Street Railway Journal

VOL. XXVIII. NEW YORK, SATURDAY, AUGUST 11, 1906. No. 6.

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

MAIN OFFICE:
NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:
Chicago: Monadnock Block.
Philadelphia: Real Estate Trust Building.
Cleveland: Cuyahoga Building.
London: Hastings House, Norfolk Street, Strand.

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

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Canada, Mexico and the Canal Zone.

Street Railway Journal (52 issues).....$3.00 per annum
Single copies ..... 10 cents
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—February, August & November) $4.00 per annum
Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks. 31 francs.
Single copies .....20 cents
Remittances for foreign subscriptions may be made through our European office.

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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 261,600 copies, an average of 8175 copies per week.

Welfare Work in Power Stations

One of the most interesting phases of modern industrialism is the increasing attention paid by large establishments to so-called welfare work, for the betterment of the conditions under which the employees labor. Activities of this kind are in no sense confined to the rank and file of employees, but are in many instances broadly beneficial to even department heads. In electric railway circles a great deal has been done along this line to improve the living conditions of employees directly occupied in the handling of cars; companies have fostered esprit de corps and strengthened many a motorman and conductor's position in life by liberal contributions to benefit associations, by supplying various necessities at less than cost, etc. Sometimes the power plant has been overlooked in these commendable activities, and it is the purpose of these comments to point out several ways in which welfare work can be extended to this part of the system.

In far too many plants the chief engineers are unprovided with any sort of office facilities worthy of the name. Of course, a power house is no place for mahogany desks, Turkish rugs and Louis Quinze chairs, but where a man is obliged to prepare careful and regular records of the power cost in detail, something in advance of a nail keg or an oil barrel is sure to be appreciated in lieu of a handsome desk. Again, power houses are sometimes lacking in anything but the most elementary sixteenth century sanitary facilities; lockers are conspicuous by their absence; or there is no place where an engineer or fireman can wash himself and then enjoy a meal which has to be taken when on duty. The provision of hot water for this purpose, a mirror and a few brushes are certainly appreciated by deserving men, and cost little from the company's standpoint. Power plant attendants are not averse to good personal appearance on the way home from work, any more than are the draftsmen in the main office. Another point is worth securing: the provision of enough men so that each power house attendant can take a day off once in seven or eight days, instead of being hemmed in to continuous service all the year round. Bonuses for reduced cost of power generation are helpful in some plants, and promotions from within when capable men for advancement can be secured from the company's own force are usually much appreciated by employees of the right sort. One or two technical journals supplied by the company ought to be available at the power house for all employees, and all reasonable encouragement should be given to power-house men engaged in night duty or outside efforts of any kind to become more efficient workers. It is in no carping spirit that we mention these points, but in many plants the working conditions may be improved by very simple and inexpensive methods.

Better Use Air Brakes

We publish this week an article from Europe strongly advocating the use of shunt-wound traction motors with regenerative control, and incidentally the bow trolley. The text of the author's preachment is the series of recent English accidents ascribed to the hand brake with magnetic brake as a reserve. If our American experience teaches anything it is that hand brakes should not be used except for light cars at low speeds, and that emergency brakes of any kind as auxiliary to hand brakes are inferior to first-class power brakes in regular use, and hence in regularly good condition. Motor braking as a feature of regenerative control is all very well if

the motor circuit is intact. It is, however, in no wise more efficient in stopping the car than properly designed air brakes, and far less simple. The most that any brake can do is to put the pressure on the wheels just short of the sliding point, and this is well within the power of air brakes, particularly when they are in steady use and the motorman is familiar with them. Reversal of the motors is the only emergency procedure of much value, and this can be done as readily with series as with shunt motors. If it is necessary to provide extreme braking power there is more to be said for the track brake than any other, but from all the braking tests which have been made the indications are that powerful air brakes will on the average stop a car as promptly as anything that has been yet devised, with the advantage that they are steadily used, so that their effect is perfectly understood. If magnetic brakes are preferred they are available, in very efficient form, including the track brake, without recourse to the intricacies of regenerative control.

If such control be used, it goes without saying that the trolley must not jump the wire. There have been many improvements in trolley wheels, and more particularly in overhead work, so that the ancient jibe of "Drop a nickel in the slot and see the trolley come off" has lost its force. City roads and even interurban roads are using the wheel trolley with excellent results, and at a cost for renewals amounting to only a small fraction of the dollar for 5000 miles cited by Mr. Hooghwinkel. Nevertheless for high speeds and heavy currents there is considerable to be said for some kind of sliding contact, which cannot come off and which will take currents of considerable size, and this phase of the subject is discussed in the following editorial. We hardly think, however, that any future sliding contact will bring shunt motors and regenerative control with it. The present series motor leaves little to be desired in simplicity and reliability. It gives a wide range of efficient control, has immense torque, and is simple and cheap to wind. Although inter-pole construction has given a new flexibility to shunt motors, they have, unless for regenerated control, no points of advantage sufficient to warrant a change. In the few foreign roads in which such control has been used the results have been, we believe, fairly satisfactory. We have yet to see any results that indicate a net saving in energy considerable enough to form a valid argument for the increase in complexity. The device is an old one, tried, like the shunt motor itself, at many times and in many places. The growth of the art has been in another direction, toward simplicity and the development of a robust operating equipment capable of hard service under all conditions. Up to the present, the shunt equipment has seemed too tender for adoption.

Current Collectors for High-Speed Roads

At present the only satisfactory method of collecting large currents at high speeds is from a third rail. By large currents and high speeds is meant the collection of more than 250 amps. at 50 m. p. h. Up to this point the ordinary trolley wheel, well balanced, bearing against a catenary-hung trolley, is fairly satisfactory. The life of a trolley wheel varies, of course, with the alignment of track and overhead construction, tension on the pole, conditions of bearings and other factors, but under ordinary conditions the average life of a trolley wheel in high-speed service is about 3000 miles. A trolley wheel will collect as high as 800 amps. at speeds below 15 m. p. h., that is, while cars are starting, but its ability as a current collector decreases with the speed until from 200 to 250 amps. is about the limit of its capacity at 50 m. p. h. These values are based upon a pressure of about 35 lbs. upward thrust.

