hard nature gives better braking, but has a great deal to do with the flattening of wheels and the length of service of wheels. A shoe too soft will require adjustment too frequently, and run up the cost of shoe to a great extent. Type and class of shoe should be a matter of judgment on the part of the persons in charge.

H. A. Johnson, Ch. Engr.,  
Public Service Cor., So. Jersey Div.

**CAR PAINTING**

*C3.—What is your general system of car painting? How have you been able to reduce the cost of painting cars? (Suggestions on car painting and itemized statements of labor, material and costs of car painting are requested in this connection).*

Owing to a fire, our car-painting practices have been greatly hampered. Our customary way, however, was to paint from the wood out once every three years, and to use finishing varnish only. We send each car into the paint shop for cleaning and varnishing every six months, the number of coats given depending upon the condition of the car, number of miles it has run, etc.

H. A. Johnson, Ch. Engr.,  
Public Service Cor., So. Jersey Div.

The following is our procedure in painting a 30-ft. car-body, 40 ft. over all, full vestibules, with detailed cost of same. After special care has been given the steel and iron work, all rust scales removed, woodwork made as smooth as sandpaper can make it, and all crevices, nail holes, screw holes, etc., dusted out, we proceed to prime with pure lead and linseed oil with about 5 per cent turpentine. We consider this the most important coat to go on the car, and special care is taken that every part of the body is thoroughly covered and that the primer is well rubbed in. This coat is allowed to dry ninety-six hours (four days). On the fifth day the work is continued with a second coat of lead and oil. On the sixth day all nail holes, screw holes, etc., are puttied. On the seventh, eighth and ninth days one coat of No. 3 or "C" surfacer. On the tenth day, rub with block pumice stone. Eleventh day, two coats of color. Twelfth day, the car is ornamented and given two coats of railway finishing varnish, forty-eight hours between coats. Total time required, fifteen days. After eight or ten months this car is taken in and given a third coat of finishing varnish, no rubbing varnish being used on the exterior of the car. By this means we are enabled to get two years' service with three coats of varnish, whereas if the three coats are applied when the car is painted, it will be necessary to add a fourth in about twelve months.

By the method described above, which is a combination of the knifing process and rough stuff process, we get a lead base, which the writer believes is conceded by all master painters to be the very best. We are also enabled by the use of rough stuff to get a much finer finish than is possible by the knifing process. The interior of the cars, which is mahogany, is finished in the usual way, being given a coat of filler consisting of cornstarch, rubbing varnish, japan, turpentine and burnt sienna, with two coats of rubbing varnish.

**COST OF LABOR AND MATERIAL FOR PAINTING 30-FT. BODY CAR AS OUTLINED**

	Labor	Material
Pure lead and oil, two coats.....	\$4.00	\$1.75
Putty .....	2.80	.50
Rough stuff, three coats.....	4.80	8.50
Rubbing .....	8.00	.45
Color, two coats.....	2.00	1.25
Decoration, gold .....	5.00	3.60
Finishing varnish, two coats.....	2.50	5.00
Roof, lead and oil, two coats.....	1.00	5.50
Filler, interior, one coat.....	2.00	.30
Rubbing varnish, two coats.....	5.00	5.00
Rubbing with rotten stone and oil.....	2.00	.50
Floor, one coat.....	.25	1.25
Total .....	\$39.35	\$33.60

This gives a total of \$72.95 for labor and material. The above is the cost of painting a new car of the dimensions given. For an old car, add \$20 to cover cost of burning off and removing old varnish, scrubbing, etc.

To reduce the cost of painting, we have discontinued the use of rubbing varnish on the exterior of our cars, applying two coats of finishing varnish, as described above. While this does not materially change the first cost, the life of the painting is prolonged, thereby reducing the cost in the end. We do not remove the seats from the car for scrubbing and finishing, as is the practice on a great many roads. Where the Walkover type of seat, with heaters attached, is used, it is a very expensive operation to take out the seats. We only remove the cushions, the backs and frames being cleaned and finished in the car. It might be added that we have eliminated all scroll and superfluous decorations, which are very expensive, and we think add very little to the appearance of the car.

W. A. McWhorter, M. M.,  
Birmingham Ry., Lgt. & Power Co.



## LINE

## LINE CAR

E2.—Please give description, with photograph or drawing if possible, of your line-repair car, or cars, including particularly any novel or especially desirable features.

Our line car is an old 16-ft. car with a standard line wagon table mounted thereon, which can be raised and lowered in the same manner as it is on the wagon. This has proven itself a most useful equipment, and is in constant service. It is used at night to make regular repairs, and during the day for inspection and repairs.

H. A. Johnson, Ch. Engr.,  
Public Service Cor., So. Jersey Div.

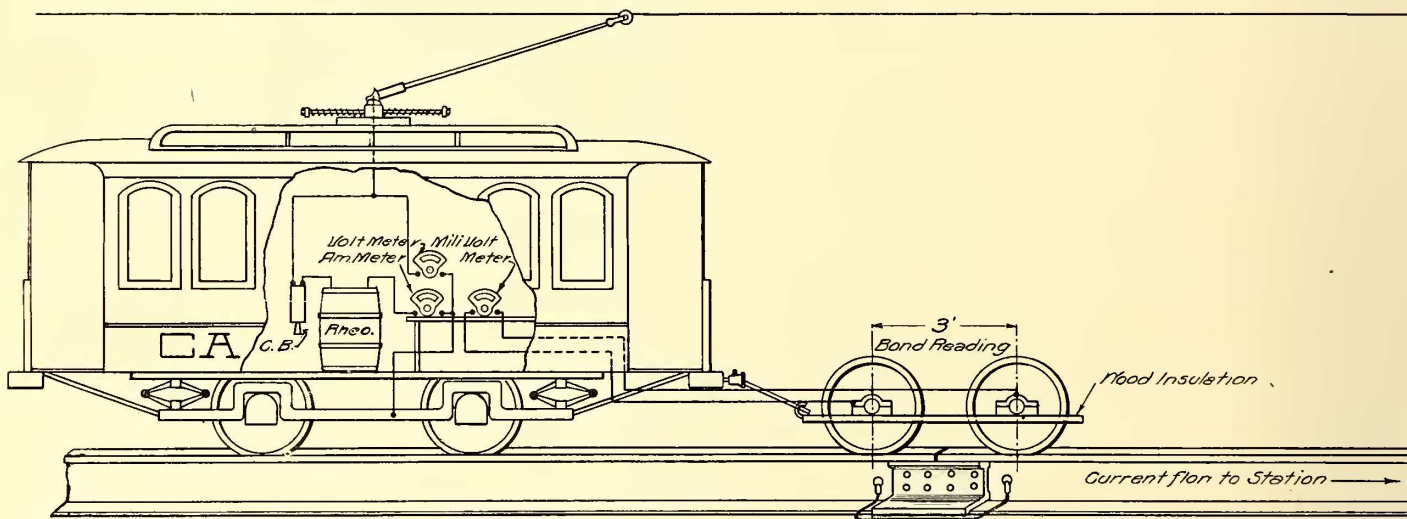
## TOOLS IN LINE CAR

E3.—Please give a list of tools it is your practice to carry on the line-repair car, or wagon, in order to enable the crew to do everything in the ordinary run of line repair work.

The writer believes the question of proper tools to equip a line wagon or line-repair car is a matter that requires considerable thought, as linemen are, as a rule, greatly prejudiced in favor of certain classes of tools. We have invariably found the best results by supplying the men with the class of tools they most prefer. There are so many varieties that it is not always wise to standardize any peculiar list.

H. A. Johnson, Ch. Engr.,  
Public Service Cor., So. Jersey Div.

The following is list of tools kept on our line car (which was described in the STREET RAILWAY JOURNAL for Aug. 8, 1903):



APPARATUS FOR TESTING RAIL-BONDS, SOUTH JERSEY DIVISION, PUBLIC SERVICE CORPORATION

Two pike poles; two sets digging tools (bar, spoon and shovel); two tampers; one dead-man or Jenny; one cant hook; one snatch block; one hand line; one pair tackle blocks, double triple 2½ ins. with ½-in. rope; one pair tackle blocks, double triple 3½ ins. with ¾-in. rope; one ratchet wrench for pole ratchets; one 12-in. monkey wrench; one pair No. 2 easy wire clippers or bolt clippers; one tool for snapping on hangers; one tool for tightening insulators; four trolley clamps; two small "Havens" clamps or "come-alongs"; one large "Havens" clamps or "come-alongs"; one pick; one No. 2 shovel; two wheel replacers; two swan dry-powder fire extinguishers; one medium size pean hammer; one hand saw; one No. 2 framing chisel; one carpenter's brace with ¼-in., ½-in., ⅝-in. and ¾-in. bits; one hand axe; one cold chisel; two pair 12-in. gas pliers.

John A. Beeler, Vice-Pres. & Gen. Mgr.,  
Denver City Tramway.

## TRACK

## TESTING BONDS

F1.—How do you test your rail-bonds?

We test our rail-bonds with a "Roller" direct-reading bond tester.

E. D. Reed, Engr.,  
Scranton Ry. Co.

We have found the Conant bond tester, though somewhat troublesome to use and a little prone to get out of order, the most satisfactory means of testing our bonds. In using this instrument it is necessary to be sure that all joints in the apparatus are perfect, that the contact wheel is free from oil, and that the track contact knives are sharp. These should be of very hard steel, and concaved on an emery wheel in the shop before starting out, and sharpened by means of a carborundum stone once or twice an hour when in use. The speed of the make and break mechanism is important, the ear being more sensitive to the higher pitches. We have found that with care an ordinary car may be used without special arrangements to furnish current for the tests. The best time can be made if one man makes the measurements and keeps the record, while another finds the joints and applies the contacts to the track. The "Roller" tester gives perfectly satisfactory results. It requires for rapid work somewhat more current in the rails, and requires a little more time to apply to the track.

Samuel P. Hunt,  
Manchester Tract., Light & Power Co.

For ordinary rail-bond testing, we use Conant T-pole rail-bond tester. We, however, make a series of tests at intervals

by a trailing truck, as shown in attached sketch. Readings are taken of the resistance of each bond, and also of the ratio of conductivity of the bond to 3 ft. of rail. The bonds designed by us and known as C. & S., Nos. 1, 2 and 3, have shown remarkable efficiency. We are now using these bonds as standard on our road. They are costly, but the results obtained warrant the expenditure. Their total cost for labor and material is \$1.50. This bond was described in the STREET RAILWAY JOURNAL for Dec. 5, 1903.

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

We test bonds with Weston milli-volt meter, comparing drop around bond with section of rail.

John A. Beeler, Vice-Pres. & Gen. Mgr.,  
Denver City Tramway.



F2.—What is the best method of keeping records of individual rail-bond tests?

We do not keep any record of individual bond tests. In testing a piece of track we mark joints which show too much resistance and follow this with a gang, which restores the damaged or broken bonds.

E. D. Reed, Engr.,  
Scranton Ry. Co.

Have span on center poles numbered, card index the line, graphically indicate the location of the pole and rail-joints and record type of bond, and when placed. During tests enter drop in pencil figures at each joint on diagram.

John A. Beeler, Vice-Pres. & Gen. Mgr.,  
Denver City Tramway.

We have used for making records of our track joints an ordinary engineer's note book, ruled in small squares. The rail-joints can be indicated by two parallel rows of dots in proper relative position to each other and to circles indicating numbered poles along the track. The record can be made in hard pencil at the time the inspection is made, and ample space may be allowed for the entry of joint resistance, date of repair, etc. The special work may be easily sketched on a little larger scale if desired.

Samuel P. Hunt,  
Manchester Tract., Light & Power Co

WRINKLES

F6.—What means, machines, devices, or special-rigged cars are you using for expediting or cheapening the work of the track department? Please send description and sketch or photograph if possible.

For cheapening the work of our track department we have several devices which have been very successful. Photographs of a stone crusher mounted on a car and a concrete mixer mounted on a truck are reproduced herewith. We also have a solid cast-iron roller weighing 5 tons mounted between the wheels of an old single truck. This roller is used for rolling

cu. yds., and the weight of the crusher is 7000 lbs. The crusher will receive stones 8 ins. x 14 ins.

The concrete mixer comprises a Drake standard single-



PORTABLE CRUSHER, SCRANTON RAILWAY

shaft mixer mounted on a flat car. The machine will mix 200 cu. yds. of concrete per 10-hour day. The gear is driven by a No. 3 Westinghouse car motor mounted on the frame of the



PORTABLE CONCRETE MIXER, SCRANTON RAILWAY

brick pavement and stone or earth filling between rails of track.

The portable crusher has a capacity of 50 yds. output in 10 hours, running at 300 r. p. m. The crusher is driven by a No. 3 Westinghouse car motor by means of a 6-in. belt, and the car upon which the crusher is mounted is driven by two No. 3 30-hp. Westinghouse motors. The capacity of the car is 6

cu. yds. The frame is mounted on a pivot and small truck, so balanced that it can be easily turned in any direction. The action of the mixer is continuous. Power for the driving motor is taken from the trolley wire by a portable pole. The car itself is moved by hand.

E. D. Reed, Engr.,  
Scranton Ry. Co.

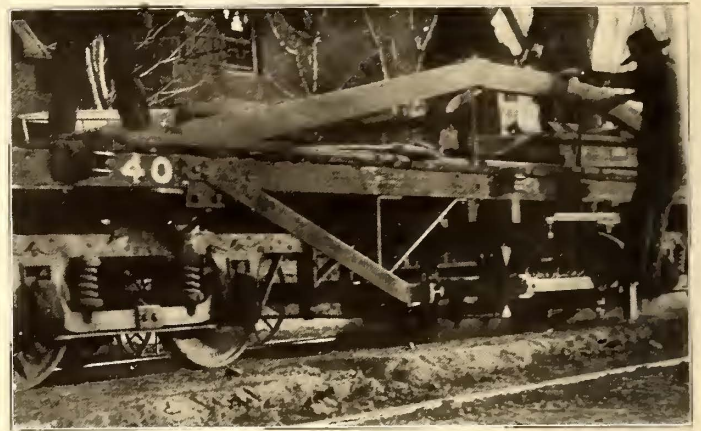


The accompanying photographs show a track gang plow, intended for the purpose of plowing dirt down to the tops of ties in order to more economically take care of an extensive job of disintegrated granite surfacing, under way in Denver last year.

which is connected to arms and shafts under the car floor. The lever also serves to hold the plow down when in use. The plow is hung on stationary pieces of T-rail under the car floor,



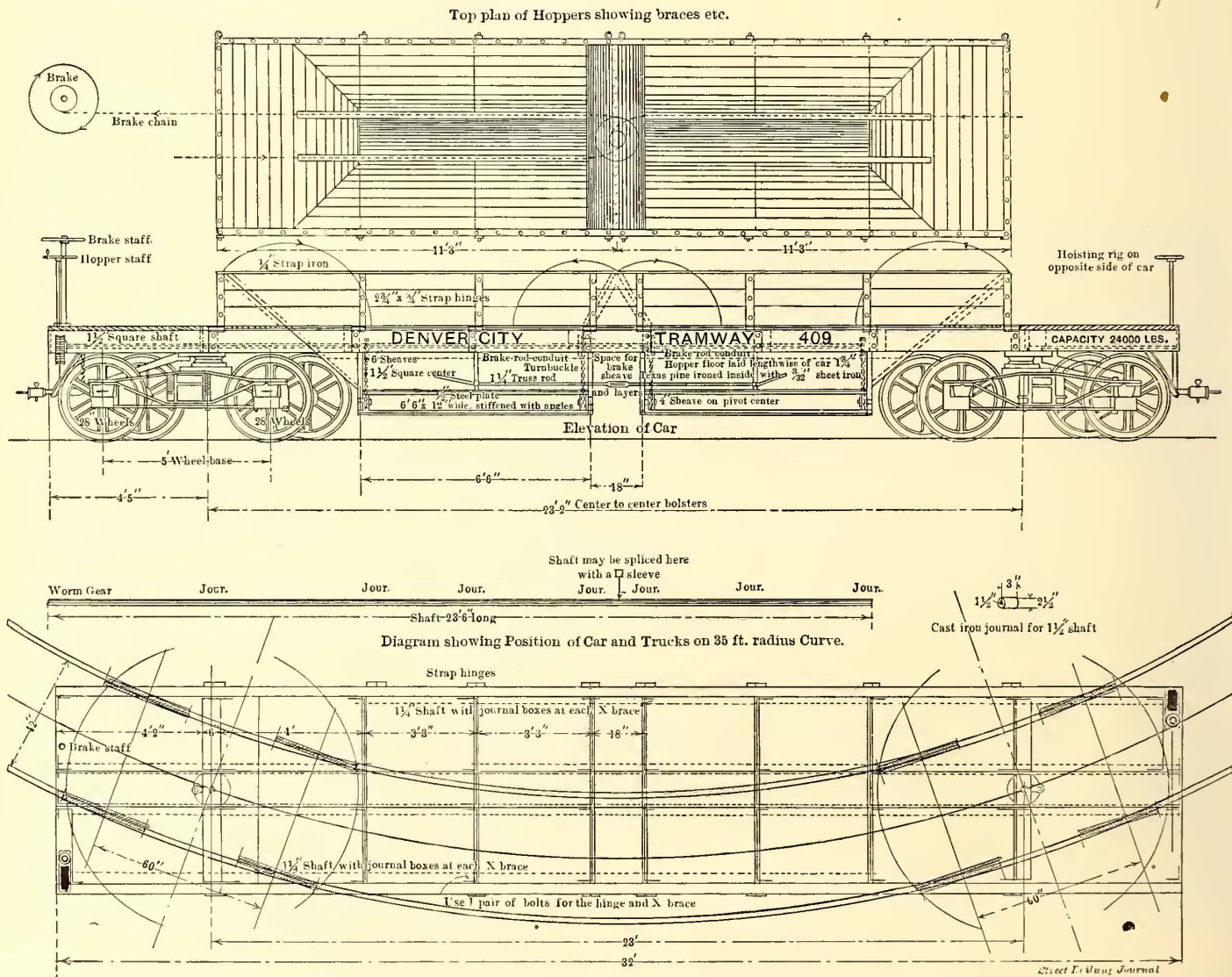
TRACK PLOW, WITH PLOW RAISED, DENVER CITY TRAMWAY



TRACK PLOW, WITH PLOW LOWERED, DENVER CITY TRAMWAY

The plow is constructed "V"-shape, and is hung under a 28-ft. flat car, between the trucks. The plow has seventeen beams and cast steel points, the draught of front "V" being

with sliding jaws fitting around the ball of the rails, to allow the plow to be moved from one side of the car to the other, so as to plow between the rails and 4 ft. outside of either rail.



COMBINATION FLAT AND DUMP CAR, DENVER CITY TRAMWAY

stationary, with jaws to receive the ends of beams. The back "V" also has jaws to receive the back ends of the beams. The plow is raised and lowered by means of a lever on top of car,

The seventeen beams and points are spaced 5 1/2 ins. from center to center, so that one point will be directly over each rail on a 42-in. gage track. The point over each rail can be re-



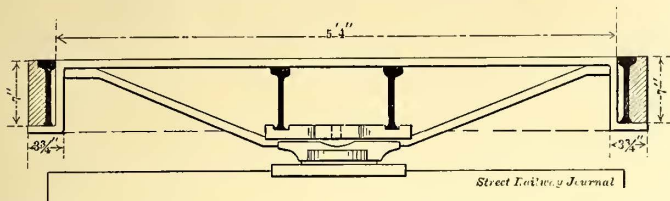
moved, and a scraper put in its place to clean the dirt from the rail. The steel points are fastened to beams in jaws with pins so they can be easily removed.

The accompanying drawing and photographs show a center

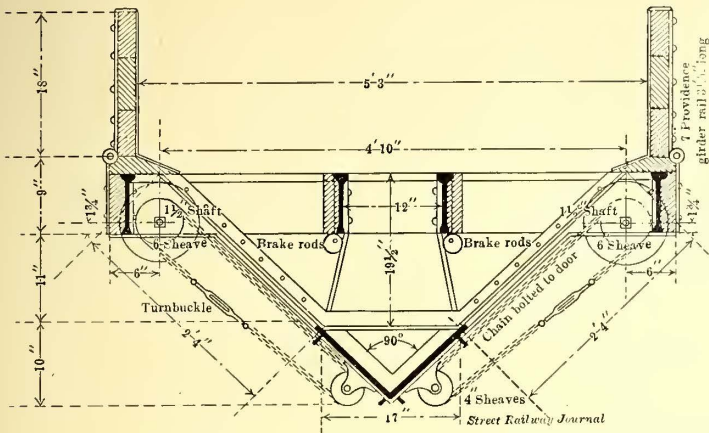
car, where a reversible ratchet and lever serves to turn the shaft.