The limit of wheel capacity comes almost entirely from two causes: (1) The inertia of the wheel when striking trolley-wire supports, which, however light and flexibly suspended they may be, still make the wheels jump at speeds approaching or exceeding 50 m. p. h.; (2) It takes only a slight unbalancing of the wheels at these high speeds to produce almost continuous arcing and hence rapid deterioration of the wheels. The remedy for this, of course, is better construction of the wheels, proper balancing, frequent inspection and turning down, and larger diameters. Tests made with trolley wheels under 18 lbs. pressure between wheels and wire indicate that with a No. 00 wire and 12-ft. pole, and at 10 m. p. h., there is a drop of about 2 volts at 500 amps., or 1 kw is lost. This drop increases rapidly with the speed, so that at 50 m. p. h. the drop averages between 13 and 14 volts. At 60 m. p. h. or more the trolley wheel becomes almost inoperative with present line construction and diameters of wheels used and the usual method of trolley pole and spring base support. This condition is practically independent of the current, and is caused by the inertia and unbalanced conditions of the wheel. Hence, it has been suggested that trolley wheels to be used for very high speeds should be of considerably larger diameter, made as light as possible, and very flexibly suspended.

The principal substitutes for the wheel trolley are the bow trolley as used extensively on the Continent of Europe, the pan scraper as used on some recent single-phase lines, and the roller trolley employed in one instance on the Pacific Slope. The European form of bow trolley with a scraping wire or semi-flat contact answers fairly well for slow-speed roads, but is expensive in maintenance and is practically inoperative at speeds much over 30 to 40 m. p. h., as the friction between scraper and wire is sufficient to saw through the contact in a very short time. The fair success of the bow trolley abroad is undoubtedly due to the low speeds at which the cars are run and to the consequent extremely light pressure used. It should be borne in mind, however, that great difficulty exists in maintaining contact between scraper and trolley wire at very high speeds unless considerable tension is placed on the trolley pole.

As a modification of the bow trolley a pan scraper is being used with some success in this country for speeds of about 50 m. p. h. One great advantage of the pan scraper is that it can be raised and lowered pneumatically. This is especially desirable on high-voltage lines, as it is difficult to insulate a trolley rope in wet weather so that it would be invariably safe with high voltage when used by the men ordinarily employed as conductors and motormen. Experiments with pans of aluminum alloy and also with pans made up of alternate sheets of copper and aluminum have been tried, and seem to indicate they can be used without excessive wear up to 50 or 60 m. p. h. where the current is not very large, as in a. c. operation. All things considered, the pan is perhaps the best all-around contact device for a. c. cars. Roller trolleys will carry an enormous current at low speeds, but are very susceptible to inertia at high speeds, owing to their great mass. There is but one road operating with roller trolleys

in this country, and here they are considered satisfactory. The speeds, however, are moderate, 35 m. p. h.; the current does not average at starting over 600 amps. and in running over 200 amps. per roller.

From this it will be seen that the subject of current collection is still unstandardized, with the trolley wheel best suited for city and light interurban service, the third-rail shoe satisfactory where the third rail is admissible, and the pan trolley the present favorite for high-speed a. c. cars. It is safe to say, however, that with the attention which is being given to this subject there are apt to be improvements, which may materially change the situation before long.

The Effect of the Rate Bill on Street Railway Accounting

An interesting question has arisen as to the effect which the passage of the Hepburn Rate Bill and its signature by the President the latter part of June will have upon the standard form of accounting for street railways. At first thought the two seem to have no connection with each other, because very few electric railway companies do an interstate business, and consequently the Hepburn Bill affects the electric railway industry directly in only the slightest way. Nevertheless, a further examination will show that the passage of the act may, and probably will, have an important influence on the form of accounting used by street railway companies.

It has long been known that the National Association of Railroad Commissioners, which represents the boards of the different States, is anxious to establish a more uniform system of accounting between the steam and the street railways in order that the main divisions at least should be the same and so that like items could be compared because so many steam lines are now electrifying parts of their systems. This subject has been discussed at a number of the meetings of the National Association of Railroad Commissioners, at which representatives of the Interstate Commerce Commission, Association of American Railway Accounting Officers, and American Street and Interurban Railway Accountants' Association have been present. The latter have manifested a willingness to take the matters in which the steam and street railway methods of accounting differ before their association and endeavor to secure such modifications as might be required to secure the uniformity sought. It is not disclosing a secret, however, to state that the representatives of the steam railroads have shown a marked indisposition to unite upon a program of this kind. All of the steam lines doing an interstate business have been up to this time to some extent, of course, under the control of the Interstate Commerce Commission, and while the reports required by that commission have been very elaborate they have not required, nor has the Interstate Commission had the authority to compel, the railroad companies to modify materially their existing systems of accounting, providing the reports were submitted in the form desired.

The Hepburn Act, however, which is far reaching in its character, is particularly stringent in regard to accounting. Section 20, which places the authority for supervising the accounts and formulating the classification of accounts of the steam railroads with the Interstate Commerce Commission, reads in part as follows:

> The Commission may, in its discretion, prescribe the forms of any and all accounts, records, and memoranda to be kept by carriers subject to the provisions of this Act, including the accounts, records, and memoranda of the movement of traffic as well as the receipts and expenditures of moneys. The Commission shall at all times have access to all accounts, records, and memoranda kept by the carriers subject to this Act, and it shall be unlawful for such carriers to keep any other accounts, records, or memoranda than those prescribed or approved by the Commission, and it may employ special agents or examiners, who shall have authority under the order of the Commission to inspect and examine any and all accounts, records, and memoranda kept by such carriers. This provision shall apply to receivers of carriers and operating trustees.

Under this section it has been claimed that the steam railroad companies cannot even keep a memorandum book of their accounts, if a part of the records of the company, unless the form has first been submitted and approved by the Interstate Commerce Commission, and so delegates to that body the complete control over the steam railroad classification. Under these conditions it will not be surprising if the proposition so long dormant to adopt a uniform classification applicable to both steam and electric roads should be consummated, especially as it has been favorably considered by the government authorities and the National Association of Railroad Commissioners and has not been opposed by the Electric Railway Accountants.

A comparison of the classification adopted by the electric railway accountants and that of the Interstate Commerce Commission quickly discloses several differences which look radical, but a closer study seems to make them more differences of treatment than of principle. The steam railroad schedule has fifty-three accounts, the electric thirty-nine, but most of the additional accounts are subdivisions of accounts, which in electric operations may be combined.

There are, however, other large differences—such, for instance, as stationery and printing—which the electric includes in one account under general expenses. The steam classification provides four, one each for maintenance of way, maintenance of equipment, transportation, and general.

The question of damages is handled by the steam classification as a transportation charge, but the electric treats it as a general expense. The steam classification has loaded the cost of conducting transportation in an endeavor to reduce the size of general expenses, while the electric classification has been based on the plan of including in general expense those items which are for the benefit of the whole property or else cannot easily be divided between the three great divisions of account without estimations. The construction and equipment accounts also show differences, but as in the operating expenses they are mostly in sub-divisions of like accounts.

It should not be understood from this that at present all steam roads use the same classification. The Pennsylvania Railroad, for instance, has a classification of ninety-three accounts, and the New York Central & Hudson River Railroad has 235, but in each case the accounts are so arranged that they may be combined to fit the fifty-three accounts called for by the Interstate Commerce Commission. The same condition exists among the electric railways.

Just how these differences can be adjusted and a classification which will be equally convenient to the steam and street railway companies of the country can be secured remains to be determined. But it will not be surprising if some progress is made in this direction during the next few months and possibly in time so that some definite action can be taken on the subject by the Electric Railway Accountants at their annual meeting in Columbus next October.

THE ELECTRIC CAR EQUIPMENT OF THE LONG ISLAND RAILROAD—I*

BY W. N. SMITH

The tendency of a change from steam to electric motive power on suburban lines such as those of the Long Island Railroad is to convert them into a rapid transit system of the same general type as the subway and elevated systems now operating in the largest cities. The building up of any suburban territory is dependent upon the transportation facilities provided for it, and the inevitable result of improvement in transportation is to increase the traffic to a degree gradually approaching the density prevailing on metropolitan rapid transit lines. It was with these ideas in mind that the management of the Long Island Railroad decided to adopt the multiple unit system on its electrified sections.

The design of the car equipment of the Long Island Railroad was based upon a careful study of the traffic conditions as they were outlined by the railroad officials at the commencement of the undertaking, and called for trains with the number of cars varying from two to six per train at different hours of the day, in regular operation, while heavy excursion travel to the beaches and race tracks would occasionally require trains of ten or twelve cars. Some of the service is express and some local. It was deemed of the greatest importance to provide a single type of equipment that should be uniformly available for all the varying conditions of train service.

The proposed local service on the Atlantic Division involved making stops at an average of about 1.6 miles apart. The express service originally contemplated between Flatbush Avenue Station and Jamaica provided for only one intermediate stop in the 9.63 miles between them. On the Rockaway Beach Division, a local train making all stops between Flatbush Avenue and Rockaway Park would average one stop every .99 mile, while an express run to Rockaway Park involved a run of 7 miles in length at the highest practicable speed.

These runs called for a schedule speed including stops of about 25 m. p. h. for local trains on the Atlantic Division, and about 30½ m. p. h. for the express trains. Upon the Rockaway Beach Division, with relatively more frequent stops, the local run called for a schedule speed of about 20 m. p. h., while the express run with seven stops in the 15.88 miles called for about 25 m. p. h. The average length of stop was usually assumed at 30 seconds.

The headway of trains on the proposed schedule was, between Flatbush Avenue and Jamaica, about twenty minutes during the greater part of the day, with ten minutes during the morning and evening rush hours, and thirty to sixty minutes during the early morning hours. During the rush hours express trains were also to be interspersed with locals. Between Flatbush Avenue and Rockaway Park the local trains were to run on about half-hourly headway during the most of the day, this being decreased to twenty minutes during the rush hours, and sixty minutes during early morning hours. Express trains were also to be interspersed between locals during the rush hours. The Brooklyn Rapid Transit trains operating over parts of the Long Island lines were to be mostly express, running on about half-hourly intervals during the early part of the day, but from noon until late at night on fifteen-minute headway. Upon days when there would be both a race-track movement on the Atlantic Division and heavy travel to the beaches, the headway of the combined traffic on Atlantic Avenue was to be reduced to about 3 1-3 minutes.

The Long Island Railroad local trains as originally proposed were to consist of two and three cars, except during the rush hours, when they were to be of six cars. The express trains were to consist of three cars each. The Brooklyn Rapid Transit trains on ordinary days were to be of four cars each, increased to six on holidays.

The maximum possible speed for express runs can be made when all the cars of a multiple-unit train are motor cars. Ordinary schedule conditions, however, usually permit a portion of each train to consist of trailers, and the most severe condition of frequent stops can be met if the proportion of trailers is not more than one trailer to two motor cars. A considerable saving in the weight of the entire train is thus possible without exceeding either the tractive power of the motors or their ability to radiate the heat developed by the frequent accelerations which are the severest tax upon their capacity. In fact, the proportion of motor cars to trailers is based upon the speed and time characteristics of the schedule and the frequency of stops.