The drawing shows a worm gear and wheel which was found to be in the way at times, when using the car as a flat car. The lever drops below the surface of the floor. The sliding doors open and close at will, so that part of the load can be let out, then closed again. It is found very convenient for ballasting and surfacing track.

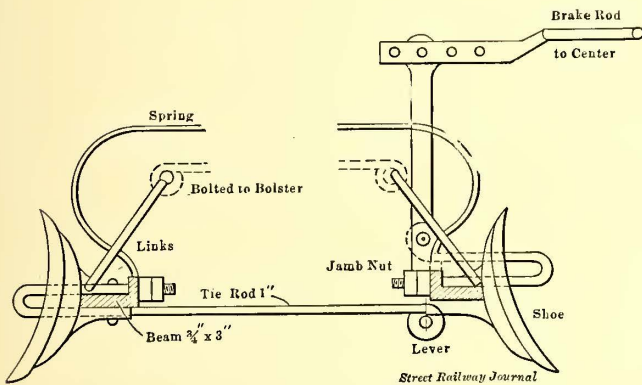
John A. Beeler, Vice-Pres. & Gen. Mgr.,  
Denver City Tramway.



SECTION THROUGH BOLSTER, DENVER COMBINATION FLAT AND DUMP CAR



SECTION THROUGH HOPPER, DENVER COMBINATION FLAT AND DUMP CAR



BRAKE MECHANISM, DENVER COMBINATION FLAT AND DUMP CAR



COMBINATION FLAT AND DUMP CAR, DENVER CITY TRAMWAY

dump-car built by the Denver City Tramway Company. The car is built so that it can be used as a flat car when not in use as a dump-car, by removing the slide boards and placing them over the hoppers to form the floor of the car. The doors in the bottom of the hoppers are of boiler plate, and are raised and lowered by means of shafts running to the end of the

DISCUSSION ON CARS FOR CITY SERVICE AT CHICAGO

"The best car for city service" was the subject discussed at the regular meeting of the electrical section of the Western Society of Engineers, held in the Monadnock Block, Chicago, Jan. 26. In the absence of B. J. Arnold, who was unavoidably detained and who was expected to act as chairman of the meeting, George A. Damon took charge of the meeting.

Mason B. Starring, vice-president of the Chicago City Railway, was the first speaker. Mr. Starring confined his remarks to the new passenger car of the Chicago City Railway, of which a complete description was given in the STREET RAILWAY JOURNAL for Sept. 16, 1905. Mr. Starring's talk was illustrated with lantern slides, showing the more important features of the car. The car, it may be remembered from the description referred to, has a length over all of 45 ft. 9 ins. and a width over all of 9 ft. It is of the semi-convertible type and seats forty-four passengers. Mr. Starring referred, among other things, to the double or storm sash with which the car is equipped, the fact that the car was hitchproof, the disappearing step, the filler on top of the bumpers and other features that made it impossible for anyone to stand on the outside of the car. The seat risers, he said, had been changed somewhat since the car was originally designed. They were now made to slope in under the seat, giving more room for the heel. Straps had been omitted because of the repeated complaints against them by the "Strap Hangers' League," but this omission had brought condemnation rather than commendation, and the company was arranging to provide four straps opposite each longitudinal seat. For summer use, the end doors will be removed and the end windows will also be taken out, thereby giving the car more of the features of an open car. Concerning the width of the cars, the advisability of widening the track centers was discussed, but there were many streets on which the cars operate which are so narrow that if the distance between the tracks was increased, wagons backing up against the curb to unload would interfere with traffic.

Harvey B. Fleming, chief engineer of the Chicago City Railway, who was present, then took up the electrical details of the car. Among the several lantern slides put upon the screen by Mr. Fleming were those showing the wiring circuits, the iron conduit and the terminal or junction box for motor leads. Regarding the employment of both a fuse and a circuit breaker in series, Mr. Fleming stated that they had used a circuit breaker alone on several of their equipments and the breakers had given good satisfaction, but they thought it advisable to place the fuse in the circuit as additional protection to the motor. The K-28 controller used on the car, he said, was similar to the K-10 type, with the exception that the blow-out coil extended along the base of the fingers and that the fingers had fibre separators between them. In reply to a question of Mr. Damon as to why electric heaters were adopted, and whether or not the heater cover became objectionably hot, Mr. Fleming said that there were several reasons which influenced the decision. Electric heaters, he said, were more economical, were less liable to get out of order, and that there was no coal, ashes or dirt to contend with. There had been several complaints



because of covers getting hot, but he thought most of the trouble was due to people sticking pins and nails in the heater short-circuiting some of the coils and throwing a heavier load on the other heaters. In reply to the question as to who decided on what point the heaters should be operated, he said that this was in the hands of the operating department. Sign boards were placed at starting points and terminals, indicating on which point the heater should be operated, and the conductor was held responsible for the proper position of the switch.

E. T. Munger, master mechanic of the Metropolitan Elevated, said he was interested in the type of junction box used on the car for connecting the motor leads, and wanted to know if that style of box could be used for motors as large as those on his road, which are of 160 hp. Mr. Fleming saw no reason why the same type of box could not be used with large motors if the jaws and connecting blades and other parts were made sufficiently large. In reply to a question on individual fusing of motors, Mr. Munger stated that the practice of his road was to fuse the motor circuit at the trolley shoe only. If the motor becomes grounded, the automatic circuit breaker is depended on to protect the circuit. If the breaker opens, the motorman is instructed to try the controller again, and if the breaker opens a second time, he is told to cut first one motor out and then the other until the breaker holds. Mr. Fleming said considerable thought was given to the question of the type of motor to be used on the Chicago City Railway cars, whether or not it should be of a design permitting the armatures to be removed from above or from below. After visiting several shops throughout the country, they decided on a General Electric type No. 80, which permits the lower half of the shell to be dropped and the armature taken out from below. This type, he said, had the added advantage of making repairs to the armature and field possible without jacking the car body up and removing the trucks. The decision was reached in spite of the fact that the general tendency for several years past has been toward the use of that type of motor which necessitated the armature being removed from above. He remarked further that at the present time the tendency in practice is to go back to the old type of motor which permits the armatures being taken out from below. In reply to Mr. Damon's question as to the consumption per car-mile, Mr. Fleming stated that power tests were being made on the cars at the present time. Roughly, however, the car consumed from 95 watt-hours to 100 watt-hours per ton-mile, exclusive of the auxiliary circuits. The weight of the car was about 26 tons, and the schedule required, from 8 m.p.h. to 9.57 m.p.h. Regarding the success of the junction box for the motor leads, he stated that there had been but three burn-outs in these since they were adopted. Two were due to workmen leaving nails or other articles in the boxes, and the third resulted from water getting into the box. No special effort was made to follow the rules of the National Board of Fire Underwriters regarding the wiring of the cars, but after the method had been decided upon, the approval of the underwriters was obtained.

To the question of the approximate cost of the cars, Mr. Starring stated that, including freight and assembling, the cost of each car was a little in excess of \$5,500.

R. F. Schuchardt wanted to know what satisfaction the company was having with the lightning arresters on the car. Mr. Fleming said that they were using the General Electric type MD arrester, and these arresters were giving good satisfaction. On some of the older equipments considerable trouble was experienced by lightning getting into the air governor and lighting circuits. These circuits seemed to act as protection for the motor circuits and the motors were not affected. A choke coil had been placed in the auxiliary lead from the main trolley on the new cars to protect the auxiliary circuits.

J. R. Cravath said that the use of the junction box marked

a decided advance. Most of the schemes commonly used to connect motor leads to car cables were very trying makeshifts. He spoke favorably of the use of frosted bulbs for illumination on these cars, saying that they were not only artistic, but that they eliminated the blinding glare of the bare filament. He favored the use of reflectors above lamps when placed in rows over the seats, but added that one objection to their use was the collection of dirt upon them.

Mr. Starring stated that this was rather a serious objection to the use of reflectors; that his company had tried them, but found that the convoluted surface collected dirt, which, because of the moisture present in the air, caused it to stick and resulted in necessitating an extra force of car cleaners to remove the dirt.

Chairman Damon wanted more discussion of the storm sash which had been adopted, and also wanted to find out something regarding the best finish for the hardware. He said that on one occasion he had tried to get a gun-metal finish, but was told that such a finish would wear off in a short time.

To the first question, Mr. Starring replied that the double sash maintained a pocket of comparatively warm air between the sashes, and that the passengers did not have a cold pane of glass next to them. The heating of cars on the Chicago City system was difficult, he said, by reason of the fact that both ends were used simultaneously for loading and unloading the cars. The double sash, in general, added to the efficiency of the heating apparatus.

C. K. Mohleer wanted to know the comparative cost of hot-water and electric heating.

The cost of heating, Mr. Starring said, was not a determining factor in the selection of the method adopted. The cleanliness, the flexibility and, possibly, the insurance, and the fact that the car was a double-end one and there was no room on either platform for the hot-water heater, were all important in determining the method to be adopted.

Mr. Damon said that he had thought a great deal about a central entrance car. When at Denver he investigated the subject, and had since had a communication from John A. Beeler, vice-president and general manager of the Denver City Tramway Company, in which Mr. Beeler gave his reasons for the use of central entrance cars. According to Mr. Beeler, the conductor was most of the time near the entrance of the car and in plain view of it. The car was safer to operate and passengers are loaded and unloaded more rapidly. It also offered an open and a closed compartment. Mr. Damon thought that it would be a serious mistake if the Chicago City Council prohibited the use of trail cars. In Denver, trailers were used to a great extent. A trailer weighing about 12,300 lbs. was employed, and carried 100 passengers. The motor car alone consumed about 2½ kw-hours per car-mile. The additional consumption caused by the trailer was about 1 kw-hour per car-mile. The cost of the trailer was only about 30 per cent of the cost of a motor car. The motor cars had been operated all day long with trailers and had shown no signs of abnormal heating. Mr. Damon showed several slides illustrating designs of central entrance cars which he had considered.

In concluding the discussion, Mr. Starring stated that he had one question to ask the association. He wanted to know when and under what conditions smoking should be permitted in a double-ended car. He said his company had never been able to work out a satisfactory solution of the problem. He also extended an invitation to the association to visit the shops of the company at any time convenient to members of the association. He stated that a special car would be put at their convenience.

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The Toledo, Port Clinton & Lakeside Railway has joined the agreement for the use of the interchangeable transportation now used by the majority of electric railways in that district.



## THE DELAWARE & HUDSON GASOLINE-ELECTRIC CAR

In a paper presented Jan. 20, 1905, by W. B. Potter, of the General Electric Company, to the New York Railroad Club and reprinted in the *STREET RAILWAY JOURNAL* for Jan. 28, a preliminary account was published of the gasoline-electric coach which was being built for the Delaware & Hudson Railroad Company by the General Electric Company and the American Locomotive Works.

The first trial run of this novel car took place Feb. 3, when a successful trip was made from Schenectady to Saratoga, N. Y., and return, over the lines of the Delaware & Hudson Railroad. During the trip several important features of this method of driving were demonstrated. While the car was not designed for high speed, the average running time was about 35 m.p.h., and several times the car attained a speed of 40 m.p.h. The smooth and rapid acceleration was most favorably commented upon by the engineers present, as was the complete absence of vibration, which might be thought to accompany the use of a gasoline engine.

This car consists essentially of a gasoline-driven electric generator furnishing current to electric motors geared to the driving wheels and controlled by a method similar to that employed in the ordinary straight electric car equipment. The car in question, shown in the illustration, is of the combination type, comprising a passenger compartment, smoking room, a baggage room, engine room, one toilet and a motorman's compartment. A complete controller equipment is located at each end of the car, the forward controller being located in the engine room, while the rear compartment is self-contained. The car has seating capacity for forty passengers, including seats for twelve in the smoking room. In general it is built on the lines of a standard Delaware & Hudson passenger coach, and is handsomely finished. Within, the passenger compartment is decorated in mahogany, with a birch wainscoting; the smoking room in quartered oak, and both the baggage and engine rooms in painted poplar. The outside of the car is painted and lettered in the standard Delaware & Hudson pattern, and Gould pattern bumpers and draw-bars are provided. It is 65 ft. long, and equipped weighs 65 tons.

The gasoline engine for this car was built by the Wolseley Tool & Motor Car Company, Ltd., of Birmingham, Eng., and is considered the most powerful unit yet constructed for this class of work; it develops 160-hhp when running at 450 revolutions per minute. The cylinders of the engine are horizontal opposed, six in number, 9 ins. in diameter, with a 10-in. stroke. All valves are mechanically operated, and the cylinders are water-cooled. Hitherto, difficulty has been experienced in starting internal combustion engines of this size, but in the present case this has been entirely overcome by using shells filled with black powder to provide the initial charge in one cylinder. On starting the engine, the shell is fired by a hand trigger, the whole being similar to the breech mechanism of a gun. Jump sparks and low-tension ignition are both provided, current being furnished to the latter by a small magneto driven from the engine shaft.

The volatilization of the liquid fuel is produced in two carburetors, which form an integral part of the engine. Each carburetor supplies three cylinders, and is equipped with two float feed chambers. The chambers are identical and are of the usual needle valve type. Very flexible arrangements are provided to govern the air supply so that it may be taken from

the atmosphere or from the crank chamber, or from both, according to the conditions required. The mixture is heated to the required temperature in a small chamber, which itself is warmed by the exhaust. In all details the engine is very complete. The lubrication is especially so, being force feed for main bearings and pistons, and drip feed for all other working parts. Gasoline is stored in steel tanks beneath the car, and the burnt gases pass through the roof into mufflers, from which they exhaust into the air. The cooling system for the cylinders consists of radiating tubes, located on the top of the car. Water for cooling is contained in the engine base. For heating the car a three-way cock is provided, which by-passes the circulating water through the usual pipe heating system within the car.

The transmission is electric, consisting of a generator and standard railroad motors. Current is furnished by a 120-kw, direct-connected, General Electric, 6-pole generator, designated for 600 volts. This generator is provided with commutating poles, which in connection with the method of



PARTY AT TRIAL RUN OF THE GASOLINE-ELECTRIC CAR

voltage control, permits a very flexible operating system. The advantage of commutating poles is evident when it is considered that the field excitation at starting is weak, and a large current at low voltage is required to give the necessary starting torque at slow speeds. Owing to the peculiar operating conditions of this system, the generator, while retaining the characteristics of a shunt-wound machine, is separately excited by a  $5\frac{1}{2}$ -kw, 2-pole, compound-wound exciter working at 110 volts. This is located on top of the generator and is driven by a Morse silent chain.

The motors are two GE 69, of standard railway construction, similar to those used on the Interborough Railway, New York.

For regulating the speed of the motors, as mentioned above, voltage control is used; in other words, the speed of the car is governed by varying the field strength of the generator. With this method the speed of the engine remains constant after acceleration. The controller is semi-automatic, and can be set for any predetermined maximum acceleration. It is arranged for series-parallel control, the motor connections being changed from series to parallel by the reversing handle. This latter has five positions, "series ahead," "parallel ahead," "off," "series reverse" and "parallel reverse." Arrangements



are provided to prevent the motor connections from being changed from series to parallel until the resistance is put in the field circuit of the generator.

Further operating details comprise a General Electric combination straight and automatic air-brake equipment and a special lighting equipment. The headlights are supplied with 100-cp incandescent lamps of the stereoptican type, one for each end of the car.

The trial trip of this car demonstrated the practicability of this equipment, and was entirely satisfactory to the engineers and officials present so far as the tests indicated. The opinion was expressed that this was merely a step toward the final electrification of all service. A gasoline car would be useful in establishing a passenger traffic, but eventually the motive power for operation would be electricity.

The photograph of the car on page 247 was taken after the

## MEETING OF THE EXECUTIVE COMMITTEE OF THE AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION

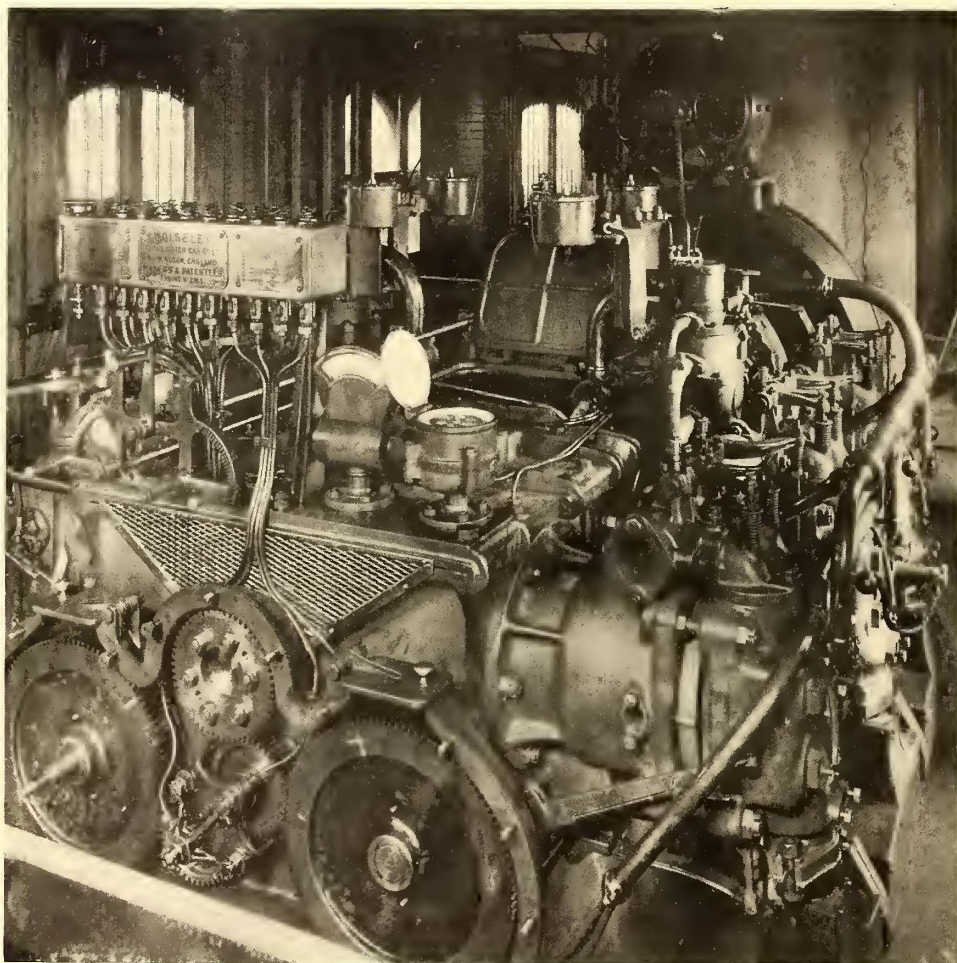
A meeting of the executive committee of the American Street and Interurban Railway Association was held at the association headquarters, 60 Wall Street, New York City, on Tuesday, Feb. 6, 1906. Those present were Hon. W. Caryl Ely, president of the Ohio Valley Finance Company, Buffalo, N. Y.; John I. Beggs, president of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis.; James F. Shaw, president of the Boston & Worcester Electric Company, Boston, Mass.; W. B. Brockway (president of the Accountants' Association), auditor of the Nashville (Tenn.) Railway & Light Company, Yonkers, N. Y.; H. H. Adams (president of the Railway Engineering Association), superintendent of shops of the United Railways & Electric Company, Baltimore; S. L. Rhoades (president of the Claim Agents' Association), general claim agent of the Philadelphia Rapid Transit Company, Philadelphia, Pa., and Bernard V. Swenson, secretary and treasurer. Upon invitation, James H. McGraw and E. H. Baker, of the Manufacturers' Association, and W. Boardman Reed, engineer of maintenance of way of the New York City Railway Company, were also present.

The meeting was called for the purpose of considering a number of important matters relating to the American Street and Interurban Railway Association and the affiliated associations.

The secretary presented a report covering the various association matters which have taken place since the convention at Philadelphia in September, 1905. He stated that investigation had been inaugurated immediately upon the close of the convention to obtain desirable offices for the association headquarters. Temporary offices were obtained at 114 Liberty Street, and permanent headquarters at 60 Wall Street. He described the equipment for research possessed by the association and the work which had been carried on during the past few months. Circular letters relating to compensation for carrying United States mail, together with printed data sheets, were sent out in December to all electric railways in the

United States, Canada and Mexico, the total number being approximately 1200. Similar circular letters were sent out the latter part of December, together with a data sheet relating to the speed of interurban cars in towns and cities. Up to the present time replies from these inquiries have been coming in continuously, and a large number is now on file in the secretary's office. Data sheets relating to the official mailing lists of the various member companies have also been sent out.