The fact that the Atlantic Division is partly in a subway, and the need of interchangeability with the rolling stock of the Interborough Rapid Transit Subway, had much to do with the design of the cars. The complete success of the first all-steel passenger cars ever built, and which were designed by George Gibbs for the New York Subway, led him, in his capacity as chief engineer of the Long Island Railroad electric conversion, to advocate their use on this road as well. To the Interborough Rapid Transit Company and the Long Island Railroad Company belong, therefore, the distinction of being the first railroads in the world to adopt this radical departure in car construction, thus insuring to the public complete immunity from the danger of fire in cars equipped with apparatus carrying powerful electric currents. The incidental advantages of these steel over wooden cars in superior strength and durability are, of course, likewise of importance in insuring their adoption. As the Long Island Railroad cars were obliged to meet very similar conditions, both as to the physical nature of the route to be traversed and the class of travel to be handled, they were built along practically the same lines as the above mentioned steel cars for the New York Subway. In fact, except for the steps, which are made necessary by the low platforms at stations in the suburban districts, the steel car bodies are practically identical with those designed for the New York Subway.

It has been common practice in the past to build passenger coaches for rapid transit service of rather lighter construction than the standard steam railway coaches, chiefly because the steam locomotive was universally used and it was desired to keep down to a minimum the weight behind the locomotive. The multiple-unit system of control, however, which allows the distribution of the motive power under all the cars, removes this restriction upon the weight and makes it possible to construct the parts of a suburban passenger car with more regard for rigidity, and greater ability to resist shocks. Multiple-unit cars for this kind of service can therefore be made as substantial as the requirements of safety and durability demand, but it should also be noted that the steel construction adopted does not materially increase the weight over what would be called durable construction in a wooden car, the increased strength and durability being secured without sacrificing operating economy.

CAR BODIES

The principal dimensions of the steel car bodies are as follows:

* For previous articles on the Long Island Railroad electrification, see Street Railway Journal for Nov. 4, 1905; April 7; June 9, 16 and 23, 1906.

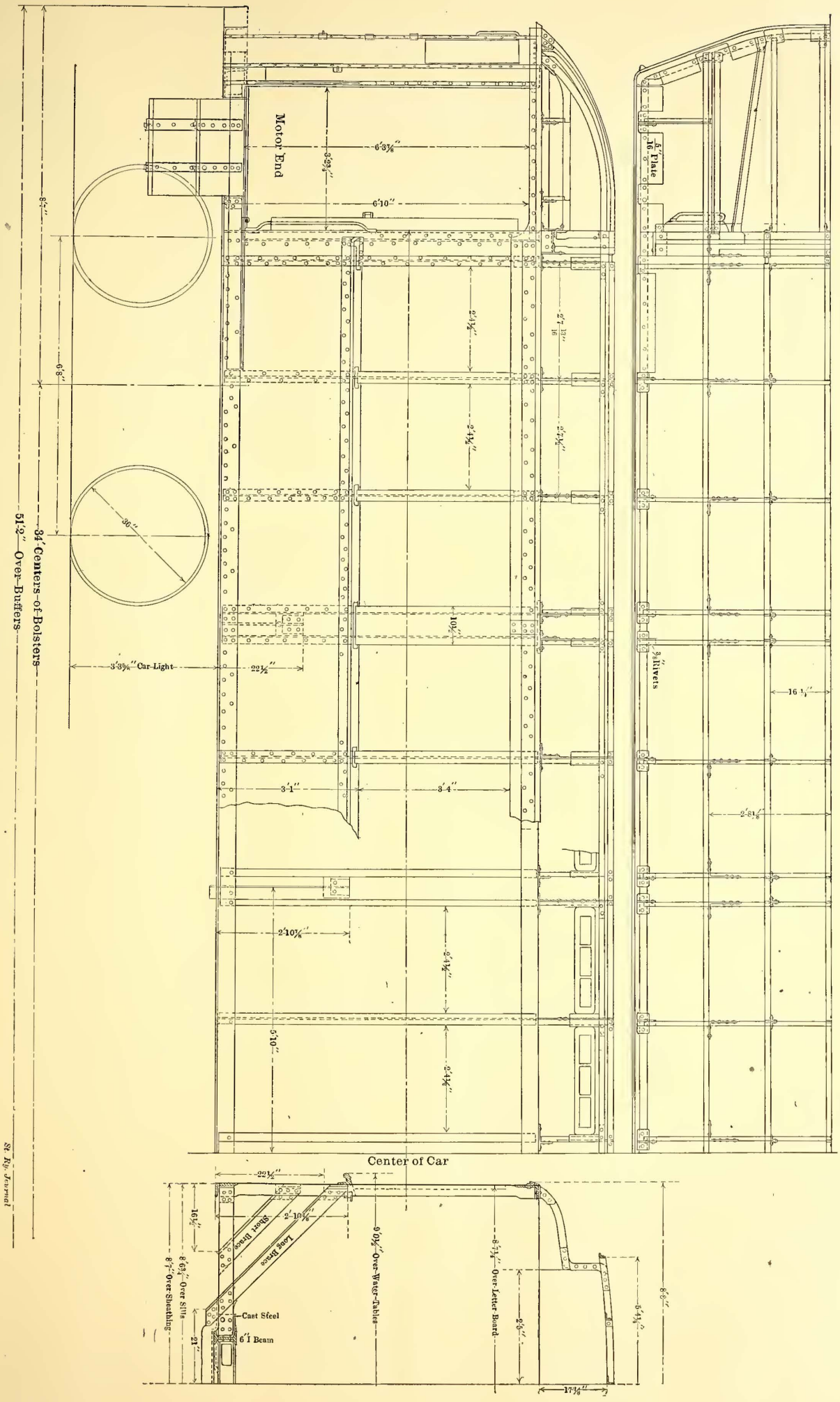


FIG. 1.—GENERAL FRAMING PLAN

	Ft.	Ins.
Length over body corner posts	41	½
Length over buffers	51	2
Length over draw-bars	51	4
Width over side sills	8	6¾
Width over sheathing	8	7
Width over eaves	8	8
Width over window sills	9	½
Width over platform floor	8	10
Height from under side of sill to top of plate	7	1
Height from underside of center sill to top of roof	8	9¼
Height from top of rail to under side of sill at truck center (car light)	3	3⅝
Height from top of rail to top of roof with car light	12	¾

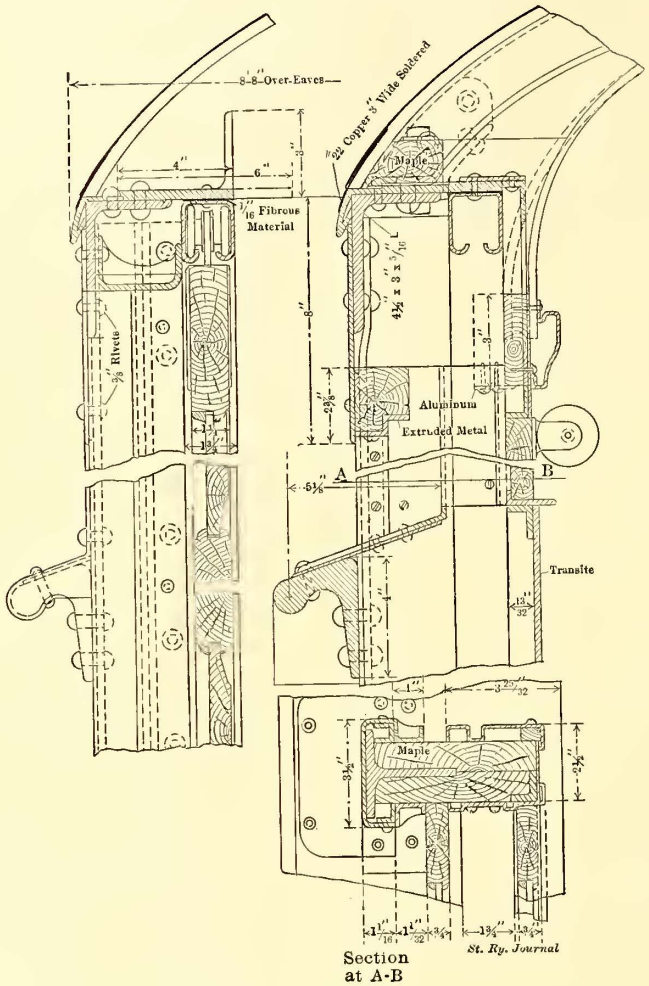


FIG. 3.—DETAILS OF BODY CORNER POSTS AND DOOR POCKET

The principal dimensions of the steel trailer cars are the same as those for motor cars, and they may, if desired, be readily converted into motor cars.

CAR-BODY FRAMING

While the formation of the car body is practically identical with the conventional type of steam railroad coach, the adoption of steel as the constructive material is responsible for some differences in the general designs of car framing that have been hitherto followed in wooden car construction. These differences will appear in the course of this description, and are illustrated in the accompanying drawings. Most of the standard parts in the framing of the wooden cars have their counterparts in the framing of the steel car.

The principal members of the car framing are of the following rolled steel shapes:

Side sills, 5 x 3 x ½ in. angles.
Center sills, 6-in. I-beams, 17.25 lbs. per ft.
Body end sills, 3 x 2 and 4 x 2 angles.
Body end posts, 2½ x 2 x ¼, and 2 x 1⅜ x ¼ angles.
Compound side posts, 3 x 2 x ¼ Ts.
Single side posts, 3 x 3 x ¼ Ts.
Side plates, 4½ x 3 x 5-16 angles.
Body end plates, 3 x 2 x ¼ and 3 x 3 x ¼ angles.
Platform sills, 4 x 3 x ⅝ angles.
Platform end sills, 6 x 3½ x ½ angles.
Belt rail, 4½ x 2¾ bulb angles.
Carlines, 1¾ x 1¼ x 3-16 angles.
Purlines, 1½ x 1½ x ⅛ angles.
Hood curve angles, 1¾ x 1¼ angles on top, and 3 x 2 and 2 x 2 angles on end.
Vestibule end bow, 3 x 3 x 5-16 angle.
Cross truss, horizontal ties, 4 x 3 x ⅜ angles.
Cross truss, diagonal brace, 4½ x 3 x 5-16 angle.
Bridging, ⅜ x 4½ plates.

Reference to the accompanying drawings and photographs will indicate the general manner in which the framing is put together. The center sills consist of two heavy I-beams