Personal typewritten letters were written to the various member companies in the latter part of December and the first part of January, outlining the work of the association as conducted under the new conditions resulting from the reorganization. In answer to this communication, the president and secretary have received a large number of letters from various railway people connected with the companies throughout the country. These letters have universally and heartily indorsed the work of the association. The association has already estab-



VIEW OF THE GASOLINE-ELECTRIC APPARATUS ON DELAWARE & HUDSON CAR

arrival in Saratoga. Among the officials present from the Delaware & Hudson Company were Axel Ekstrom, consulting electrical engineer; J. H. Manning, superintendent of motive power; J. W. Burdick, passenger traffic manager; James McMartin, chief engineer; J. B. Dixey, assistant to second vice-president; W. J. Mullin, assistant to second vice-president; D. F. Wait, superintendent of the Susquehanna division, and E. F. Peck, manager of the Schenectady Railway Company; and from the General Electric Company E. W. Rice, Jr., technical director; W. B. Potter, chief engineer; J. R. Lovejoy, general manager of the railway department; J. G. Barry, assistant manager of the railway department; W. J. Clark, manager of transportation department; E. D. Priest, A. F. Bachelder and H. G. Chataine, of the railway engineering department, and F. H. Gale, of the advertising department.

It is expected that the car will be put in regular service between Schenectady and Saratoga.



lished correspondence with over 400 different people since the establishment of the office. More than 2000 letters have been written in the ordinary correspondence.

#### MEMBERSHIP COMMITTEE

The membership committee has sent out two circular letters to non-member companies, one on Sept. 15 and the other in January, 1906. These letters were in all cases signed by H. H. Vreeland, chairman of the membership committee. As a result of this work, forty-nine new companies have already joined the association, and letters are still being received in this connection.

#### INSURANCE MATTERS

Considerable work has been done on the question of insurance, much of which has been accomplished by the chairman of the insurance committee. This committee consists of H. J. Davies, of Cleveland, chairman, and R. B. Stearns and T. C. Penington, of Chicago. Mutual insurance companies are being formed, and it is believed that the insurance question, from the standpoint of the street railway companies, will be very materially bettered by the work of this committee.

#### ANNUAL REPORT

The annual report of the association is still in the printer's hands, but will be ready for distribution within a short time. The report of the Railway Engineering Association has already been distributed, and that of the Accountants' Association will be ready for distribution within a week or ten days.

#### RELATIONS WITH STATE AND SECTIONAL ASSOCIATIONS

The president and secretary have devoted considerable attention to the question of State and sectional street and interurban railway associations and their relation with the national association. These officers attended the meeting of the Massachusetts Street Railway Association in Boston on Dec. 13, 1905. The secretary also attended the first quarterly meeting of the New York State Street Railway Association, held at Schenectady on Jan. 10, and the president and secretary attended the first annual convention of the Central Interurban Railway Association, held at Dayton, Ohio, on Jan. 24.

#### THE 1906 CONVENTION

The date and location for the 1906 convention was discussed at some considerable length. Invitations had been received from Atlantic City, Denver, San Francisco, Chattanooga, Atlanta and Put-In-Bay. No definite convention city was decided upon, but the matter was left to the president, Vice-President Shaw and the secretary to investigate and report at the next meeting of the executive committee.

#### STANDING AND SPECIAL COMMITTEES

At the Philadelphia convention, committees on "membership," "insurance" and "rules for ear wiring" were appointed. In addition to these committees, the president was authorized at the meeting to appoint several other committees, among them one on "papers and topics." This is a very important committee, and one by whom it is expected much work will be done within the next few months, as it is the desire of the executive committee to secure the presentation of valuable papers at the next convention.

#### OTHER BUSINESS

Among the other important matters which were considered by the executive committee was the approval of the constitutions and by-laws of the affiliated associations. These constitutions and by-laws were presented at the meeting, and, after some discussion, the matter was referred to the presidents of the various affiliated associations, together with the secretary of the American Association, with power to act.

Other matters considered related to the distribution of the proceedings for the current year, the binding of the proceedings of past years and the privileges of associate membership.

After the meeting, which adjourned at 7 p. m., those present were the guests of President Ely at dinner at the Holland House.

## CITY LAND VALUES AS AFFECTED BY TRANSPORTATION FACILITIES

A most interesting address on the early history of the introduction of electric traction in New York and the opposition which the plan originally excited among real estate owners and dealers, was delivered last month by Herbert H. Vreeland, president of the New York City Railway Company, before the real estate class of the West Side Y. M. C. A., of New York. The history in New York was very similar to that in many other large, as well as small, cities, although the opposition more intense, if possible. Mr. Vreeland's account of how this antagonism gave way to a more sensible realization of the benefits conferred by modern transportation is exceedingly instructive. He said, in part:

A more vehement opposition was never raised to any improvement than that which had to be met by the advocates for the substitution of electric power in the streets of New York. They were even more violent than the riots created in London by the cabbies when umbrellas were first introduced in England from China. These London riots were based on the theory that the umbrella would destroy the cockney hacking business, and it took nearly two years to convince the outraged cabbies that they had an indestructible industry. Now that we have been enjoying for several years the benefits of rapid electrical transportation, and that it has become an hourly necessity of our daily lives, it is inconceivable that the introduction of it was ever opposed; but the truth must be told, and it is that every single step taken to bring about this great reform was opposed by real estate owners who have been most directly benefited. As a matter of fact, whole neighborhoods arose in angry protest and organized to petition the court to prevent the substitution of deadly electric-power for horse-power, on the ground that the substitution would endanger lives and limbs, destroy property values and carry away established business to other places. The records of the Supreme Court show that no less than five powerful combinations of property holders and over 100 individual taxpayers filed sworn petitions attesting their faith in the dangerous and destructive character of electric traction. It was no argument to them that the streets would not be disfigured; that the current was to be conveyed under ground; that the system had been used elsewhere, and was known to be safe and reliable. They prayed, nevertheless, to be delivered from consequences, none of which ever resulted or could possibly result. Each separate case and each new objection—one was invented every day or two—had to be formally answered in court as gravely as though it had great merit. Only the patience and sagacity of the promoters secured this great boon to the city.

I doubt if I would quote New York's experience if it was peculiar to New York alone. The experience, however, was practically universal. Much the same thing happened in a smaller way in other communities where conversions were made, and I rehearse the fact here for the purpose of bringing before you an interesting historical fact and introducing the point which will be the burden of what I have to say concerning the intimate relations between street railway improvements and real estate values. I am happy to have an opportunity to tell this little bit of history to you, for in your turn and at your time you may have a chance to spread such light as I can throw on the subject. Not all of you are to remain and labor in New York, and in the course of time you will scatter here and there into other communities where just such questions as have already been settled here will arise, and if you bear in mind the experience of history, every one of you may have an influence of great public good, and public good agreeably associated with personal and professional profit. The contests of which I speak are too remote and the success of the reforms have been too great to leave me open to the inference of complaining, and if I can free your minds from an inclination so to charge men, the



road is open to point out to you how the business of transportation bears beneficially on the rental value of land of all kinds, whether it be used for farms, factories, residences or business structures.

I take it that no argument is necessary to convince any one of you that to a fertile and isolated valley nothing could be a greater blessing than a means by which it is to be populated and put into communication with the outside world and its teeming markets. State that such a region is to be open for settlement to man and a means provided for quickly transporting the products of his labor in the field or factory to open markets, and you have the unanimous consent to proceed, and all men agree that it is a beneficent thing to do. No one for a moment doubts that the furnishing of such means would immediately enhance the value of the land in the valley. It goes without saying that it would, and no argument is necessary. When the same conditions are compressed within the limits of a town or city and you have the same problem in miniature, the whole aspect of the thing seems changed and the effort to bring the various regions of a restricted place into easy access and afford citizens the means of coming and going, is under denunciation as a grab for fraud and a public outrage generally.

I think I ought, before proceeding, to point out to you certain radical differences between steam railroads and the street surface railroads. In the case of steam railroads, the roadbed, and usually a considerable space on either side of it, is owned in fee by the railroad company. A great new highway is created for the exclusive use of the steam railway, from which every one is excluded on peril of being charged with misdemeanor, and various penalties are prescribed for obstructing or interfering with it in any way. To create new highways in crowded cities through masses of monumental architecture in which millions have been invested is, of course, out of the question, and as a result railroad improvement in cities is for a more intensified use of existing highways, and not for the creation of new ones. So that it comes about that contemplated improvements, like those, are denounced and opposed as I have described; and the general public has been slowly educated to the view that the introduction of a street railway on a city thoroughfare is a misuse of the people's property, whereas in truth and in fact, the only hope of profit that its promoters have is that it will accommodate hundreds of thousands of people and facilitate access to and from the particular neighborhood into which it goes.

A foreigner, unfamiliar with our habit of editorial exaggeration, and accepting at face value what is uttered in print, would, on reading the ordinary comment concerning surface railroad extension, believe that a railroad proposed to seize an ancient highway and forthwith deprive the public of its use. When you explain to him that what is really proposed is only an added usefulness to an existing thoroughfare; that it was proposed to give the people of small means equal privileges along the highway with those who ride in cabs, carriages, automobiles, delivery wagons, bicycles, perambulators and what not else, he is puzzled to reconcile the comment with the facts. However, his mystification is no business of ours. Let him work it out for himself, while we get back to the topic in hand, the influence of transportation on the rental and taxable value of land.

When I came to the consideration of this subject, which was new to me, I assumed that on a question of this importance there existed and had been collated a mass of facts and figures which, when examined, would throw considerable light on the topic we have in hand. I inferred that from this data it would be possible to answer two questions: First, what is the effect, good or bad, of railroad improvement on land values? and, second, to what extent has this influence been felt? I found to my surprise, however, on investigation, that no such data exist in collected form, and it was in truth the discovery of this fact that finally put an end to my hesitation in favor of coming to

speak to you. Because, if you carry away from this conference nothing more than the knowledge that all archives are barren of figures and facts on this important topic, it will not have been in vain, for it will have brought intimately home to your consciousness the necessity of just such work as has been undertaken in this lecture course. It will show you the necessity of an organization of this kind which can collect, discuss and collate data of this kind and make them available for those who intend to devote their time to the real estate business.

Perhaps the simplest way of illustrating what I have in mind is to quote certain examples. Let us therefore take a look at Thirty-Fourth Street and see what happened there within the past few years.

#### THIRTY-FOURTH STREET

In discussing this particular thoroughfare, I will exclude its east and west termini, as they are too far away from the intersecting points of these great north and south lateral lines running the length of the island, and I will confine myself to that portion of the street between Eighth and Fourth Avenues. Ten years ago this portion of Thirty-Fourth Street was among the most fashionable residential sections of the city, and its occupants had sufficient strength to postpone for many years the introduction of a crosstown line through it, notwithstanding the fact that there was a clamorous public demand for cheap transportation across town at some point between Forty-Second and Twenty-Third Streets. The promoters of the road finally succeeded in meeting the demand and beating down local opposition. Thereupon the street went into the transitional stage and the values of the residences owned by the original objectors soon began to change for the better, although the uses to which the land was to be put was for business more than for residential purposes.

By means of transfer to north and south lines intersecting this Thirty-Fourth Street railroad, the street was thrown into communication with the whole of Eighth Avenue, Seventh Avenue, Sixth Avenue, Broadway, Fourth Avenue and Lexington Avenue, so that broadly considered, that little strip of Thirty-Fourth Street was as if it had been inserted into each of those great north and south thoroughfares. Presently the line was so overtaxed that it was necessary to change the motive power, and on Aug. 28, 1900, cars propelled by electric storage batteries were introduced there. It was supposed that this improved power would ease the congestion made by the passenger contributions from these great avenues, north and south, but the tide of travel swamped the cars, and on Sept. 10, 1903, the owners of the road converted it to the underground electric system.

In the year 1900 property in this section sold at the rate of from \$2,000 to \$2,500 per front foot, but immediately after that date a very sudden rise took place, and R. H. Macy & Company paid for some of their land on that thoroughfare as high as \$133 per square foot, or about \$16,000 per front foot. On the corner of Broadway and Thirty-Fourth Street, I am informed, they paid \$333 per square foot, and this in a section uninfluenced by any other than mere surface transportation, because for over twenty-five years the elevated in the immediate neighborhood, one block south, had failed to affect values at all.

Directly opposite the Macy corner, at the Sixth Avenue intersection, is the Broadway Tabernacle. The trustees of that church in 1857 bought ten lots on the northeast corner of Thirty-Fourth Street for \$78,500, and disposed of four of them for \$33,000, making the actual cost of that site \$45,000. Within the past three years this property, which cost them \$45,000, was sold for \$1,275,000, and real estate men inform me that this rise was not a speculative one, but was reasonable, because of the accessibility of this site, on a corner from which four lines extending over some 500 odd miles of city streets transfer.

Opposite the Macy site there is another, that now occupied by Saks & Company. The syndicate that built this structure,



which came into existence after the facilities on Thirty-Fourth Street had been fully developed, paid \$133 per square foot in some instances, and the tenant of the property is under an annual rental of \$170,000. A Chicago merchant, I am informed, has made an offer to the owners of this property of \$3,750,000, agreeing to take it subject to a mortgage of \$2,000,000 at 4½ per cent, and pay \$1,750,000 in cash for their equity. The owners, believing as everyone does who studies the transportation problems of this city, that it is worth more, have fixed their price at \$4,250,000, so the neighborhood seems still to be growing.

Rents in the block between Fifth and Sixth Avenues are naturally estimated upon the value of the land. Nos. 43 and 45 West Thirty-Fourth Street, dwelling houses, on a plot 50 x 98.9, have been rented to a tenant for a term of years at an annual rental of \$24,000, with taxes and repairs. This same property rented in the early nineties for private use for \$3,000 and \$3,500, respectively.

Finally, probably the most important result of the great increase in values on Thirty-Fourth Street property, is the benefit derived by the city from increased taxes, part of which, at least, is in consequence of the excellent surface car facilities. The taxes on the following properties on the north side of Thirty-Fourth Street have increased as follows:

	Taxes		Net Gain
	1894	1905	
Between 7th and 8th Aves.....	\$6,686.55	\$22,684.18	\$15,997.53
Between 7th Ave and Broadway...	2,557.60	15,261.35	12,703.75
Between Broadway and 5th Ave...	29,015.00	75,710.37	56,695.37
Between 5th Ave. and Madison...	9,057.40	19,093.30	10,035.90
Between Madison and 4th Aves...	6,873.60	9,794.58	2,910.98
Total increase .....			\$98,343.53

116TH STREET

Prior to 1895, 116th Street, between Pleasant and Manhattan Avenues, was improved only to a small extent, and at that time dwellings and apartments were erected without the remotest idea of the street ever becoming a business thoroughfare. But on April 12, 1896, the 116th Street crosstown car line was established from Lexington Avenue to Columbus Avenue and 109th Street. This was the beginning of a great change in that street, for since that time, or at least within the last five years, buildings which have been erected have stores at least on the first floor, and in many instances, one, two and three-story taxpayers, for business only, have been erected. Many of the old type five-story apartment houses have also been altered into stores and offices, at least on the first floor, and this has been more extensive than most people realize. Over 225 stores have been added by this transition. Where the alteration of apartments into stores has not taken place, many of the old private residences and first floors of apartment houses are now used by tailors, dressmakers, milliners, doctors, dental parlors, clubs, schools, etc. Another noteworthy change is that of tearing down old private residences and replacing with large elevator apartment houses with stores, the value of the land having increased so rapidly that owners can easily afford to do so. This is plainly shown, for wherever a crosstown surface line is put through a wide street it almost immediately starts a great change from a resident to a business section, and real estate values in all cases rise rapidly, as stores command a much higher rent than apartments. Rental values have been greatly increased, and 116th Street is becoming more and more a business thoroughfare. Of course, these changes do not occur in a day. They are gradual, but are, nevertheless, the more certain. The fact that so many of these alterations have taken place in so short a time signifies that the change is yet in its infancy. As 125th Street, a much older business street, has the advantage of a car line from river to river which 116th Street has not, it cannot be expected that the change effected in 116th Street shall equal that of 125th Street. Business seldom pre-

cedes a surface line, but it is very noticeable that in sections where there has been little or no business activity, after the establishment of a surface line, flourishing business and increased real estate values ensue. Therefore, every surface line is a decided boon to the public as well as real estate holders—so the more surface lines we have, the better.

125TH STREET

One Hundred and Twenty-Fifth Street is indisputably the uptown business center, where merchants in all lines have located, and they will never regret it either, for they are amassing fortunes. Why is this? Why, just because you can easily reach 125th Street from anywhere. The surface lines will transfer in every direction, be it Harlem or Washington Heights, and the service is excellent, too. One Hundred and Twenty-Fifth Street has not only become a business center, but, peculiarly enough, also an amusement center. Now, what effect has all this had upon the value of real estate on or about this thoroughfare? Well, just so much, that property has doubled and trebled so within the past ten years, that to-day real estate on 125th Street is worth about \$4,000 per front foot, and, in consequence, rents are extremely high. But even at these high rentals, there is never a scarcity of willing and anxious lessees, and if the congestion and demand continues, there is no telling what the rents will be. Let us consider the rental conditions existing on 125th Street: To begin with, leases made this year are considerably higher than ever before. One store, 50 ft. x 100 ft., was leased for twenty-one years at a graduating rental of \$14,000 to \$16,000 per annum, and the lessee sub-let to a Boston shoe merchant half of the store, 25 ft. x 100 ft., at a graduating rental of \$11,000 to \$13,000 per annum. About the same time the southwest corner of Seventh Avenue was leased for twenty-one years at \$13,000 per annum. A 50-ft. store, which five years ago rented for \$7,000 per annum, now finds a ready market at \$15,000 per annum. This great increase in rentals in so short a time is almost unparalleled, and is almost wholly attributable to the excellence of the surface transit facilities.

LEXINGTON AVENUE

In conclusion, I must, in order to complete my story, give you the history of a north and south line. The values of no avenue suffered more than did those on Lexington by its proximity to Third Avenue, which was the principal business thoroughfare of the east side. Beginning as Lexington Avenue does at Twenty-Second Street and Gramercy Park, in a section where there is no special business activity, and ending in the midst of car houses and factories, its possibilities as a thoroughfare were small, but by the opening of a surface railroad in 1895, a great change took place. Residents of West Harlem were enabled to reach any part of the east side as far south as Twenty-Third Street without change of cars, which naturally brought to this avenue people who would probably not have visited it under ordinary circumstances were it not for the Lenox Avenue extension. Stores which until the advent of the new road had lacked tenants were rented and business places already established were enlivened by the increase of visitors. It is significant that for some time prior to the opening of the road there had been no attempt to improve available property on the avenue with stores; but after work was commenced there was a movement in many sections toward such improvement, since which time many operations have been completed of buildings which contain stores, for which tenants were easily secured; and in numerous instances old dwellings, from which the owners derived little profit, have been altered for business purposes, and are now showing their proprietors substantial returns. These conditions are matters of record.

Though Third Avenue still retains a place as a great business thoroughfare, it will be noticed that a better class of stores, and stores that yield more to their owners, are on Lexington Avenue.



### SEMI-CONVERTIBLE CARS FOR NEW YORK CITY

The New York City Interborough Railway Company has lately placed on its lines in the borough of Bronx ten grooveless-post, semi-convertible cars like the one shown in the illustrations, which were built by the J. G. Brill Company. The railway lines in the borough of Bronx were laid out primarily



INTERIOR OF SEMI-CONVERTIBLE CAR FOR NEW YORK

as feeders to the elevated roads and the subway, but considerable local traffic is also handled, as this section has developed to a remarkable extent, and has its own shopping district and business center. The company's system north of the Harlem River covers the lower half of Westchester County, embracing Mt. Vernon, Yonkers, New Rochelle, Mamaroneck, White Plains and Tarrytown. Bronx Park, with its fine zoological and botanical gardens, and Van Cortland Park, with its public golf links, are reached by the lines, and many persons use the cars in fine weather for the pleasant rides through the suburban towns which are along the Hudson River and Long Island Sound.

The form and dimensions of the bottom framing and upper structure of the cars are what the builders consider to be the standard for the length of 28 ft. over the body, with the exception of the straight sides and the fact that the platforms are 5 ft. long instead of the usual, 4 ft. 8½ ins. The extreme length of the car is 39 ft. 8 ins.; extreme width, 18 ft. ¾ ins.; width over the posts, 8 ft., and height from rails to top of roof, 11 ft. 11 9-16 ins. The grooveless-post, semi-convertible window system is too well known to need description, and as the illustrations show the details and general appearance of the type, it is needless to repeat them. Attention, however, is directed to the long transverse seats and wide aisle obtained in this width of car by the absence of window pockets in the side walls. The transverse seats are 35 ins., and the aisle, 22 ins. wide. The longitudinal seats at the corners each take up two windows, a plan which is being adopted by many of the large city systems which use a transverse seating arrangement. The last cars built by the J. G. Brill Company for Philadelphia, Baltimore and Chicago included this arrangement.

The interiors are finished in cherry, stained to a dark color, and the ceilings are of birch veneer, with neat decorations. Brill step-over back-spring cane seats are used, and the platform gongs, sand boxes, brake handles, radial draw-bars, folding gates, angle-iron bumpers and other patented specialties

are of the same manufacture. The trucks are of the No. 27-G-1 type, with 4-ft. 6-in. wheel base and 33-in. wheels. They are capable of a speed of 30 m.p.h.

### CONSTRUCTION AND ELECTRICAL EQUIPMENT BIDS ASKED FOR NEW YORK CENTRAL TUNNEL UNDER THE DETROIT RIVER

Bids for the construction of a double-track tunnel under the Detroit River to connect Windsor, Ont., with Detroit, Mich., have been requested by the New York Central Railroad and will be opened March 8. The advisory board of engineers, which has charge of the engineering and award of contracts, consists of W. J. Wilgus, vice-president, chairman; H. A. Carson, of Boston, and W. S. Kinnear, of Detroit.

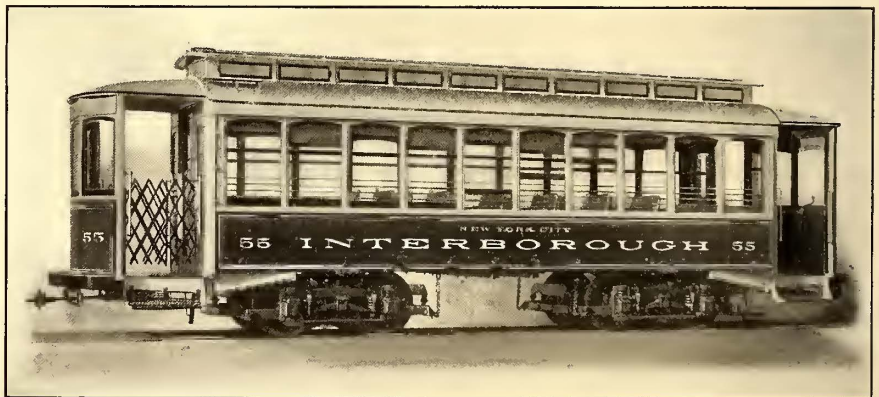
The tunnel will have a length, including approaches, of 12,800 ft., made up as follows: West approach in tunnel, 2135 ft.; subaqueous portion, 2625 ft.; east approach in tunnel, 3100 ft.; total length of tunnel, about 7860 ft.; west open approach, about 1540 ft.; east open approach, about 3400 ft.; total length of approaches, 4940 ft. The grade in the tunnel on the Detroit side will be 2 per cent, and on the Windsor side, 1½ per cent.

The tunnel will be operated by electricity, and bids for the electrical equipment will be called for about Feb. 15.

### SINGLE-PHASE LINE FROM PITTSBURG TO BUTLER

The Pittsburg & Butler Street Railway Company, which plans to build an electric railway from Pittsburg to Butler, Pa., a distance of about 32 miles, has awarded the Westinghouse Electric & Manufacturing Company a contract for the equipment of its lines with the single-phase system. J. C. Reilly is president, and J. R. Buchanan, vice-president of the company. Already the local system in Butler has been taken over and a contract entered into with the Pittsburg Railways Company for the entrance of the company's cars into Pittsburg.

The plan for the interchange of freight which has just been put into effect upon the merged lines connecting Indianapolis with nearby cities and towns is acknowledged to be a great success. Agents have been appointed along the various lines



SEMI-CONVERTIBLE CAR FOR INTERBOROUGH RAILWAY COMPANY OF NEW YORK

and the advisability is now being considered of increasing the freight car equipment. From one source it is said the business has increased more than 50 per cent. An hourly service is now being given over the lines.

The Big Four Railroad Company has decided to build a 5-mile cut-off that will eliminate the prosperous town of Zionsville. The inroads made by the Indianapolis & Northwestern Traction Company on the Big Four's traffic have made it unprofitable for the steam line to maintain a station at Zionsville.



**A NOVEL CASH FARE RECEIPT TICKET**

Corresponding to the losses sustained by street railways from "knocked-down" fares and illegitimate transfers, the interurban railway frequently suffers from the improper accounting of fare tickets, riding beyond stations paid for, etc. To cut down such losses to a minimum, besides simplifying the work of the conductor and auditor, the Globe Ticket Company, of Philadelphia, has just brought out a new cash fare receipt ticket, designed by W. C. Pope, the vice-president of this company.

This ticket gives an accurate and absolute check on both the passenger and the conductor, the money collected and the ride

the conductor. The station letter shown on the notch projection opposite the starting station, taken in connection with the highest amount left on the passenger's receipt portion, shows by the table arrangement at a glance the amount of fare collected and the stations between which the passenger has ridden. It will therefore be seen that this novel ticket is quickly issued, easily understood and hard to beat.

**SALE OF AN OHIO RAILWAY**

The Cleveland & Sharon Traction Company has been sold by the Eastern Construction Company and the Cleveland & Sharon

GLOBE TICKET COMPANY, PHILA., PA. NOTCH PROJECTION	<b>XYZ TRACTION CO.</b> <b>100852</b> AUDITOR'S STUB To be turned into office with receipts Tear off on line to LEFT of fare collected with notch in line with starting station on passenger's receipt portion, leaving destination station letter on the projection so passenger's receipt shows by highest figure remaining amount passenger has paid, and stations between which fare is collected. JOHN DOE, Gen'l Supt. Pope Patent July 11, 1905	<b>WEST BOUND</b> J Summers I Jones Valley H Bull Run G Bellacks F New Hope E Baldwins D H Corners C Millers B Post Office A Browns	45 CTS. 40 CTS. 35 CTS. 30 CTS. 25 CTS. 20 CTS. 15 CTS. 10 CTS. 5 CTS.	A B C D E F G H I	<b>WEST BOUND</b> J Summers I Jones Valley H Bull Run G Bellacks F New Hope E Baldwins D H Corners C Millers B Post Office A Browns	<b>XYZ TRACTION CO.</b> <b>100852</b> PASSENGER'S RECEIPT Show when called for Highest amount in upper left hand corner denotes fare paid. Station letter shown on projection in line with starting station shows destination. Good day and date indicated only. JOHN DOE, Gen'l Supt. Pope Patent July 11, 1905	<b>DAYS</b> 1 11 22 2 12 23 3 13 24 4 14 25 5 15 26 6 16 27 7 17 28 8 18 29 9 19 30 10 20 31 JUNE NOV. DEC. MAY APR. OCT. MAR. SEPT. FEB. AUG. JAN. JULY
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FIG. 1.—COMPLETE TICKET

to which the passenger is entitled, as well as a perfect record for the auditing department. Neither the auditor's report stub nor the passenger's receipt portion can be manipulated by unscrupulous passengers or conductors without detection. Fig. 1

Traction Company to the Eldenbel Construction Company, of New York City. The Traction Company is in course of re-organization and will be known as the Cleveland & Sharon Electric Railway Company.

GLOBE TICKET COMPANY, PHILA., PA. NOTCH PROJECTION	<b>XYZ TRACTION CO.</b> <b>206347</b> AUDITOR'S STUB To be turned into office with receipts Tear off on line to LEFT of fare collected with notch in line with starting station on passenger's receipt portion, leaving destination station letter on the projection so passenger's receipt shows by highest figure remaining amount passenger has paid, and stations between which fare is collected. JOHN DOE, Gen'l Supt. Pope Patent July 11, 1905	<b>EAST BOUND</b> A Browns B Post Office C Millers D H Corners E Baldwins F New Hope G Bellacks H Bull Run I Jones Valley J Summers	45 CTS. 40 CTS. 35 CTS. 30 CTS.	J I H G F
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25 CTS. 20 CTS. 15 CTS. 10 CTS. 5 CTS.	<b>EAST BOUND</b> A Browns B Post Office C Millers D H Corners E Baldwins F New Hope G Bellacks H Bull Run I Jones Valley J Summers	<b>XYZ TRACTION CO.</b> <b>206347</b> PASSENGER'S RECEIPT Show when called for Highest amount in upper left hand corner denotes fare paid. Station letter shown on projection in line with starting station shows destination. Good day and date indicated only. JOHN DOE, Gen'l Supt. Pope Patent July 11, 1905	<b>DAYS</b> 1 11 22 2 12 23 3 13 24 4 14 25 5 15 26 6 16 27 7 17 28 8 18 29 9 19 30 10 20 31 JUNE NOV. DEC. MAY APR. OCT. MAR. SEPT. FEB. AUG. JAN. JULY
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FIG. 2.—AUDITOR'S AND PASSENGER'S RECEIPT, PORTIONS OF AN ISSUED TICKET

shows a complete ticket, and Fig. 2 an auditor's and passenger's receipt portions of an issued ticket. For example, this ticket is shown as issued to a passenger riding on an eastbound car from H Corners to Jones Valley, the fare being 25 cents. The highest amount in the upper left-hand corner of the passenger's re-

The main office will be in the New England Building, Cleveland, Ohio, and the company is now in the market for rails, ties, poles, boilers, etc. Francis B. Morgan is the temporary purchasing agent.

**THE ERIE RAILROAD ELECTRICAL COMMISSION**

It has been known for a long time that the Erie Railroad has been studying the possibilities of electric traction for its suburban service in the neighborhood of New York City, but that the equipment of these lines has been delayed for a number of reasons, among them the construction of an open cut in place of the present Jersey City tunnel and the rearrangement of the terminal station at Jersey City. Nevertheless, the directors of the company have recently authorized Vice-President Graham to organize an electrical commission to study the subject in detail, and it is thought that one of the branch lines, either the Northern Railroad of New Jersey or the Greenwood Lake division, will be equipped with electricity within the next year. The electrical commission, which was appointed Feb. 2, consists of the following: J. M. Graham, vice-president, chairman;



FIG. 3.—NOTCHED DETACHER USED IN CONNECTION WITH NEW TICKET RECEIPTS

ceipt portion shows the fare collected, and the projection made when issuing by the notched detacher, Fig. 3, shows plainly printed on it the letter I opposite the station H Corners, which is the place the passenger got on. This letter I is the station letter for Jones Valley, or the place to which the passenger has paid fare. Thus it will be seen the table automatically checks



Bion J. Arnold; L. B. Stillwell; E. A. Williams, general mechanical superintendent; A. J. Stone, assistant general manager; C. H. Morrison, acting electrical engineer and secretary of the commission.

The commission will make a study of the proper system to be adopted and will report to the directors.

### A NEW INSULATING MATERIAL

After experiments extending over a period of five years, followed by a series of careful and extensive tests under all possible conditions by the Electrical Testing Laboratories, of New York, a remarkably high potential insulating material, named Voltax, has been placed on the market by the Electric Cable Company, of New York. Aside from the important fact that it can be manufactured and sold at about 20 per cent less than the ordinary rubber insulation, the tests mentioned have shown that its chemical and physical properties are such as to make it well suited for the most difficult situations which an insulating material must meet. Briefly capitulated, the principal merits of this material are: lower cost; high insulation resistance; neutral chemical qualities, which make it absolutely impervious to atmospheric conditions, moisture, acids or alkalis, and consequently give indefinite retention of elasticity and insulating properties; may be subjected to severe tension and bent at short angles without affecting it in any way; will not drip under 250 degs. F.; and as it has no corrosive effect upon copper, it is unnecessary to tin the wire before applying the insulating compound.

To demonstrate conclusively the exact qualities of this material, three tests were made on four samples of wire submitted. Each wire was wrapped with a different number of layers of cotton tape impregnated with Voltax. These trials, as the following data show, demonstrated the high potential capacity, insulation resistance capacity, as well as the melting point and carrying capacity determined by the dripping of the insulating material. A notable fact in connection with these tests is that they were made on hand-taped wires, which, of course, could not be expected to give such good results as would be obtained with the machine-taped wires which the company is now able to supply. It should also be noted that all of these samples had an extremely thin wall of insulation. The material furnished by this company for commercial use can have the thickness of wall of insulation increased to such an extent that no voltage ever generated for commercial use can puncture the insulation. This can be accomplished by simply adding more impregnated tapes.

The high potential tests were made with one ½-kw, 10,000-volt transformer or more in series. In all cases the pressure was raised gradually from a low point until puncture occurred. The pressure was applied to the samples of wire between the copper and the tin foil wrapped tightly around it. The compound was melted also into sheets and tested between 1-in. circular discs just touching either surface. All the voltage values given in the following Table I. are virtual and not maximum:

TABLE I.

Sample	Volts at Puncture	Average Volts of Several Samples
No. 1. One layer of tape—Lowest....	2,500	4,390
Highest .....	7,000	
No. 2. Two layers of tape.—Lowest..	4,000	8,300
Highest .....	10,500	
No. 4. Four layers of tape—Lowest..	27,600	27,750
Highest .....	27,900	

The total insulation of the last sample consisted of four layers of impregnated tape and dry tape, measuring only 84 mils in thickness. A sample covered with six impregnated tapes and a dry tape, after being immersed in salt water for seventy-two consecutive hours, presented a resistance of 23,000

ohms, thus showing that even salt water has no effect whatever upon this insulation.

The material for commercial application will be manufactured with any desired number of impregnated tapes, covered with a jute braid, hard finish, thus adding sufficiently to the resistance to withstand any commercial voltage.

Table II., given herewith, is the record of a high potential test of two wires covered with tape impregnated with Voltax after a trial of their carrying capacity:

TABLE II.

Sample	Volts at Puncture	Average Volts
1 tape—Lowest .....	2,000	2,050
Highest .....	2,100	
4 tapes—Lowest .....	27,600	27,750
Highest .....	27,900	

The tests made on the sheets of this compound are recorded in Table III., herewith:

TABLE III.

Sheet	Volts at Puncture	Thickness	Volts Per Mil.
Lowest ....	20,000	75 mils.	267
No. 1. Highest ....	25,500	75 mils.	344
No. 2.	22,500*		
No. 3.	30,000	105 mils.	286
No. 4.	30,000		

\* Arced over edges, but did not puncture.

With reference to the foregoing Table III., it may be added that sheet No. 3 withstood 30,000 volts for 10 seconds, while No. 4 withstood the same voltage for 1 minute without puncture.

For the insulation resistance tests a copper wire was covered with six layers of tape impregnated with Voltax and placed in salt water. Its insulation resistance was measured by the usual galvanometer method after several periods of immersion. The insulation resistance of the compound made in thin sheets was also measured. In both cases the resistance was in thousands of millions of ohms, and hence it was practically impossible to determine exact figures.

The corporation now making this compound is, as noted above, the Electric Cable Company, which was formed recently to succeed the Magnet Wire Company and the Peerless Electric Company, both of New York. Details regarding the organization of this company were published on page 219 of the STREET RAILWAY JOURNAL of Feb. 3, 1906.

### DETAILS OF ELECTRICAL EQUIPMENT FOR THE BOSTON ELEVATED

With the increased traffic on the elevated lines of Boston's street car system, it has become necessary to augment the present rolling stock. The satisfactory operation of the previous car motors bought from the General Electric Company two years ago, led to the purchase of the forty-five additional equipments from the same company. Each of these equipments consists of two GE 68, 175-hp motors with the Sprague-General Electric multiple-unit control. In addition, the present elevated cars are to be provided with similar control systems to take the place of the older type of control, and 153 Sprague-General Electric type M controllers have been bought for this purpose. Another device with which the Boston Elevated Company is about to equip its elevated system is an electrically-operated circuit breaker. This automatic switch, in addition to opening in the ordinary manner under an overload, can be set or tripped from a button in the motorman's cab. More than 175 of these new circuit breakers have been purchased from the General Electric Company.

The equipment for the East Boston tunnel will also be increased. For this purpose fifty two-motor GE 73, 75-hp car equipments have been ordered. These, like the elevated equipment, will be controlled by the type M apparatus, which has proved so universally successful.

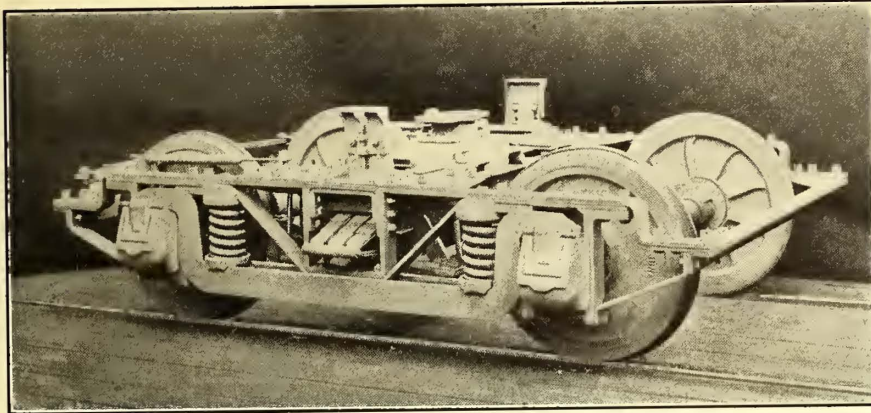


**TRUCKS FOR THE ROCHESTER, SYRACUSE & EASTERN**

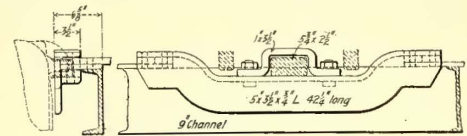
In the account of the track construction of the Rochester, Syracuse & Eastern Railway, published in the STREET RAILWAY JOURNAL for Dec. 16, 1905, there was a short reference to the trucks and rolling stock. A side and end elevation, a cross section and side view of one of the trucks are presented herewith. The truck is interesting principally from the fact that it is representative of the increasing tendency of heavy high-speed electric lines to use the essential features of the Master Car Builders' steam railroad truck, with such modifica-

of steel angle, which are secured to and supported by the pedestal braces.