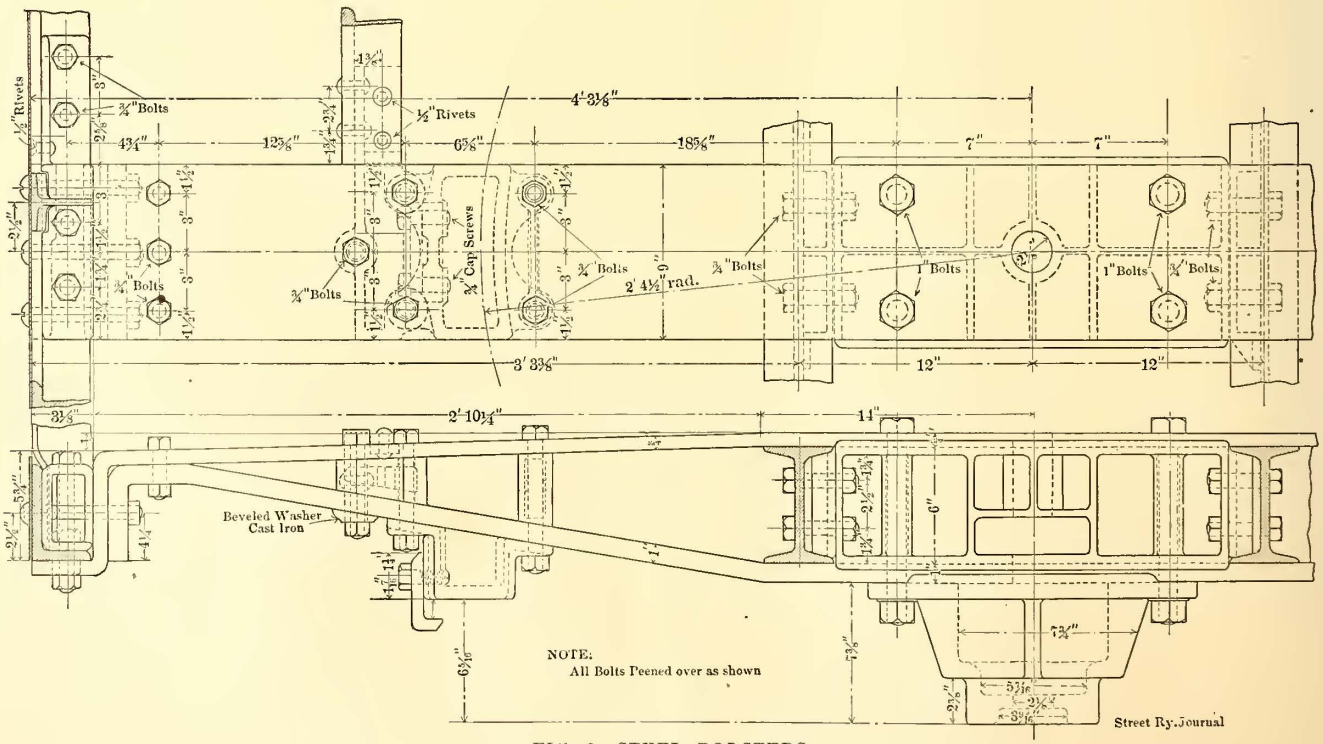


FIG. 2.—STEEL BOLSTERS

which are continuous between the platform end sills. The side sills are of heavy angles. Two extra sills, extending back to the body bolster, and composed of 4-in. x 3-in. angles, support the vestibule platforms. Fig. 1 is a general plan of the car framing.

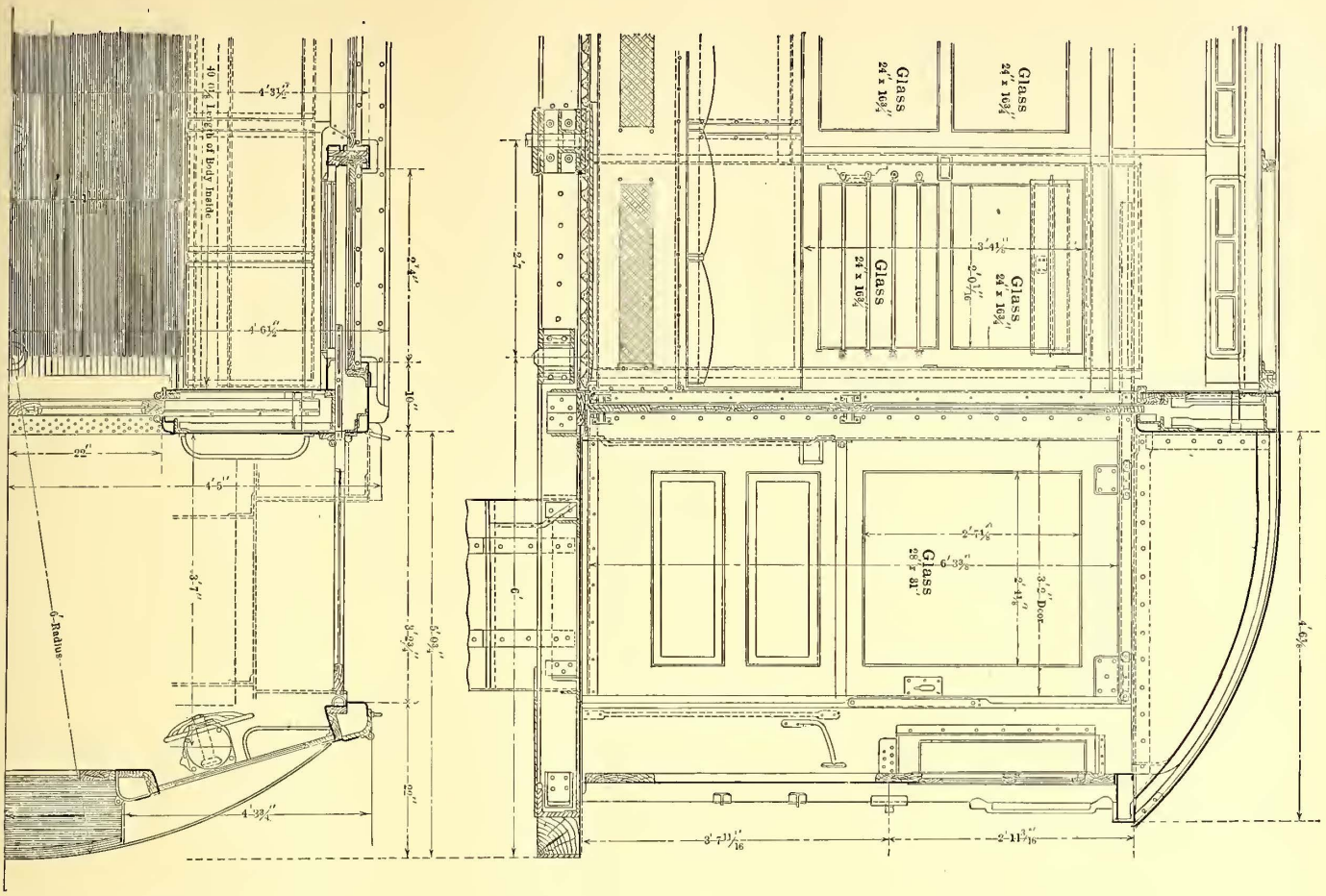


FIG. 4.—SECTIONS THROUGH END OF CAR, SHOWING SLIDING DOOR

The bolsters are of the built-up type, the top and bottom members being made of two rolled-steel plates, as shown in Fig. 2. They are machined on their outer ends to fit together perfectly, the top member being bent down over the bottom member and securely bolted to it. In the space between the top and bottom members and between the center sills is placed a malleable-iron draw casting, machined so as to be a perfect fit between the bolster plates and the longitudinal sills to which it is bolted. Between the center and the side sills malleable-iron struts are inserted. The top member of the body is ¾-in. x 10-in. steel plate, and the bottom member of 1-in. x 10-in. The body center plates are of cast steel, machined to fit the truck center plates and the bottom member of the body bolster, and have their edges lipped over the bolster, to which they are secured by heavy turned bolts in reamed holes.