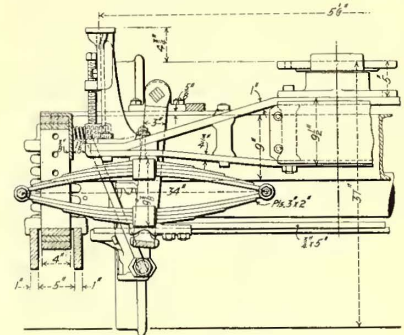
The bolster transoms are double steel channels 9 ins. deep, rigidly secured to the top frames and truss members. The bolster is constructed of two steel members; the upper 12 ins. x 1 in., and the lower 12 ins. x 3/4 in. The upper and lower members of the bolster are secured together by bolts and braces of heavy section metal. The top and bottom center plates are of cast steel. The bolster is supported upon six full elliptical



TRUCK FOR THE ROCHESTER, SYRACUSE & EASTERN RAPID RAILWAY



MOTOR SUSPENSION

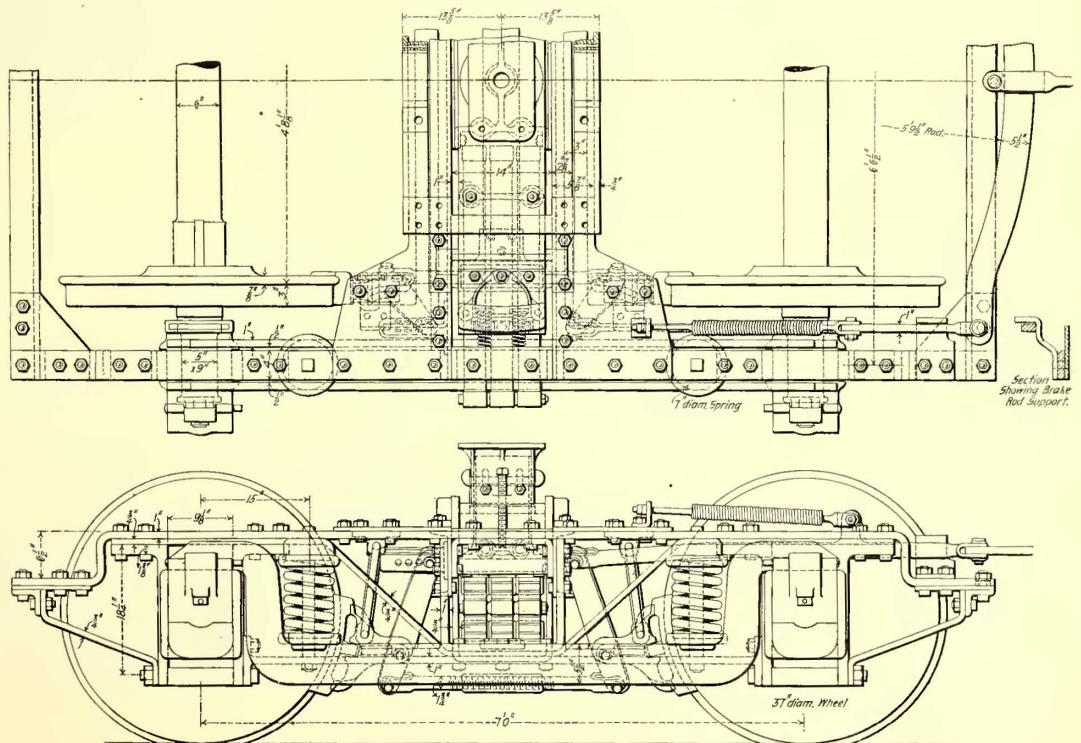


SECTION THROUGH BOLSTER

tions as are necessary to adapt the truck for heavy high-speed motor service. The truck was designed by R. A. Dyer, Jr., mechanical engineer of the railway company, and E. G. Long, of New York, formerly with the Peckham Company, and was built by the J. G. Brill Company. It will carry two Westinghouse No. 119 motors. The trucks will carry a car body measuring 46 ft. over corner posts, 55 ft. over all, and 8 ft. 3 ins. over sills.

springs, three at each end. Each spring is 3 ins. wide x 34 ins. long x 9 3/8 ins. high. The coil springs, secured between truck frame and equalizing bars, are each 7 ins. in diameter x 10 7/8 ins. high, with suitable inner coils, these springs being made of proper strength to give, in combination with the triple elliptical bolster springs, a very easy riding car under all conditions of

The entire weight of the equipment is made up as follows: Weight of trucks, 24,000 lbs.; weight of motor equipment, 21,180 lbs.; air brake equipment, 2600 lbs.; car body only, 33,000 lbs.; weight of car without load, 80,780 lbs.; average passenger load, 10,000 lbs.; total weight of car loaded, 90,780 lbs. The main dimensions of the truck follow: Diameter of wheels on tread, 37 ins.; width of wheel tread, 3 ins.; depth of wheel flange, 7/8 in.; diameter of axles, 6 ins.; diameter of gear seat on axles, 7 1/16 ins.; diameter of journals, 5 ins.; length of journals, 9 ins.; length of wheel base, 7 ft.; gage of track, 4 ft. 8 ins., and gage of wheels, 4 ft. 8 1/8 ins.



SIDE ELEVATION AND PART PLAN VIEW OF TRUCK

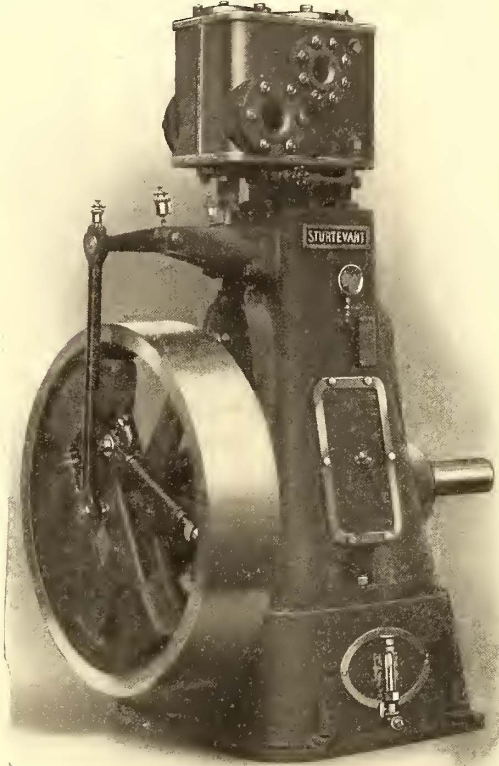
The truck frames are of forged steel throughout, and are composed of a top frame of steel 4 ins. wide and 1 in. thick, truss members of steel 4 ins. x 3/4 in., and lower members of steel 4 ins. x 1/2 in., for rigidly securing in position the yokes or pedestals within which the journal boxes are secured. The equalizing bars are 5 1/2 ins. x 1 in., and the ends of the frame are reinforced by heavy pieces

load. The brakes are of the M. C. B. type, and the brake-shoes and heads of the "Christie" pattern. The journal boxes are also of the M. C. B. pattern, except that they are made deeper, so as to hold more lubricant, and the lugs securing the bearing and wedge are stronger, to endure the increased thrust of axle due to its carrying a heavy motor.



### A VERTICAL ENGINE USING FORCED LUBRICATION

The B. F. Sturtevant Company, of Hyde Park, Mass., has just brought out a line of new vertical high-speed automatic engines, known as class VS5. A system of forced lubrication and the complete enclosure of the moving parts provide for continuous operation for weeks at a time without attention, and insure perfect reliability even in the hands of the unskilled. These engines are especially designed for the driving of direct-connected generators. Lubrication for all bearings is provided by a submerged oil pump in the base. This pump is operated by the crankshaft, and acts against a pressure of



VERTICAL ENGINE USING FORCED LUBRICATION

from 10 lbs. to 20 lbs. per square inch. Centrifugal oil guards located on the shaft just where it passes through the casing, together with the enclosing frame and the watershed partition, insure perfect cleanliness and absolutely prevent the escape of the oil, which is continuously repumped to the bearings. Another important and distinctive feature of this engine is a watershed partition, which prevents water from the piston-rod stuffing box mixing with the lubricating oil in the case, and at the same time makes impossible the passage of oil from the enclosing frame to the interior of the cylinder. The piston-rod stuffing box may be readily adjusted without opening the case. This watershed partition forms a part of the enclosing frame, which protects the parts from dirt and accident, insures economy and eliminates the necessity of frequent attention; but the removable oil-tight plates or covers make the parts as accessible as in the open type of engine.

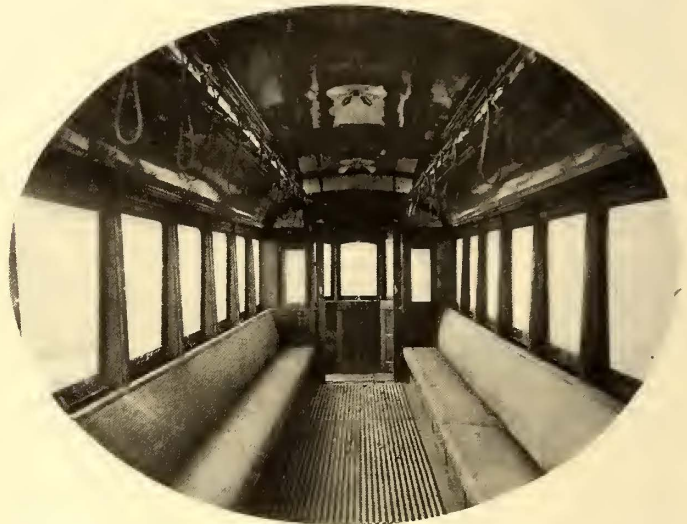
The cylinder, with which is cast the valve chamber, is provided with relief valves, which, by opening automatically at any predetermined pressure, prevent possible damage by water. A planished sheet-iron cylinder casing enclosing a thick layer of asbestos greatly reduces condensation. The flow of steam to and from the cylinder is controlled by a perfectly balanced piston valve, the snap rings of which insure tightness, and the

bushing in which it moves may be easily replaced when worn. A Rites fly-wheel governor alters the cut-off by changing the valve travel, permitting only  $1\frac{1}{2}$  per cent variation in speed between no load and full load. The hollow cast-iron piston, strengthened by internal ribs, is fastened to the piston rod by a forced taper fit, secured by a nut.

Open-hearth steel is the material from which are forged the piston rod, connecting rod and crankshaft, each from a single piece. The composition boxes of the connecting rod are lined with Sturtevant white metal hammered in and accurately bored; the cast-iron cross-head is equipped with adjustable shoes and a nickel-steel wrist pin, and the crank pin is of unusually large size.

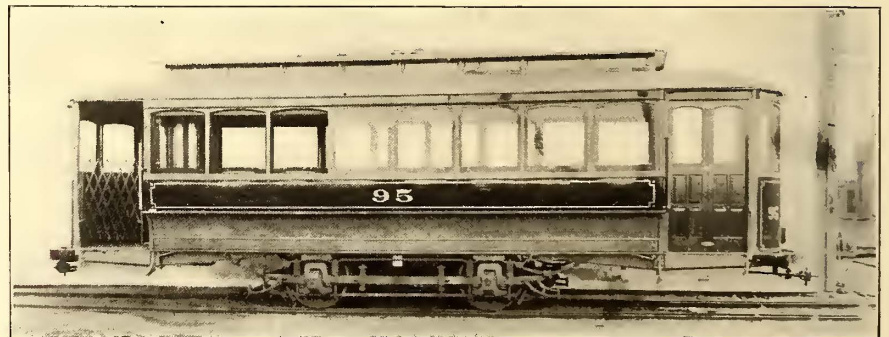
### NEW EQUIPMENT FOR THE SPRINGFIELD CONSOLIDATED RAILWAY

The car illustrated is one of a number lately delivered to the Springfield Consolidated Railway Company, of Springfield, Ill., by the American Car Company. The builders furnished to the



INTERIOR OF SPRINGFIELD CAR, SHOWING LONGITUDINAL SEATING

Springfield Company a lot of cars of a similar type about a year ago, and previous to that built several convertible cars of the Brill type. The railway company now operates nearly seventy cars on its 28 miles of track.



TYPE OF CAR ADOPTED BY THE SPRINGFIELD CONSOLIDATED RAILWAY CO.

The new cars measure 22 ft. over the bodies and 32 ft. over the vestibules; width over the sills, including the plates, 6 ft. 3 ins., and over the posts at the belt, 7 ft.  $5\frac{1}{2}$  ins.; sweep of the posts,  $7\frac{3}{4}$  ins.; distance from the center to the center of the side posts, 6 ft.  $8\frac{1}{4}$  ins.; height from the floor to the ceiling, 7 ft.  $11\frac{5}{8}$  ins.; from the track to the under side of the side sills, 2 ft.  $2\frac{5}{8}$  ins., and from the under side of the side sills over the trolley board, 8 ft. 11 ins.; from the track to the platform step,  $15\frac{1}{4}$

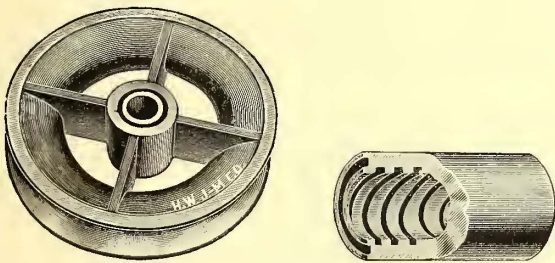


ins., and from the step to the platform, 12 ins. The side sills are  $3\frac{3}{4}$  ins. x 7 ins., with 7-in. x  $\frac{1}{2}$ -in. plates on the outside; end sills,  $3\frac{1}{2}$  ins. x 6 ins.; thickness of the corner posts,  $3\frac{3}{4}$  ins., and of the side posts,  $1\frac{3}{4}$  ins.

The seats are placed longitudinally and are upholstered in spring rattan. Cherry of natural color constitutes the interior finish, with ceilings of neatly decorated birch veneer. The bronze trimmings are of generous dimensions. The platforms are 5 ft. long instead of 4 ft. 6 ins., which is usual in single-truck cars. Folding gates are used in addition to the vestibule doors. The doors are controlled by an automatic device which prevents them from swinging free. This device is of Brill manufacture, as are also the folding gates, platform gongs, signal bells, angle-iron bumpers, etc. The cars are mounted on No. 21-E trucks, with 8-ft. wheel base and 33-in. wheels. The trucks, it is claimed, will carry these extra long car bodies at speeds of from 15 m.p.h. to 20 m.p.h. without oscillation.

### PURE COPPER TROLLEY WHEELS

In the manufacture of trolley wheels such materials as arsenic, antimony, bismuth, tin, lead and spelter are frequently combined with copper, and these elements, even though used only in very small quantities, seriously affect copper as a conductor of electricity, renders the metal harder and greatly diminishes its ductility. As a result the trolley wheels cut the wire and both the wheels and the overhead construction require more frequent replacement. To obviate these difficulties, the H. W. Johns-Manville Company has recently placed on the market a new wheel made of absolutely pure copper, which is purified, hardened and made tough by a special treatment devised by this company. These wheels have been subjected to severe tests in actual service, and have, it is claimed, demonstrated their superiority over all other types. The salient feature of the J-M pure copper wheel that appeals to the operating railroad man is economy, as the mileage is stated to be far greater than heretofore obtainable by the use of any other metal or com-



TROLLEY WHEEL AND BUSHING

bination of metals. These wheels wear evenly and will not pit, arc or burn.

In the manufacture of these wheels the pure lake copper used is treated chemically to reduce to a minimum any ingredients there may be in the copper in its crude state, and by a further chemical process to exclude the action of the atmosphere. The copper is subjected to the action of carbon to remove the oxygen to render the copper solid when cast, thus increasing its malleability and durability. An additional process toughens the metal without hardening it, and the result is that the wear is reduced to a minimum and the conductivity of the wheel made equal to that of the wire.

These wheels are furnished with the J-M special trolley wheel bushings, which are made from a metal peculiarly adapted for this purpose. The tenacity of this metal is equal to mild steel, with a compressive strength of about 130,000 lbs. per square inch. Its ductility and toughness are such that it will not crack when distorted by this load. It is much harder than a gold coin, and when placed in a position where it is subjected to heat will not harden, and is therefore less susceptible

to wear. These bushings are packed with a packing, which is stated to be not only anti-frictional, but also an excellent lubricant.

### LONG-DISTANCE LIMITED SERVICE IN OHIO AND INDIANA

Within the next two or three months the possibilities for long-distance, high-speed travel in Ohio and Indiana will be greatly improved and trips of 200 miles to 300 miles at speed closely approximating that of the best steam trains will be made possible. A number of roads which heretofore have had connection and have operated local service only are now arranging to put on limited service in the very near future, and by mutual agreement their schedules are being arranged so that the layovers in connecting cities will be very short; in most cases they will be just long enough to insure connections. The opening of the line between Findlay and Lima has greatly increased the possibilities for this through traffic, and as soon as this new track can be ballasted the through limited service will be extended greatly. The details of some of these new services are interesting.

Beginning March 1 the Fort Wayne, Van Wert & Lima Traction Company will institute limited train service between Fort Wayne and Lima. There will be four cars each way daily, making the 65 miles in 1 hour and 45 minutes. In Lima close connections will be made with the "Lima Limiteds" of the Dayton & Troy and Western Ohio lines, which make the 80 miles between Dayton and Lima in 2 hours and 35 minutes, making possible a trip from Dayton to Fort Wayne, 145 miles, in 4 hours and 20 minutes. At Fort Wayne these cars will make connection with limited cars over the Fort Wayne & Wabash Valley and the Indiana Union Traction Company, which will make 135 miles from Fort Wayne to Indianapolis, via Peru, in 4 hours and 20 minutes.

By April 1 it is expected that the Findlay-Lima line will be in shape for high-speed service, and at that time the "Lima Limiteds" will be extended through to Toledo over the Toledo, Bowling Green & Southern. The distance from Dayton to Toledo is 162 miles, and a schedule of 5 hours and 30 minutes has been arranged for.

Within the next thirty days the Detroit, Monroe & Toledo Short Line will start its limited service between Detroit and Toledo, making the 60 miles in 2 hours. Close connection will be made in Toledo with the "Lima Limiteds," which will give a service of 7 hours and 30 minutes for 222 miles.

Before the middle of the summer the Cincinnati Northern will start a limited service between Cincinnati and Dayton, and with the schedule arranged for it will be possible to travel from Cincinnati to Detroit, 275 miles, in 9 hours and 30 minutes.

Last Saturday representatives of the Detroit, Monroe & Toledo; Toledo, Bowling Green & Southern; Western Ohio; Dayton & Troy, and Fort Wayne, Van Wert & Lima companies met in Toledo to work out plans for handling through passenger and freight business on these connecting lines, which in the future will work under an agreement known as the "Lima Route." Rates and schedules for both passenger and freight service were discussed. A committee composed of C. C. Collins, general freight agent of the Western Ohio, and C. M. Paxton, traffic manager of the Dayton & Troy, was appointed to work up necessary schedules and submit them to the various managers at a later meeting. By the agreement there will be a perfect understanding between the various roads and tickets will be sold and freight shipped to all points between Detroit, Toledo, Lima, Dayton, Springfield, Columbus, Cincinnati, Newark, Ohio; Richmond, Ind.; Indianapolis Fort Wayne, Logansport and numerous other towns in Indiana. Much of this has been done in the past, but some of the roads have had different methods of handling the business. Now the methods will be made uniform and schedules will be arranged so that fast through freight will be possible.



### A NEW VARIABLE-SPEED MOTOR

The Lincoln Electric Manufacturing Company, of Cleveland, is introducing a new variable-speed motor for stationary work, which was designed by John C. Lincoln. The method of obtaining speed variation is unique in that it is obtained by withdrawing the armature from the influence of the field poles. The motor is of the ordinary shunt-wound type, the shunt-field wind-

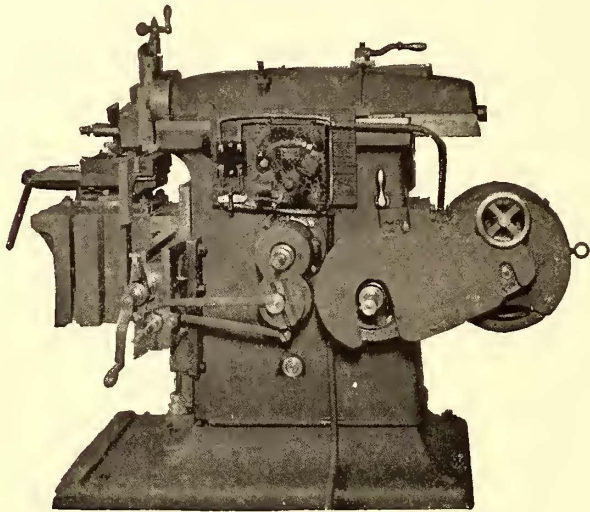


FIG. 1.—SHOWING 2-HP MOTOR MOUNTED AT SIDE OF 16-IN. SHAPER

ings being connected in series, and the armature is wound as an ordinary armature in any shunt-wound motor. Means are provided for moving the armature in and out between the pole pieces. As the armature is withdrawn the magnetic flux decreases and the magnetic resistance increases, the result being increased speed. The armature is slightly larger at one end than at the other. The use of the conical-shaped armature makes it possible to obtain a more rapid change in speed with a given lateral movement than with a cylindrical armature.

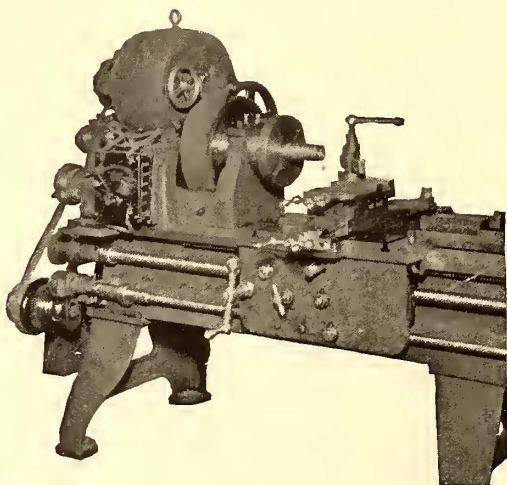


FIG. 2.—VARIABLE-SPEED MOTOR ON 16-IN. LATHE

With the conical armature the withdrawal of the armature decreases the area of the air gap in the same proportion as it would if a cylindrical armature was used, but at the same time it increases the length of the air gap, which would not occur with the cylindrical armature. Thus the increase in the resistance of the air gap is more rapid with the conical armature than with the cylindrical armature, so that a given variation in speed can be more rapidly obtained with a conical than with a cylindrical armature.