The floor framing and transference of the floor load to the side trusses of the car are different from the construction hitherto followed in wooden coaches. Needle beams

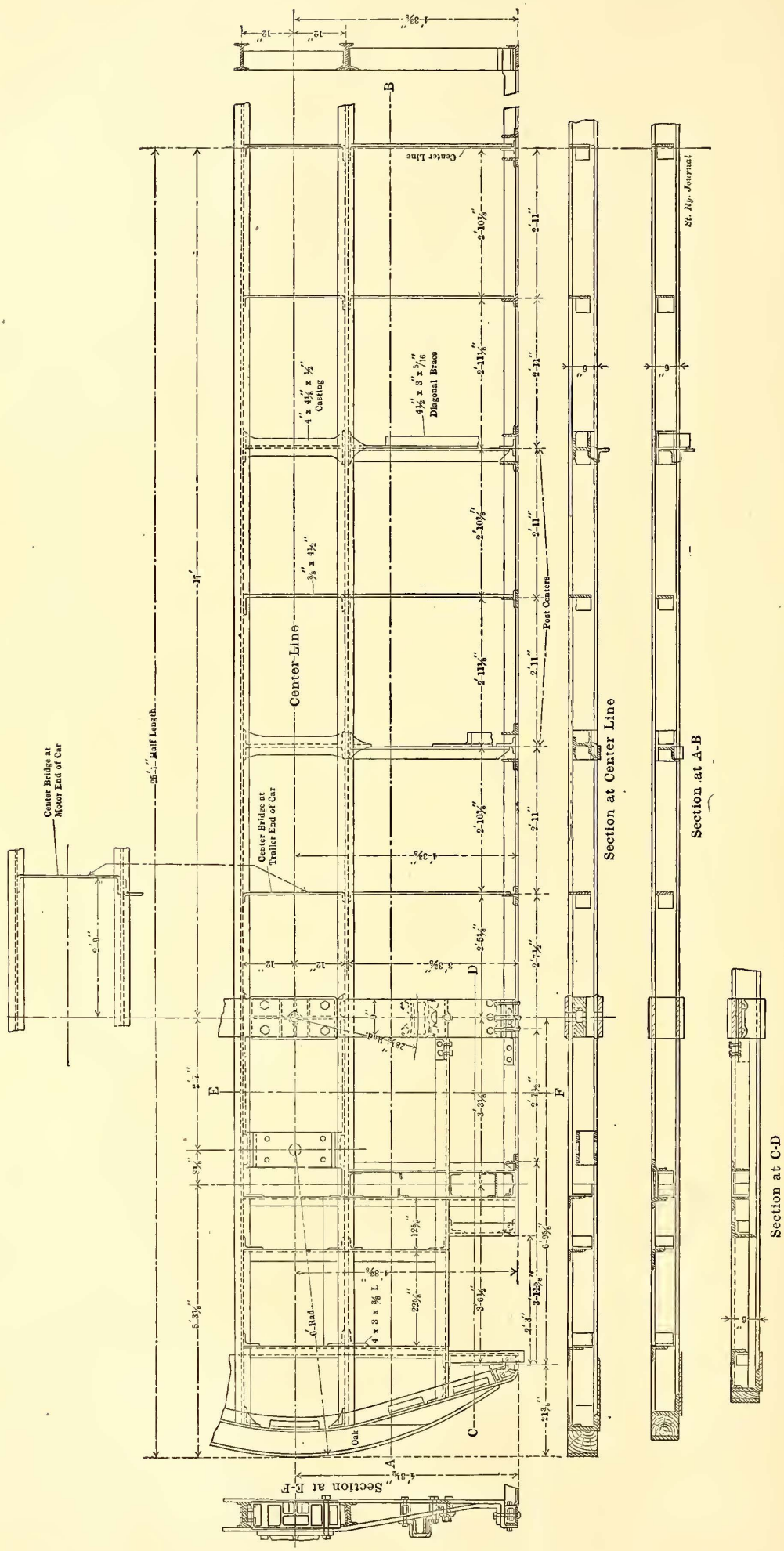


FIG. 5.—FLOOR FRAMING OF STEEL MOTOR CAR

and longitudinal underneath trussing are dispensed with, the construction being as follows:

The belt rail, side sills, and side posts are riveted together at their intersections, making a truss of square panels so reinforced by the ⅛-in. steel plate side sheathing of the car that they constitute a stiff truss without the necessity of diagonal bracing. Instead of needle beams and longitudinal truss rods, four sets of diagonal braces reach down from the side posts of the car below the belt rail, and are fastened to the bottom framing as shown in the sectional elevation in Fig. 1. These braces are concealed in the backs of the stationary cross seats, so that their presence in the car is not evident after the seats are installed. The bottom chords of the four cross trusses have riveted to them heavy steel casings which form struts between the two center sills, thus considerably increasing the stiffness of the bottom framing. The center sills are further stiffened by the introduction of the draw-castings for the attachment of the draft gear, and by the body end sill and platform end sill construction, also by numerous cross bridges. The platform end sills are of heavy angles, bent to give the proper shape, and are continuous from side to side. The vestibule end posts are fastened to them with heavy steel castings.

The end sills of the car body are not made as continuous pieces extending completely across the ends, but are in the form of a double set of short pieces of angle-bar fastened between the side and center sills by angle-iron braces, making a stiff construction for holding the side and center sills rigidly in line. They constitute a set of box-framed struts, or filling-in pieces, between the sills, at the ends of the car.