Special series-wound commutating poles are provided be-

tween the main field poles, and the armature comes under the influence of these as it is withdrawn into its positions of high speed, the result being, it is claimed, sparkless commutation at all speed and loads.

The particular advantage claimed for this type of motor over motors using the field weakening method of control is in the wide range of speed which can be obtained with this construction. A hand wheel is used in connection with a screw mechanism, and by means of this wheel it is possible to get any range of speed of which the motor is capable. This is of great advantage in machine-tool work, as the machinist can increase or decrease the speed as he desires, at the same time giving his entire attention to his work. A variation of 10 to 1 is provided on many of these motors, and a wider variation can be obtained if desired. The wide speed variation is due to the fact that there is no more distortion of the main flux at high speeds than there is at low speeds, because the full field strength is used, no matter what the motor speed may be.

The commutator end of the armature is supported by a thrust bearing. This is made solid and has ample oil space, and as it is fitted with a cap to retain the oil, it will run for several weeks without attention. The brushes are carried on the thrust bearing, and as the bearing, armature and commutator all move together, there is no relative lateral movement between the commutator and the brushes. A coil spring is used to counterbalance the magnetic pull on the armature, greatly facilitating the ease with which speed adjustments are made. On the thrust bearing is a scale on which the approximate speed of the motor is indicated.

It is claimed that at all speeds the motor can be overloaded 100 per cent without sparking, and at low and intermediate speeds it will carry for a short period even a greater overload. A special advantage is the fact that the motor will run in either direction with like results. It is built for 110-volt, 220-volt and 500-volt direct-current circuits. All speeds are obtained with one voltage from an ordinary two-wire circuit. The fields and armature coils are shaped and treated so as to provide the best ventilation and heat radiation, so that notwithstanding the small size and weight of the motor, the heating even at high speeds is well within the margin of safety. The efficiency is claimed to be very high and the capacity throughout the range is constant.

The Lincoln Company has fitted up a factory and it is utilizing its motors on a number of machine tools which were not designed for direct electric drive. Fig. 1 shows a 2-hp 5 to 1 motor mounted on a 16-in. shaper being attached at the side of the machine and connected by a silent chain. Fig. 2 shows a similar motor mounted on a 16-in. lathe and geared directly to a speed pulley, the main shaft passing through the field frame. In every case the hand wheel for regulating the speed by shifting the armature is close to other controlling levers on the machine tool, so that the operator need not move from his position or have his attention taken from his work in varying the speed.

### ATHENS-PIRAEUS STEAM AND HORSE LINES TO BE CONVERTED FOR ELECTRIC OPERATION

Consul Horton, of Athens, reports on the electric tramway extension for Athens and Piræus, to be developed from the present horse and steam system by Franco-Belgian capitalists. Delay was caused in granting the new concession because of the change in the Greek ministry, all such matters having to be ratified by the Chamber of Deputies. The present 25-mile line will be transformed into a 30-mile electric line, with 60 per cent of it double-tracked. The electrical apparatus will be American pattern, manufactured in Paris by the French Thomson-Houston Company. Further information can be secured from G. Sacco Albanese, care the Greek Electric Company.



**GENERAL ELECTRIC STRAIGHT AIR-BRAKE EQUIPMENT**

The General Electric Company has recently placed upon the market a complete line of air-brake equipments to meet the demands of all classes of electric railway service. Owing to its close relation to electric railway development since its inception, the air-brake apparatus now offered is the result of a long experience and careful study of the requirements of electric traction service. The straight air-brake equipment combines the essential features of positive control, simplicity and ease of manipulation, and has consequently been almost universally adopted as standard for motor cars, operating singly or occasionally hauling one or two trailers. The standard straight air-brake equipment consists of the following: Motor compressor, suspension cradle, air compressor governor, motorman's valves with removable handles, brake cylinder, reservoir with hangers and drain cocks, safety valve, gages and exhaust mufflers.

The compressor is very compact and self-contained, and the motor is made strictly in accordance with the standard practice of the General Electric Company in railway motor construction. The four-pole cast-steel magnet frame extends in both directions to form a complete box-shaped covering for the armature and field coils. All bearings are supplied with dustproof doors to provide perfect protection from dust, and at the same time render all parts immediately accessible for inspection. Herringbone gearing with a removable protecting case is provided, assuring comparatively noiseless operation and long wear. The wearing qualities of the compressor are further assured by straining all entering air through curled hair filters, thus excluding dust and other foreign substances. All parts of the motors and compressors of the same size are interchangeable. Careful provision has been made for the lubrication of all bearings, and the enclosed construction affords complete protection from water and dust. The compressor is supported in a cradle in any convenient place beneath the car. Several sizes of compressors are manufactured to meet any requirement.

To govern the intermittent action of this motor compressor a governor is furnished. This may be located in any convenient place beneath the car or within the car itself, as it is dust, snow and waterproof, and is also of small size. Briefly, this governor consists of a flexible diaphragm and plunger, which operates a pair of contact fingers through a double system of levers. These open and close the circuit in response to the variation in pressure upon the diaphragm. The double series of levers renders the action of the fingers quick-breaking and positive, and a strong magnetic blow-out effectually extinguishes the arc formed on opening the circuit. All parts of this governor, subject to wear, are easily renewable, and the construction, together with the absence of valves of any sort, insures the utmost reliability of action.

To control the admission of air into the brake cylinder an improved form of motorman's valve is employed. These valves have been specially designed to meet the requirements of the hard service and rough usage to which they are put. Two forms are manufactured, namely, types S and SS, the latter differing only in construction from the first in that it has an auxiliary valve for admitting air to pneumatic sanders. This is operated by a press button located in the handle, so that the operator can apply the sand during braking or running without removing his hand from the handle. As these valves, from the nature of their service, are subjected to wear, special attention has been paid to the wearing surfaces, which are designed to keep in proper alignment and to facilitate even wear, and also to permit regrinding them when that becomes necessary. These motorman's valves are furnished either of the slide or rotary types. The brake cylinders supplied with these equipments have been designed with a view of incorporating such features as have been found to be most satisfactory in the past, and which, therefore, have become almost universal standards. The cylinders are fitted with tubular piston rods, which

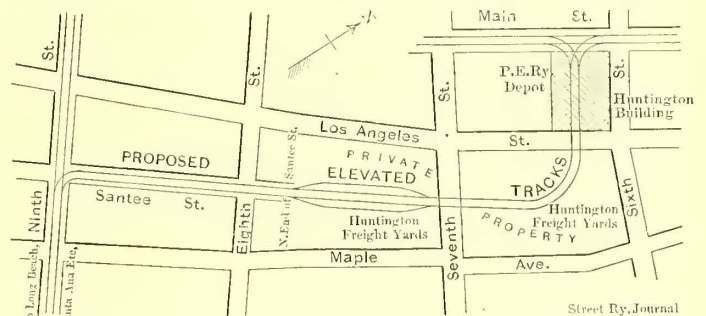
surround the push rods to which the brake levers are connected. These push rods are so arranged as to move within the hollow piston rods when the brakes are applied by hand.

The accessory apparatus of this straight air-brake equipment exhibits the same care and attention to detail as the main features above outlined. The reservoirs are made of a special grade of steel. A 1/2-in. drain cock of substantial construction is furnished with each reservoir; this is fitted with a lever handle. Mufflers are provided to deaden the noise of the exhaust when brakes are released. These do not interfere in any way with the free release of the brakes. In addition to the parts outlined, when two or more motor cars are equipped with the straight air-brake equipment, couplings for reservoir lines between cars are provided, as well as special governors for simultaneous starting and stopping of the car compressors. These retain the same desirable features at the M. C. governor.

The General Electric Company also furnishes automatic equipments and combined straight and automatic air-brake equipments to meet the requirements of all classes of service.

**ELEVATED TRACKS FOR LOS ANGELES**

The accompanying map shows the route to be traversed by Los Angeles' first elevated railway, which, by reason of the enterprise of Henry E. Huntington, will be built by the Pacific Electric Railway Company to relieve car congestion on Main Street. According to the company's engineers, another important reason for building the elevated tracks is the desire to save all the time possible in the interurban service. All the lands necessary for carrying out the project have been acquired and no time will be lost in putting the plans into effect.



LAYOUT OF PROPOSED ELEVATED TRACKS FOR LOS ANGELES

It is proposed that the new system shall be in operation in little more than a year. The map indicates that the elevated tracks will begin at Ninth Street and run in a northerly direction along Santee Street to a point, and thence westerly into the great Pacific Electric Depot building through its entrance on Los Angeles Street. The installation of such a system will remove from Main Street all the interurban traffic of the Pacific Electric Railway Company to San Pedro, Long Beach, Alamitos Bay, Huntington Beach, Newport Beach, Whittier and Santa Ana.

In the annual report of the Capital Traction Company, of Washington, were given some interesting statistics relative to the character of the accidents to people in which the company's rolling stock figured during the year just past. It appears that 403 persons were injured more or less seriously in the twelve months. Of these, 241 were hurt because of a failure of the passengers or the car crews to observe the rules of caution. Of this number, 139 were hurt while stepping off moving cars, 78 while attempting to board moving cars, 18 through the starting of the car while alighting, and 6 by the starting of the car while boarding. Thus of the 241 persons injured in this general manner during the year, 217 were hurt through their own carelessness, assuming that in every case the passenger was at fault when hurt while trying to board or to leave a moving car.



## FINANCIAL "INTELLIGENCE"

WALL STREET, Feb. 7, 1906.

### The Money Market

There has been no appreciable change in the monetary situation during the past week. It is true that the local institutions have lost substantial amounts of cash as a result of their operations with the sub-treasury, and by the shipments of moderate amounts of gold to Argentina, but these losses have not been sufficient to cause any hardening in the rates for either call or time accommodations. On the contrary, money has been in abundant supply throughout the week at comparatively low rates, and there is nothing in the situation at the moment to warrant the belief that materially higher rates will prevail in the near future. The New York City banks continue to gain cash from the interior, and it is expected that the receipts from this source will be sufficient to offset the losses sustained by the local banks to the sub-treasury. Government finances also show considerable improvement. Receipts are in excess of expenditures, and it is probable that the surplus will be restored at an early date. The foreign exchange market has ruled firm, but no shipments of gold to Europe are expected, owing to the fact that money rates at New York are higher than at any of the principal European centers. The Paris market has ruled decidedly easier, the open market discount rate at that center being  $2\frac{3}{8}$  per cent at the close. At London, the rate was unchanged at  $3\frac{3}{4}$ , and at Berlin the quotation was  $3\frac{1}{4}$  per cent. The bank statement, published on last Saturday, was more favorable than had been generally expected. The loss in cash amounted to only \$1,129,600, which was considerably below the preliminary estimates. Loans increased \$16,251,800, owing to the activity in the stock market. Deposits increased \$14,290,500. The reserve required was \$3,572,625 larger than in the previous week, which, together with the decrease in cash of \$1,129,600, resulted in a reduction in the surplus by \$4,702,235. The surplus reserve now stands at \$11,127,625, as compared with \$19,841,925 in 1905, \$21,842,775 in 1904, \$18,645,675 in 1903, \$17,896,225 in 1902, \$20,362,625 in 1901, and \$30,871,275 in 1900. Money on call has loaned at 5 and at  $3\frac{3}{4}$  per cent, the average rate for the week being about 4 per cent. Time money was in better demand, especially for four months, and offerings for all periods up to six months were liberal, at  $4\frac{1}{2}$  per cent on ordinary mixed securities. Mercantile paper was more active, and the rate was reduced to  $4\frac{1}{2}$  per cent for the best material. Choice single names were discounted at  $4\frac{3}{4}$  per cent, and other good names were marketable at  $5\frac{1}{4}$  to  $5\frac{3}{4}$  per cent.

### The Stock Market

The past week in the stock market has been one of considerable irregularity, but with a tendency toward recovery from the previous very sharp decline. Rallies and reactions have followed one another in rather quick succession, and fluctuations in several instances have been over a wide range. However, the volume of speculation has, on the whole, been somewhat smaller than heretofore, and there was a considerable falling off in outside interest, which is not at all surprising, when the late serious slump is taken into consideration. General conditions were every bit as favorable as at any time in the recent past, the only retrograde movement noticed having been a moderate decline in the price of copper metal from the high figures that have been ruling for a considerable time past. Money was abundant and cheap, railroad earnings reports received were of a highly gratifying nature, the bank clearings of the country reached a higher altitude than ever before, and additional evidence was afforded of the practically unprecedented prosperity in the iron and steel trade.

While the favorable factors noted undoubtedly served as a backlog to the market, they failed to impart to the general share speculation that bullish enthusiasm which had come to be such a characteristic of the market. This, no doubt, is accounted for in considerable measure by the tactics pursued by a certain element of professional traders, notably those with Western connections, whose antics in the market of late have been anything but of a character to inspire confidence. Another reason for the lack of bullish enthusiasm has been the widespread talk of the possible strike in both the anthracite and bituminous coal trades during the coming spring, while the further decline in the reserves of the local banks has not been without its effect. Withal, however, the week has witnessed the making of some new high records in the stock market,

the most striking cases in point being among the shares of the so-called Hill group. Rumors of deals, "melons," etc., have been current in connection with these properties, and while there has been nothing apparently to base these on, their influence has been none the less acute. Apart from these stocks, there are very few that merit special consideration, as the fluctuations in general, as before stated, were very irregular and had nothing in particular to explain them. It is somewhat remarkable in view of the decline in copper metal referred to that the shares of the copper companies were among the strongest dealt in. However, this is accounted for by the fact that there has been a lot of talk of a settlement of the long-existing differences between the Amalgamated Copper and Heineze interests, which appeared to have a good deal of foundation, though the principals declined to confirm the various rumors current. As for the future of the market there does not appear to be anything in sight to warrant the expectation that conditions will materially change from those now existing; on the contrary, the indications are that, for the time being at least, speculation will remain comparatively narrow, with fluctuations in prices of an uncertain character. Ultimately values will unquestionably rule higher than they are at present, as the country as a whole is rich and fast growing richer, and the money thus being piled up must eventually find an outlet in the market for good legitimate securities.

The feature of the week in the local traction share market has been the opposition that developed to the Interborough-Metropolitan merger. This threatened to hold up the carrying out of this deal, and in consequence the stocks of all the companies concerned declined sharply. The stock of the Brooklyn Rapid Transit Company was also heavy, chiefly because of the attacks that are being made upon that property by a certain city official, and like the balance of the group showed little or no rallying power from the low prices which the selling movement in it occasioned. In the meantime all these companies are going ahead accumulating record-breaking earnings and making additions and improvements to their respective properties, all of which is bound to tell in the long run.

### Philadelphia

Moderate activity developed in the local traction issues during the past week, and prices held remarkably well considering the weakness prevailing in the general securities markets. Early in the week some pressure was brought to bear upon the speculative issues, but in the subsequent dealings there were substantial advances. Philadelphia Rapid Transit was again the active feature of the group, upwards of 10,000 shares being dealt in. Opening at 33 it ran off to  $32\frac{1}{8}$ , but later the price advanced to  $33\frac{1}{4}$  on buying for New York account. The close was at  $32\frac{3}{8}$ . Philadelphia Company, after selling at  $51\frac{1}{2}$  at the opening, rose to  $52\frac{7}{8}$  on active purchases, and closed within  $\frac{1}{8}$  of the highest. About 9000 shares changed hands. Philadelphia Traction eased off a small fraction, about 300 shares selling at  $101\frac{1}{4}$  to 101. Union Traction sold to the extent of about 600 shares at  $63\frac{3}{4}$  and  $63\frac{1}{2}$ , and several hundred shares of Consolidated Traction of New Jersey brought  $82\frac{1}{2}$  and 82. Other sales included Philadelphia Company preferred at 51 to  $50\frac{1}{2}$ , Railway Company General at  $7\frac{1}{8}$  to 7, United Companies of New Jersey at  $269\frac{1}{4}$ , American Railways at 53.

### Baltimore

The market for tractions at Baltimore was fairly active and strong. United Railway issues were the feature, the 4 per cent bonds advancing to  $94\frac{1}{2}$ , the highest price attained for many months. The free incomes rose from  $71\frac{1}{8}$  to  $72\frac{3}{8}$ , and closed at  $71\frac{1}{8}$ , about \$165,000 changing hands, while the pooled incomes advanced a point to  $71\frac{1}{4}$ , on the purchase of about \$75,000 of bonds. The free stock sold to the extent of about 3000 shares, at prices ranging from 17 to  $17\frac{3}{8}$ , while the certificates of deposit for upwards of 3500 shares brought  $18\frac{1}{4}$  to  $18\frac{7}{8}$ , the final transaction being made at  $18\frac{1}{4}$ . Another noteworthy feature of the dealings was the activity and strength in Norfolk Railway & Light 5s, \$84,000 of which changed hands, at prices ranging from 98 to  $100\frac{1}{2}$ . Other transactions included City & Suburban 5s at  $112\frac{1}{2}$ , Lexington Street Railway 5s at 104 and  $104\frac{1}{2}$ , Charleston Consolidated Electric 5s at 97 and  $97\frac{1}{4}$ , Virginia Railway & Development 5s at 99, Atlanta Street Railway 5s at  $105\frac{5}{8}$ , and Norfolk Street Railway 5s at  $110\frac{1}{4}$ .

### Other Traction Securities

Trading in street railway issues at Chicago was extremely quiet, and prices generally displayed a declining tendency. Chicago Union



Traction common was an exception to the rule, the price advancing to 12½, on comparatively light trading, in sympathy with the sharp advances in both the common and preferred stocks on the New York stock exchange. North Chicago Street Railway sold at 75 and 73 for 15 shares, and a small amount of West Chicago brought 45. Other sales included Metropolitan Elevated common at 27¼ and 27, preferred at 70¼ and 69½; Chicago & Oak Park common at 7 and 8½, preferred at 27 and 25; Northwestern Elevated preferred at 27 and 26½, and South Side Elevated at 95½ and 95. The Boston market was generally quiet but firm. Boston Elevated rose from 159 to 160 on light transactions, but subsequently declined to 156, ex the dividend. Boston & Worcester advanced from 30 to 32, and closed at 31½, while the preferred moved up from 77½ to 81¾. About 1200 shares of the common and about 1400 shares of the preferred were dealt in. Massachusetts Electric common and preferred continued strong, the first named advancing from 18 to 18¾, while the preferred rose from 67½ to 69, and ended the week at 68½. Other sales included West End common at 99¾ and 99 and 99½, the preferred at 114½ and 114, and the 4s of 1916 at 102¾. In the New York curb market Interborough Rapid Transit was quiet but firm, about 4500 shares changing hands at from 232 to 235, and back to 234. The new securities of the Interborough-Metropolitan Company developed considerable activity, but the price movements were very erratic. The common advanced from 52½ to 55½, on the purchase of nearly 20,000 shares, while the preferred stock, after selling at 97, dropped back to 95½. The 4½ per cent bonds were extremely active. From 93¼ at the opening the price rose to 94½, but at the close there was a reaction to 93¼. Upwards of \$700,000 were traded in. Other sales included 100 New Orleans Railway at 37½, 1250 preferred at 84¾ and 84; \$175,000 New York, Westchester & Boston certificates at 92¼ and 91½, 2000 American Light & Traction common at 115 and 121 and 700 preferred at from 99 to 103.

Cleveland Electric declined from 82 to 81¼ and then to 81. Northern Ohio Traction & Light sold at 32½ and 33. Several blocks of the 4s sold at 74½ and the 5s at 101. Lake Shore Electric common sold at 16¾ and 17, and Cleveland & Southwestern common at 14¼ and Aurora, Elgin & Chicago at 35. Western Ohio receipts again sold at 18 and the 5s at 87.

Cleveland Electric has been showing some weakness in Cleveland, the price declining from 82 to 81¼ and then to 81, this week's sales aggregating about 600 shares. It is stated that brokerage houses have heavy buying orders if it touches 80. Northern Ohio Traction & Light sold at 32½ and 33 for about 500 shares. Several blocks of the 4s sold at 74½ and the 5s at 101, both new high marks. Lake Shore Electric common sold at 16¾ and 17, and Cleveland & Southwestern common at 14¼. Aurora, Elgin & Chicago had a strong movement early this week at 35. Western Ohio receipts sold at 18 and the 5s at 87, both old prices.

**Security Quotations**

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

	Jan. 31	Feb. 7
American Railways .....	53	* 53
Boston Elevated .....	159	*156
Brooklyn Rapid Transit .....	88½	86
Chicago City .....	199	199
Chicago Union Traction (common).....	11	11¼
Chicago Union Traction (preferred).....	—	—
Cleveland Electric .....	82	82
Consolidated Traction of New Jersey.....	81	81
Consolidated Traction of New Jersey 5s.....	—	—
Detroit United .....	100¾	101
Interborough Rapid Transit .....	232	233
Interborough-Metropolitan Co. (common), W. I.....	53	55½
Interborough-Metropolitan Co. (preferred), W. I.....	95	95½
Interborough-Metropolitan Co. 4½s, W. I.....	93½	93
International Traction (common).....	—	36½
International Traction (preferred), 4s.....	—	73
Manhattan Railway .....	159¾	160¾
Massachusetts Electric Cos. (common).....	18	18½
Massachusetts Electric Cos. (preferred).....	68¼	68
Metropolitan Elevated, Chicago (common) .....	27	27½
Metropolitan Elevated, Chicago (preferred) .....	69½	69¾
Metropolitan Street .....	122½	121¾
Metropolitan Securities .....	72¼	71½
New Orleans Railways (common) .....	39	37
New Orleans Railways (preferred) .....	84	83
New Orleans Railways, 4½s.....	90½	91¼
North American .....	102¼	101¾

	Jan. 31	Feb. 7
North Jersey Street Railway .....	25	25
Philadelphia Company (common) .....	54	54
Philadelphia Rapid Transit .....	33	32¾
Philadelphia Traction .....	101	101
Public Service Corporation 5 per cent notes.....	95	95
Public Service Corporation certificates.....	70	69
South Side Elevated (Chicago).....	96	96
Third Avenue .....	136	136
Twin City, Minneapolis (common).....	118½	116½
Union Traction (Philadelphia) .....	63	63¼
West End (common) .....	99	99
West End (preferred) .....	113½	113½

\* Ex-dividend. W. I., when issued.

**Iron and Steel**

Consumption continues at an enormous rate, and shipments of finished iron and steel are close to the record—an extraordinary fact in midwinter. The pig iron markets show some easing off all around for forward delivery. The uncertainties in the labor situation in the coal mining industry are causing some consumers to start stocking up pig iron and coke. The rail makers have thus far taken orders for delivery during 1906 for between 2,400,000 and 2,500,000 tons, exclusive of export sales, with a further constant flow of work.

**CONTROL OF ROCHESTER COMPANY TRANSFERRED**

Formal control of the Rochester Railway & Light Company and the Rochester Railway Company passed Thursday, Feb. 1, from the hands of the Clark syndicate to the Vanderbilt-Andrews syndicate. First was the reorganization of the Railway & Light Company. These directors were chosen: Horace E. Andrews, William K. Vanderbilt, Jr., Granger A. Hollister, William M. Eaton, W. J. Wilgus, John Carstensen, W. C. Brown, E. V. W. Rossiter, H. D. Walbridge, Edward Bausch, Thomas W. Finucane, Albert H. Harris, A. M. Lindsay, Eugene Satterlee and Henry A. Strong. The directors chose these new officers of the company: Horace E. Andrews, president; William K. Vanderbilt, Jr., Granger A. Hollister and William M. Eaton, vice-presidents; Horace E. Andrews, William K. Vanderbilt, Jr., H. D. Walbridge, E. V. W. Rossiter and John Carstensen, executive committee. These directors were elected for the Rochester Railway Company: Horace E. Andrews, William K. Vanderbilt, Jr., John J. Stanley, E. V. W. Rossiter, John Carstensen, W. J. Wilgus, W. C. Brown, A. G. Hodenpyl, Charles J. Bissell, George W. Archer, Charles T. Chapin, George F. Roth and William Eaton. These directors chose the new officers of the Rochester Railway Company: Horace E. Andrews, president; William K. Vanderbilt, Jr., and John J. Stanley, vice-presidents.

**CHANGE IN DATES OF SALE FOR APPELYARD PROPERTIES**

The dates of the sales of the Appleyard properties have been changed, and now are as follows: Feb. 19, for the Dayton, Springfield & Urbana Railway and the Columbus, London & Springfield Railway; Feb. 20, for the Central Market Street Railway and the Columbus, Grove City & Southwestern, and on or about Feb. 24 for the Urbana, Bellefontaine & Northern Railway.

**HUNTINGTON AFTER OREGON ROADS**

W. D. Larrabee, H. E. French and J. Whyte Evans, of Los Angeles, representing H. E. Huntington, the STREET RAILWAY JOURNAL learns, have been in conference with Andrew Gradon, president, and L. Y. Keady, secretary, of the Oregon Traction Company, for the purpose of closing a deal by which the property and franchises of that company are to pass into possession of Mr. Huntington. This means that the Oregon Traction Company's line projected to Hillsboro and Forest Grove, and already constructed on Twelfth and Pettygrove Streets, is to become the nucleus of a system of interurban railways connecting Portland with various points in the Willamette Valley. The Oregon Traction Company owns franchises in Portland, Hillsboro and Forest Grove, and has bonuses pledged at the two latter towns for construction of a standard gage electric railway, about 26 miles long. Under a contract which the company had with the Atlas Construction Company construction work proceeded several blocks on Twelfth and Pettygrove Streets when the construction company failed, without having paid for its rails, ties and ballast and some labor. Claims against the company amount to \$21,000. It is said that these claims will be liquidated by the Huntington syndicate and the property taken over, if franchises now pending in Portland are granted.



**UNITED RAILWAYS REPORT**

The United Railways Company, of St. Louis, has issued a preliminary report covering the earnings and expenditures of the consolidated St. Louis lines for 1905, and comparing the finances of the company for last year with the showing for 1904, the World's Fair year, and 1903. The report shows that the increase in street car travel between 1903 and 1905, two normal years, was great enough to produce a gain in gross earnings in favor of 1905 of about \$1,200,000, as compared with an increase in 1904, an extraordinary year, over 1903 of about \$2,700,000. The operating expenses last year exceeded those of 1903, but the gain in receipts was sufficient to offset a deficit in 1903 and leave a surplus of about \$500,000 after deducting ordinary fixed charges. This figure gives an earning of 2½ per cent on the common stock, but the company had absorbed this by allowing a deduction of \$421,000 as a depreciation and improvement fund, which reduces the final surplus to \$104,000. Following are the details of the statement:

	1905	1904	1903
Gross earnings .....	\$8,435,915	\$9,953,398	\$7,259,460
Operating expenses and taxes....	4,896,616	5,751,067	4,513,515
Net earnings .....	\$3,539,299	\$4,202,331	\$2,745,945
Other income .....	24,101	24,167	36,387
Total income .....	\$3,563,400	\$4,226,498	\$2,782,332
Deductions			
Interest on bonds.....	\$2,385,618	\$2,365,291	\$2,059,800
Dividends on preferred stock....	649,160	598,022	587,846
Organization expenses .....		833	1,000
Miscellaneous interest .....	2,297	80,168	196,473
Depreciation .....	521,752		
Total deductoins .....	\$3,458,827	\$3,044,314	\$2,845,119
Surplus .....	104,573	1,182,184	*62,787

\* Deficit.

**CHICAGO TRACTION ORDINANCE DISCUSSED**

The \$75,000,000 Mueller ordinance, passed by the City Council recently, was discussed at a meeting of the City Club, held Jan. 28. Walter L. Fisher offered several criticisms of the ordinance, the most prominent of which were: It provides no working capital to carry the city through the period of construction and preparation—or until operation can be fully attained.

The foreclosure section in the ordinance is not surrounded by the necessary safeguards.

The ordinance does not specify the actual scope of expenditure under the certificate plan.

No rate of fare is provided in case foreclosure proceedings are brought.

In discussing the franchise, Mr. Fisher said: "It is certain that something more than this single ordinance is needed to bring about municipal ownership. There must be either an ordinance based upon the contract plan, or one upon a short franchise grant with the right to take over at an early date, or a construction grant by which a company might operate until the certificate scheme shall have been carried through."

Mayor Dunne does not regard as serious the objections to the ordinance. He said that the ordinance had been gone over carefully by his legal advisers and himself, and they were satisfied with it in its present form. He said further that he had no intention at the present of putting forward his contract plan ordinance, and that he would have no more suggestions to make regarding municipal ownership for the present.

There seems to be no disposition on the part of the local transportation committee or its friends in the Council to revive the franchise ordinance upon which so much time was spent, and which it was hoped at one time would be a solution of the whole controversy.

**STATEMENT TO METROPOLITAN STOCKHOLDERS**

Because the officers of the Metropolitan Street Railway Company felt that the stockholders were entitled to full information regarding the company, and to the advice of disinterested stockholders, based upon a full investigation of the company's affairs, a committee was appointed, consisting of De Haven & Townsend, Strong, Sturgis & Company and Van Emburgh & Atterbury, who have reported in part as follows, giving the statement of the finances of the company: Under the proposed merger the Metropolitan

Securities stockholders receive \$93.50 par value of non-assessable common stock of the Interborough-Metropolitan Company in exchange for a share of Metropolitan Securities stock upon which \$75 has been paid, and upon which a further assessment of \$25 might be called. The common stock of the new company is entitled to the future profits of the surface, elevated and subway lines of the boroughs of Manhattan and the Bronx, after providing the interest upon the bonds issued in part payment for the Interborough stock and the dividends on the preferred stock issued in part payment for the Metropolitan Street Railway stock. The new common stock will accordingly get the benefit of the enormous growth in the passenger traffic of New York City, whether that growth be upon the elevated and subway lines, or upon the surface lines. The operating officers believe that the operation of the properties together will result in a very large increase in profits beyond what would be possible if the properties were to continue to be operated separately.

They, accordingly, believe that holders of Metropolitan Securities stock greatly improve their position and their chances for an adequate return upon their investment by exchanging their stock for the new stock upon the proposed basis.

The investigating committee published the following statement:

**METROPOLITAN SECURITIES COMPANY AND NEW YORK CITY RAILWAY COMPANY**

Consolidated statement as of Dec. 31, 1905, of the two companies and their application:

Metropolitan Securities Company received from subscriptions to its capital stock .....	\$15,014,775.00
Add profit on securities purchased, including appreciation in market values of securities still owned; Third Avenue stock, which was taken over from the Metropolitan Street Railway Company at \$125 per share, being figured at \$140 per share .....	2,092,399.46
Total .....	17,107,174.46

These resources have been or are to be appropriated as follows:

Operating deficit paid and accrued after deducting income from securities owned .....	\$5,497,585.25
Estimated amount of special franchise tax since date of lease of Metropolitan Street Railway.....	2,350,000.00
Construction, franchises and property, including outstanding capital stock of several corporations owning franchises in Manhattan and Bronx, other investments, engineering and other expenses in connection with proposed subways, organization expenses, etc.....	4,530,498.44
Advanced to leased and controlled companies for construction purposes .....	1,845,263.03
Materials and supplies and other working assets .....	829,215.45
Balance invested in current assets....	2,054,612.29
Total .....	\$17,107,174.46

The above balance of \$2,054,612.29 is arrived at as follows:

Securities owned, appraised at present market values, Third Avenue stock being taken at \$140 per share .....	\$13,035,966.00
Cash, notes and accounts receivable and other current assets.....	1,108,702.63
Less:	
Notes payable .....	\$4,250,000.00
Interest, rentals and taxes accrued, but not due, and estimated amount of special franchise tax, since date of lease of Metropolitan Street Railway, and accounts payable....	6,467,056.34
Balance due Metropolitan Street Railway Company on account of \$23,000,000 payable under lease....	1,373,000.00
	12,090,056.34
Net current assets as above.....	\$2,054,612.29



## RAILWAY BILLS OFFERED IN MASSACHUSETTS LEGISLATURE

Of the considerable number of bills affecting street railways now pending before committees in the Legislature of Massachusetts, the one to allow municipal ownership is of special interest. The bill as now drafted provides that any Massachusetts city or town may, within or without its own limits, construct, acquire, own or operate, or lease to one or more street railway companies for terms not exceeding twenty years, one or more street railways or any part of a railway plant. To control a line outside its own limits a city or town must get the approval of the Railroad Commission. Any motive power allowed to private companies may be used. To build or acquire a street railway a city must secure a two-thirds vote of its City Council in each of two successive years, and a town a two-thirds vote at each of two separate special town meetings not more than thirteen months apart. Whenever a railway is publicly acquired and operated under this act, a manager of street railways is to be created, subject to removal by the Mayor in a city or the Selectmen in a town, this manager's term to be five years, under bond; the manager to turn over the profits of the business and give an accounting once every month. Two or more municipalities are allowed to combine to acquire or build or operate street railways, the name of their joint company to be such as they determine, but to include the words, "Municipal Street Railway." Stock of such municipal companies is made transferable only to other cities or towns in which parts of the line may be located. Proceedings for taking over a street railway company by a city, town or municipal company, are similar to those now prescribed for obtaining locations—by local hearing and order, with appeal to the Railroad Commissioners, with the addition that when a municipality or municipal company files an acceptance of an order for purchase, the street railway company may, within thirty days, require and oblige it to purchase. The Supreme Judicial Court, or any justice thereof, is made the arbiter of disputes between the parties as to terms of sale, etc., through the agency of specially appointed commissioners, with the court itself as the board of final appeal. Cities and towns and municipal railway companies are made subject to the usual laws for construction and operation of street railways, and bonds which they may issue on account of ownership of street railways are not to be included in its debt limit.

Another bill receiving attention is one to compel companies to equip their cars with improved headlights. It provides that all companies doing business in the State shall, within two years from the passage of the bill, equip their cars with apparatus for always directing the light from their headlights on the tracks directly in front of them, and especially upon all curves in such tracks. The apparatus must be approved by the Railroad Commission, and the penalty under the act is \$50 per car per month during the time when the equipment is not provided after being required. This bill is put in on petition of E. Eugene Gay, and doubtless grew out of the situation in Wellesley, where residents, as previously stated in the *STREET RAILWAY JOURNAL*, complained before the Railroad Commissioners of the annoyance and danger which they had suffered by reason of the lights on the fronts of cars in their town. The Railroad Commissioners are now at work upon a regulative order for the use of such lights, and do not need more legislation before dealing absolutely with the matter.

On petition of John J. Conway, a bill has been introduced to restrict the number of standing passengers carried on street cars. It applies to such street railway cars only as are constructed so as to admit of passengers standing in the aisle, and then provides that the number of passengers so standing shall not exceed one-half the seating capacity of the car. There is no penalty attached to the bill.

Another bill provides a fine of from \$20 to \$100 for any street railway company refusing to sell on demand, or refusing to accept for transportation, packages or books of six tickets for 25 cents, each of which tickets shall be good for a 5-cent fare on any route between the hours of 6 and 9 in the morning and 5 and 7 in the evening, any day in the week excepting Saturday.

Lowell M. Maxham is the name appearing on the petition for a bill appropriating \$5,000, to be expended by the Railroad Commissioners, for the purpose of experimenting and making tests of any new safety appliances on cars, such as fenders and other like implements that will tend to protect passengers on street cars from injury. The bill also would require the Railroad Commissioners, on petition of ten citizens of the Commonwealth, to make an investigation for the purpose of determining the efficiency of any appliances on street railway cars recommended in such petition.

A special excise tax is proposed for corporations furnishing heat, light, power, etc., to State, county, city or town, of 1 per centum

of the gross receipts of Massachusetts business, provided the dividends of the firm or company aggregate 6 per cent per annum, and one-half of 1 per cent additional of the gross receipts from Massachusetts business for every per cent of the total annual dividends paid in excess of 6 per cent. The tax would be paid annually on Nov. 1, one-fourth to the State and three-fourths to the cities and towns in which the firms or companies transact their business. The tax is to be in addition to all taxes now imposed, and municipal corporations are exempted.

It is worth noting that the bills advocated by the special recess committee on railway and railroad laws, now pending, establishes new class in transportation lines in Massachusetts, to be known as "electric railroads," distinct from railroads and street railways. "Railroads," in Massachusetts law, are understood to be lines running entirely on private right of way. "Street railways" run primarily in the streets or highways and only incidentally on private right of way (for the purpose of avoiding dangerous grades and curves). But "electric railroads" are designated as a class of lines running primarily on private right of way and only incidentally in the streets and highways.

## THE TRAFFIC PROBLEM IN CLEVELAND

Reference was made in the last issue of the *STREET RAILWAY JOURNAL* to plans instituted by the Cleveland Electric Railway Company for diverting many of its cars away from the Public Square, by means of loops in the down-town district. Since the first changes the company has altered several other routes, and the scheme is now working a great benefit to the street car service of the city. There are some complaints from the merchants of the Public Square, but the public, as a whole, seems satisfied, since it is possible for the company to increase the number of its cars and reduce schedules from the center of the city, thus accomplishing two much desired results. It was stated in the original plan for changing routes that the interurban cars would be diverted away from the waiting room in the Public Square, but this was not carried out, so that under the present arrangement the interurbans are not effected.

## OFFICIAL INTERFERENCE AT MONTGOMERY

Following the recent purchase of the Montgomery Street Railway, of Montgomery, Ala., by the Montgomery Traction Company, plans were made for operating the properties jointly so as to effect economies impossible when the systems were operated separately. Among the plans evolved was one for the unification of the street car lines, with a readjustment of routes that would better serve the public interest. To carry out this work the company had to secure permission from the Council to make certain connections between the tracks of the systems and to abandon several short stretches of line. Opposition was encountered from the city authorities, who took advantage of the application to demand a readjustment of the terms of the franchises under which the separate companies now operate. In return for the privileges sought by the combined interests, the Council wanted 5-cent fares and 3½ cents for teachers and school children, transfers to any part of the city, removal of tracks on certain streets, or payment to the Council of \$5,000 to be allowed to leave them there, right to order up third track on Dexter Avenue when it pleased, payment of 1 per cent on gross receipts for a term of years and 2 per cent thereafter. The company refused to consider the \$5,000 payment and the income tax, and declined to accept a new franchise with these terms as a substitute for the two franchises, under which it has the right to operate without transfers. To get at the will of the people, General Counsel Ray Rushton of the Traction Company is sending out the following request to the residents of the city:

"If you agree with me, that it is to the interest of the city to have all the tracks of the street railways connected into one system, on condition that the companies:

"Give transfers to any place on the lines for a 5-cent fare;

"Sell tickets to school children at 3½ cents;

"Abandon the old car house on Bainbridge Street, and erect a new, modern car house, shops, offices and club rooms, for the employees on the extension of Madison Avenue;

"Remove at the will of the Council the tracks from Mobile and Perry Streets;

"Pay such licenses as may be imposed under the city charter, by the City Council, and taxes at the rate imposed by law on all persons, firms and corporations, I will esteem it a great favor if you will sign and return to-day the attached card."



## CHICAGO ELEVATED REPORTS

Net earnings of the South Side Elevated Railway, of Chicago, for the year ended Dec. 31, 1905, were equal to 6.06 per cent on the capital stock, as against 5.54 the preceding year. Gross earnings gained 8.7 per cent for 1905, compared with a decrease of 6.2 for the preceding year. The increase in traffic was 8.47 per cent. In every way the road showed marked improvement.

Following are the financial statements submitted at the annual meeting of the stockholders, Friday, Jan. 26:

EARNINGS		
Month ending Dec. 31—	1905	1904
Passenger .....	\$1,647,987	\$1,523,421
Other earnings .....	62,662	49,898
Miscellaneous .....	2,697	1,599
<b>Totals .....</b>	<b>\$1,713,347</b>	<b>\$1,574,829</b>
EXPENSES		
Maintenance of way and structure.....	\$72,175	\$64,946
Maintenance of equipment.....	141,077	129,035
Conducting transportation.....	437,934	415,478
General expenses .....	165,519	153,410
Loop rental and expenses.....	236,255	207,104
<b>Totals .....</b>	<b>\$1,052,962</b>	<b>\$969,975</b>
Total operating earnings .....	1,713,347	1,574,829
Less operating expenses .....	1,052,962	969,975
<b>Net earnings .....</b>	<b>\$660,385</b>	<b>\$604,853</b>
Bond interest .....	33,750	33,750
Dividends .....	409,165	409,149
<b>Surplus for year .....</b>	<b>\$217,470</b>	<b>\$161,954</b>

### GENERAL BALANCE SHEET

ASSETS		
Cost of property.....	\$12,255,943	\$12,312,338
Construction and extension.....	3,989,900	1,313,942
Capital stock in treasury.....	92,400	92,400
Materials and supplies on hand.....	137,878	45,084
Due from individuals and companies..	15,905	7,978
Due from agents .....	9,242	5,182
Current assets .....	23,443	14,500
Cash on hand .....	154,059	176,085
Cash on hand—con. and ext.....	949,249	817,578
<b>Totals .....</b>	<b>\$17,628,023</b>	<b>\$14,785,091</b>
LIABILITIES		
Capital stock .....	\$10,323,800	\$10,323,800
Funded debt .....	5,610,000	3,110,000
Current liabilities .....	336,839	161,377
Depreciation .....	50,000	50,000
Reserve .....	1,307,384	1,139,914
<b>Totals .....</b>	<b>\$17,628,023</b>	<b>\$14,785,091</b>

In his annual report to the shareholders President Leslie Carter noted the improved position of the property. He gave due credit to the White City for a large portion of the increase in traffic, but pointed out there had been a continuance of substantial gains after the open air amusement season closed.

The structure and equipment, he said, had been maintained in the best order, and he gave the details of new construction and maintenance. There was some extra expense on the Union Loop, which was relaid with steel rails. He declared the platforms on the loop should be made long enough to allow two trains to stand at stations and unload and load at the same time, as a means of facilitating transportation.

Concerning the new construction, he said the contracts therefor had almost all been made at prices less than estimates. The third track on the main line would have been ready for operation by the end of 1905 but for labor troubles of the steel erectors, for which trouble the company was in nowise responsible. Eighty-two per cent of the third track, he said, had been erected. The express service could not be established, however, until all the work had been done.

He said 150 new cars had been ordered and were arriving. These operate successfully in trains with the present equipment, and all can be used for either local and express service. Power was greatly added during the year by the completion and putting on the line an additional storage battery of 1000-kw capacity. The addition to the power house, he said, would provide two new engine-driven units of 2000-kw capacity each. They should be

ready for operation in the spring. He expressed appreciation of the work of all the officials from the general manager down.

The stockholders voted to consolidate the Englewood branch, which is building, with the South Side Elevated. The action was a formal one.

Charles H. Wacker and T. J. Lefens; whose terms as directors expired, were re-elected for a four-years' period. Officers were re-elected as follows: Leslie Carter, president; T. J. Lefens, vice-president; Marcellus Hopkins, general manager; M. F. Hardy, secretary and treasurer.

At the annual meeting of the Chicago & Oak Park Elevated Railroad Company the resignation of Charles T. Page as a director, which had been accepted, was filled by the election of Charles H. Randall to fill the vacancy. There were no other changes in the board or officers, the latter being: Clarence Knight, president; Redmond D. Stephens, vice-president; W. V. Griffin, secretary and treasurer.

The financial statement of the company was issued last November for the fiscal period ended June 30, 1905. It showed a deficit for the year of \$110,847, but owing to the continued increase in traffic it is presumed the six months just ended have shown marked improvement.

There was issued a balance sheet of the Chicago & Oak Park Elevated Railway Company for the fiscal year ended Dec. 31, 1905. The railway company is the New Jersey holding corporation, controlling the railroad company, which latter is an Illinois corporation, and the operating concern. The balance sheet showed the railroad securities held by the railway company had increased. There is nothing to be shown in the way of surplus by the railway company until the railroad company shall be able to make excess earnings. The railway balance sheet compares as follows:

ASSETS		
Securities—	1905	1904
Stock and income bonds of the Chicago & Oak Park Elevated Railroad Company, at par.....	\$858,900	\$852,800
Carried at .....	7,670,948	7,464,696
Notes receivable .....	1,488,600	1,384,150
Cash on hand .....	814	1,815
Expenses .....		8,339
<b>Total .....</b>	<b>\$9,160,362</b>	<b>\$8,859,010</b>
LIABILITIES		
Capital stock—		
Preferred .....	\$3,039,000	\$2,986,000
Common .....	5,645,800	5,416,000
Capital stock, scrip—issued and to be issued for stock on which assessment is paid:		
Preferred .....	14,405	\$45,069
Common .....	12,557	67,492
Notes payable .....	448,600	344,150
<b>Total .....</b>	<b>\$9,160,362</b>	<b>\$8,859,010</b>

Since the last annual report there have been issued, in accordance with the agreement with the securities committee of the Lake Street Elevated Railroad Company, 530 shares of preferred stock and 2295 shares of common stock.

The amount of stock issued and now outstanding is:

	Shares
Preferred stock .....	30,390
Common stock .....	56,458
<b>Total .....</b>	<b>86,848</b>

The company now holds of the securities of the Chicago & Oak Park Elevated Railroad Company:

Income bonds, par value.....	\$858,900
Stock .....	91,446,425-1000 shares

## CHICAGO ELECTRICAL SHOW

The Electrical Show, which was held in Chicago, Jan. 15 to 27, was such a marked success both in the way of public attendance and interest displayed by electrical men all over the Middle West, that the management announces that arrangements are already under way for another similar exhibition, to be held in Chicago next January. While the exhibition was one which naturally attracted electric light and power men more than the electric railway contingent, a number of electric railway men were to be seen among the out-of-town visitors to the show during the two weeks it was open. The show was run by the Electrical Trades Exposition Company, of Chicago.



## NEW YORK, NEW HAVEN & HARTFORD POWER STATION EQUIPMENT

The power station of the New York, New Haven & Hartford Railroad, from which current will be supplied to the single-phase locomotives for the operation of the company's trains into New York, will be located at Cos Cob, Conn. The apparatus to go into this station will consist of three 4500-hp Westinghouse-Parsons turbo-generating outfits, 11,000 volts, 3000 alternations, single and three-phase; two 125-kw exciters, driven by Westinghouse steam engines; one main switchboard with electrically-operated switches for 11,000 volts. It is understood that in the overhead system girder bridges will be used every 300 ft. to support the catenary construction.

General Manager Higgins, of the New York, New Haven & Hartford Company, has stated publicly that the handling of passenger trains on the system between New York and Stamford, by electricity, will be begun by Sept. 1, and has predicted that by 1908 the line will be equipped for operation between New York and New Haven.

## ELECTRIC BELT LINE AND TERMINAL FOR STEAM ROADS ENTERING BUFFALO

Henry J. Pierce, president of the International Traction Company, of Buffalo, was in conference a few days ago in New York with the officers of the steam railroads entering Buffalo regarding the plan to build a union station at William and Curtiss Streets, Buffalo. Mr. Pierce says the plan is for the steam railroad companies jointly to build a station on the site mentioned, and for the New York Central to electrify its belt line and establish convenient local passenger stations at different points, to which the International Company will loop its lines so as to handle traffic expeditiously. If the union station is established at William and Curtiss Streets, the International Traction Company undoubtedly will run belt lines to it direct from the Elmwood district, through Elmwood Avenue and Utica Street, via William Street, and back through Broadway, and also belt lines from other parts of the city. Mr. Pierce has said he regrets very much the action of the people which resulted in the refusal to entertain the overtures of the companies to build on the Cary site, in the heart of the city. He predicts that in ten years the center of population of the city will have changed.

Last Saturday articles of incorporation were filed at Albany for the Buffalo Subway Railroad Company. Mentioned as incorporators are: Frank S. McGraw and William B. Cotter, of Buffalo, and members of the firm of Black, Olcott, Gruber & Bonyng, of New York, by whom the papers were filed. Whether or not the new company is in any way connected with the plan for a subway into Buffalo to be built by the steam roads, as previously noted, could not be learned. According to an unofficial source the company will build a street surface railway underground from a point in Carolina Street, southwest of the land of the New York Central & Hudson River Railroad, thence easterly beyond the city line to a point about 2000 ft. beyond the lands of the Terminal Railway, of Buffalo, in the town of Chectowaga, a distance of 6 miles. A branch about a mile in length will run from the main line at William Street and Fillimore Avenue to the intersection of Curtiss and Lovejoy Streets.

## NEW YORK RAPID TRANSIT COMMISSION YIELDS TO CONNECTING RAILROAD

Having surrendered to the Pennsylvania and the New York, New Haven & Hartford Railroad Companies on almost every other demand made by the Bureau of Franchises as compensation for a charter to the New York Connecting Railroad, the members of the contract committee of the Rapid Transit Commission of New York, on Thursday, Feb. 1, waived the matter of the amount proposed in the new terms and invited A. J. Cassatt, of the Pennsylvania, and Samuel Rea, president of the Connecting Railroad, to appear before the committee this week to discuss a reduction.

In his amended franchise, Harry P. Nichols, of the Franchise Bureau, inserted clauses requiring the company to pay the city \$250,000 within thirty days after the franchise was signed by Mayor McClellan, \$50,000 a year for the first ten years, and \$100,000 a year for the next fifteen years, after which a new rate of compensation was to be fixed by an appraisement committee.

Under the original franchise the company would pay the city about \$10,000 a year during the first period and \$20,000 a year during the latter part of the first twenty-five years. Mr. Nichols has insisted that this sum is entirely inadequate.

## PENNSYLVANIA RECORDS MADE PUBLIC

The advance sheets have just been issued of the report by Major Isaac B. Brown, secretary of Internal Affairs and Superintendent of the State Bureau of Railways of Pennsylvania, to the State, covering the operation of street railways and railroads with the Commonwealth for the year ending June 30, 1905. The report shows that the total capitalization of the street railway companies reporting to the bureau is \$387,112,703, whereas it was only \$17,911,680 in the year 1887. The total assets of operating and subsidiary companies for the year covered by the report was \$394,869,902. Turning from the figures which denote the total capitalization, and making a study of assets of operating street railways, it is found that the total amount of cost of road and equipment for all these operating roads was \$119,283,196. In addition to this substantial asset of operating street railway companies, stocks and bonds of other companies are owned amounting to \$27,260,850, to which may be added cash and current assets \$13,550,222, and other assets \$10,222,358, making the total amount of assets \$170,316,626. The gross income of the street railways of this State for the year covered by the report were \$37,888,809. The total number of employees of those companies was 23,486; their compensation amounted to \$14,126,876. The number of passengers carried was 854,007,798. For the period covered by the report there were 115 operating companies and 120 lessor or subsidiary companies.

## ELECTRICITY AND TRAMWAY PROGRESS IN ENGLAND

The annual return of the capital and traffic of tramways and light railways for 1904-5 issued by the British Board of Trade states that: Since the year 1878 the length of lines open for traffic has grown from 269 to 2117 miles, the capital expenditure from £4,207,350 to £52,675,152, the net receipts from £230,956 to £3,351,977, and the number of passengers carried from 146 millions to 2069 millions. Out of a total of 2117 miles of rails 1780 are electrical. Of 320 undertakings, 174 belong to municipalities. This is twelve more than last year. The number belonging to other parties has diminished from 150 to 146.

Local authorities have applied out of tramway profits £209,881 in relief of rates. Last year the amount was £207,087. This year they have applied to repayment of money borrowed for their tramways £572,725 out of revenue.

The mileage open for traffic has doubled since the year 1898, when overhead electrical traction began to come into general use, and the increase in mileage during the past year was almost equal to the total tramway mileage of the year 1879. The number of passengers carried has multiplied two and one-half times since 1898, and nearly fourteen times since 1879, the total now reached representing forty-eight times the entire population of the United Kingdom at the last census. The capital expenditures per mile open has increased by about 58 per cent since the days of horse traction; but, on the other hand, the percentage of net receipts to capital expenditure has increased in rather larger proportion. The percentage of working expenditure to gross receipts from traffic shows under electric traction a marked reduction, as compared with the time when steam traction was at its highest, and a still greater reduction from the horse period. The number of passengers carried per mile of route open is substantially greater than in the days of steam, and enormously greater (having more than doubled) since the horse period of 1879. The number of passengers carried per car-mile remains nearly stationary since the steam period of 1868, but shows a decided increase on the horse period of 1879. The average fare per passenger shows a tendency to diminish, and has dropped almost exactly 3 farthings per fare since 1879.

## STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

### STREET RAILWAY PATENTS ISSUED JAN. 30

811,037. Danger Signal; William C. Creveling, St. Louis, Mo. App. filed Dec. 8, 1904. An alarm to prevent passengers from passing behind a car and in front of an approaching car on the other track. Also provides a rear illuminated danger signal operable when the trolley wheel is displaced from the wire to warn a car approaching from behind. These signals are operated by storage batteries.

811,101. Electric Surface and Elevated Trolley Railway; Chas. D. Smith, Fond du Lac, Wis. App. filed March 2, 1903. The third



rail has cover plates of inverted V section, which plates are forced open by wedge-shaped fingers projecting from the frame at the front and rear of the trolley wheel.

811,153. Trolley Pole; John E. Lagergren, New York, N. Y. App. filed May 25, 1905. The trolley is journaled on a supplemental arm or lever whose relative movement when the pole leaves the wire is effective to apply a brake or lock, which prevents upward movement of the pole.

811,160. Railway Switch; Charles A. Mann, Albany, N. Y. App. filed May 16, 1905. A pair of rods eccentrically pivoted at one end to a concentrically-pivoted horizontal disc, and having their opposite ends freely held in beveled grooves in a block flush with the track surface, and an arm connecting the disc with the switch tongue, and projections carried upon the free ends of the rods adapted to engage depending arms carried on the cars.

811,284. Electric Race Track; Thomas F. Gaynor, New York, N. Y. App. filed March 14, 1905. Details of a pleasure railway, consisting in the special construction and combination of the electric power system of distribution from the generator to the truck motors.

811,319. Railway Switch; William P. O'Brien, Salem, Mass. App. filed July 24, 1905. A pivoted switch arm, an intermittently movable cam-grooved disc in engagement therewith for moving it back and forth on its pivot, means for moving the disc, and an operating device on the car adapted to engage an actuating lever.

811,340. Attachment for Electric Controllers; Ferdinand Volk, Pittsburg, Pa. App. filed Sept. 12, 1905. Details compelling step-by-step movement of the controller handle in turning on the power, but can be moved freely to the off position.

811,415. Regulation of Electric Motors; Johan G. V. Lang, London, England. App. filed June 28, 1904. By the ordinary regenerative system of control the motors are connected in different circuits for the purpose of giging a generative or braking action suitable to the particular speed condition of the train. In order to avoid depending on the motorman to properly move his controller for this purpose the patentee provides an automatic device.

811,519. Electric Switch for Street Railways; James A. Posey, Midlothian, Tex. App. filed March 14, 1905. A shoe adjacent to the track rails is depressed by the approach of a car. The direction in which the switch point moves is determined by a pair of selector magnets operated by a special trolley circuit and under the control of the motorman.

## PERSONAL MENTION

MR. THOMAS M. MOORE, of the legal department of the Public Service Corporation, is dead.

MR. GEORGE H. BOWERS, formerly secretary and treasurer of the Peckham Manufacturing Company, of Kingston, N. Y., has become associated with the Audit Company, of New York City.

MR. JOHN JOHNSTONE has resigned as general superintendent of the Muskogee Electric Traction Company, of Muskogee, I. T., and has accepted a position with the Pioneer Telephone & Telegraph Company, of Oklahoma City, Okla.

MR. MARSHALL MORGAN, a son of Mr. Randall Morgan, the Philadelphia traction magnate, has become clerk in the office of the Cincinnati Traction Company, where he will learn the traction business under the guidance of Mr. W. Kelsey Schoepf.

MR. RALPH E. DEWEESE, for the past five years manager of the Dayton & Northern Traction Company, of Dayton, has resigned on account of ill health. A short time ago Mr. DeWeese resigned as treasurer of the Ohio Interurban Railway Association for the same reason. He has been ill for some time, and although convalescing is still in a very weak condition.

MR. W. A. SHARP, of Tacoma, has resigned as assistant superintendent of the Seattle-Tacoma Interurban Railway to accept the superintendency of the Montana Miners' Electric Railway & Power Company, which is building an electric railway from Libby, Mont., for a distance of 25 miles, into the Coeur d'Alene mining district. It will be used solely for freight traffic, the ores of the mines providing the bulk of the shipments.

MR. JACOB P. DUNN, formerly City Controller of Indianapolis, Ind., has been made auditor of the Winona enterprises, consisting of educational institutions, transportation companies and public service corporations, having an aggregate value of \$3,500,000. This is a new office, and in addition to looking after the accounts of the Winona Assembly the auditor will also keep the accounts of the Winona & Warsaw Railway Company, the Winona Electric Light & Water Company and the Winona Interurban Company.

MR. ARTHUR B. METCALF, general superintendent of the Fifty-Second Street surface car shops of the Brooklyn Rapid Transit Company, has accepted a position with the mechanical depart-

ment of the Rochester, Syracuse & Eastern Railroad, with headquarters at Newark, N. Y. Mr. Metcalf was connected with the Brooklyn company for some twelve years. Upon his leaving Brooklyn he was presented with a loving cup by his associates in the company as a token of esteem.

MR. LOUIS J. MAGEE, who introduced American electric railway apparatus in Germany, and who is a director of the Allgemeine Elektrizitäts Gesellschaft of Berlin, has contributed an interesting article to the current issue of "The Engineering Magazine," on "The American and the German 'Peril.'" Mr. Magee analyzes the industrial conditions of the two countries, and believes that American manufacturers can derive considerable benefit from a study of German methods, particularly in the organization and training of the producing force. He also adds some valuable hints on export trade. The article has been reprinted in pamphlet form.

MR. H. C. MACKAY, for the past nine years comptroller and auditor of the Milwaukee Electric Railway & Light Company, has accepted the position of comptroller of the Virginia & Carolina Coast Railroad Company, with offices at Norfolk, Va. Mr. Mackay's railroad experience dates from Jan. 11, 1886, at which time he entered the service of the Minneapolis, Lyndale & Minnetonka Railway Company. This company was later on absorbed by the Minneapolis Street Railway Company, which retained Mr. Mackay in its employ successively as clerk, paymaster, bookkeeper, chief clerk and assistant auditor. In 1897 Mr. Mackay accepted the position of comptroller and auditor of the Milwaukee Electric Railway & Light Company. Upon his departure from Milwaukee Mr. Mackay was presented with a testimonial by Mr. John I. Beggs, the president and general manager, in the shape of a framed group of photographs of the president, superintendent and others with whom he was intimately associated. Included in the testimonial is a picture of the new terminal station and general office building, together with the following inscription: "Presented to H. C. Mackey, by his associates in the Milwaukee Electric Railway & Light Company, as a token of their sincere friendship and esteem, Feb. 1, 1906."

MR. R. W. DAY, who for a number of years has been claim agent of the Wilkesbarre & Wyoming Valley Traction Company, has resigned from the company to become general manager of the Northern Electric Street Railway Company, now constructing an electric railway from Scranton to Factoryville, passing through Chinchilla, Clark Summit, Clark's Green, Waverly, Glenburn, Dalton and La Plume, with extensions eventually to Tunhannock and Lake Winola, a distant of about 28 miles. From 1890 to 1896 Mr. Day was adjuster in the liability department of the Traveler's Insurance Company, and since 1896 has been manager of the claim department of the Wilkesbarre & Wyoming Valley Traction Company. Mr. Day is a member of the



R. W. DAY

American Association of Street Railway Claim Agents.

MR. FRANK CAUM, who has retired as acting manager of the Hartford lines of the Consolidated Railway Company, operating the electric railway properties in New England controlled by the New York, New Haven & Hartford Railroad, to become general manager of the Scranton Railway, of Scranton, Pa., was tendered a complimentary dinner a few days ago by a number of old and intimate friends. Speeches were made touching upon incidents in connection with the management of the Hartford Street Railway, and regrets were expressed at Mr. Caum's leaving Hartford. Among those present at the dinner were Mr. E. S. Goodrich, Mr. J. L. Adams, of the Hartford, Rockville & Manchester Tramways; Mr. H. S. Newton, of the Hartford & Springfield Street Railway; Mr. Charles E. Hubbard, of the Farmington Street Railway, and Mr. Norman McD. Crawford, of the Consolidated Railway Company, with whom Mr. Caum was long associated in the management of the Hartford property. Later in the day a smoker was given in Mr. Caum's honor at the Weathersfield Avenue car house, where the employees' association has its headquarters. Mr. Warren P. Bristol, superintendent of the Meriden lines of the Consolidated Railway Company, who is to succeed Mr. Caum at Hartford, has received from his Meriden associates a gold watch and chain as a token of their esteem.