The body corner posts are built up in a special form of construction. The corner

post proper consists of an angle-bar fastened to the end sill and the end plate, which is reinforced by a Z-bar, and also by the first side post of the car, which is only about 10 ins. back from the end and is riveted to the side sill and the side plate. The first post and the end post are practically made into one member by the ⅛-in. side sheathing, which is rounded into the form commonly used in the outside shape of the corner post of the car. This side sheathing is securely riveted by round-head rivets pockets is shown in Fig. 4. There are sixteen posts along each side of the car, of which six are compound, being made of two 3-in. x 2-in. x ¼-in. angles, spaced 6 ins. apart. The remaining side posts are single 3-in. x 3-in. x ¼-in. Details of both types of side post are shown in Fig. 6.

To the top of the side posts are secured side plates of 4½-in. x 3-in. angles, which are not broken at the vestibule side doors, but are continued in one piece from end to end of the car vestibule hoods, where they are fastened to the end bows,

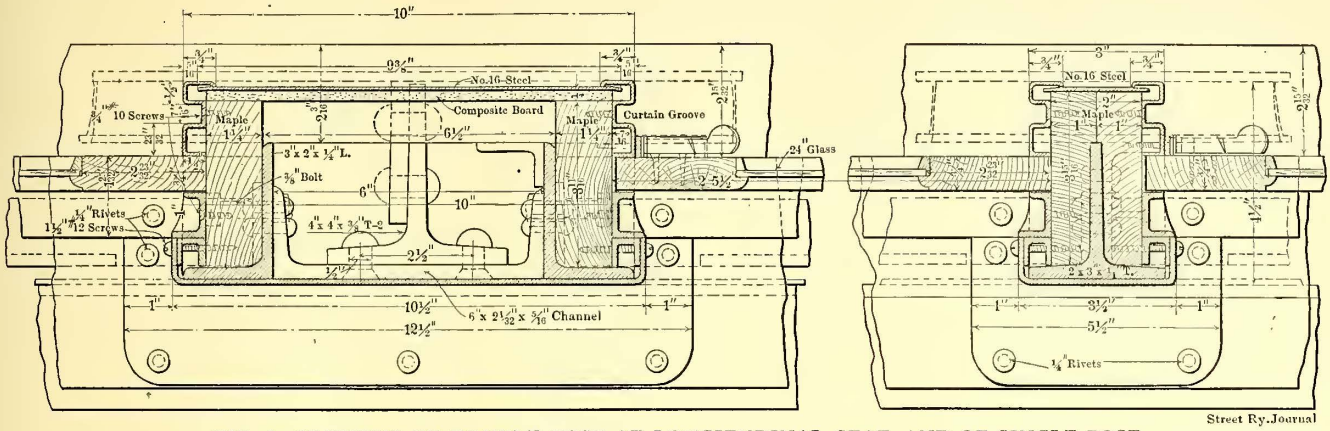


FIG. 6.—SECTIONS OF DOUBLE POST AT LONGITUDINAL SEAT, AND OF SINGLE POST

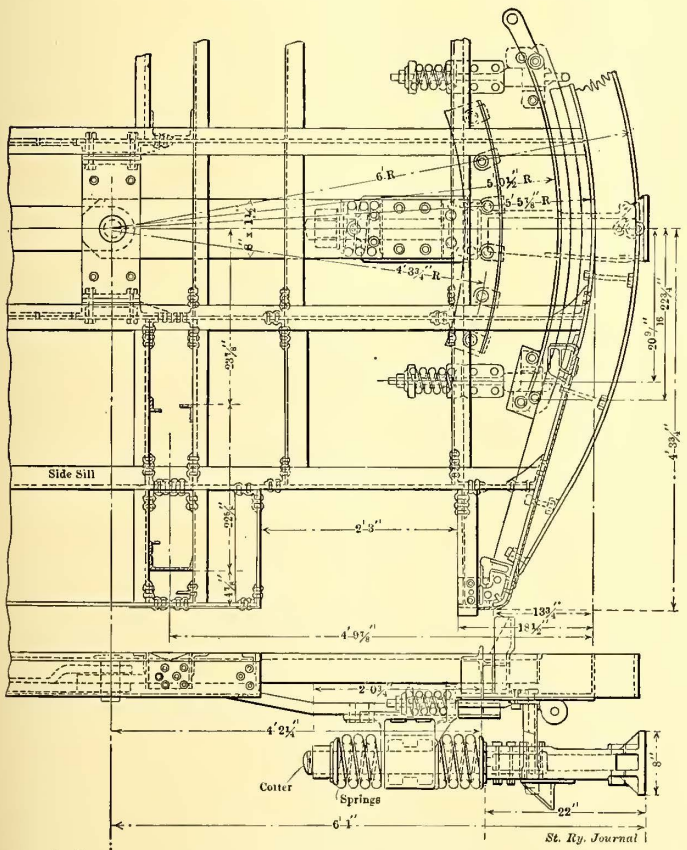


FIG. 7.—PLAN AND LONGITUDINAL SECTION OF DRAFT RIGGING

to the angles and Ts constituting the post, making an end-post construction that is practically 3 ins. thick and 10 ins. long. (See Fig. 3 for details of this construction.) Immediately toward the center of the car from this end post is the pocket for the sliding doors of the vestibules, and toward the center of the car from this pocket, and at right angles to it, is the pocket for sliding end doors of the car body. The back end of this pocket is formed by a 6-inch steel channel with flanges pointing inward and running up from the end sills to the angle braces that connect the side plates to the end plates of the car. The general arrangement of the door which are of heavy angle bent into the proper shape to form the convex ends of the car vestibules.

The end plates of the car body framing are of heavy angles. They are in duplicate on account of the door pocket construction, and are framed directly across at about 4 ins. above the level of the side plates, being connected to the latter by a pair of braces of heavy angles forming a sort of "Z" connection. This enables the end plates to be raised high enough to admit of the insertion of the steel door rails at the proper height for carrying the sliding doors in the ends of the car body, and also facilitates the curving of the roof, which is somewhat lower than is usual in steam railroad practice on account of the clearances made necessary by the tunnel sections of the railroad. Their position is shown in Fig. 4.

DRAFT GEAR

The draft gear comprises a spring draw-bar of the Van Dorn automatic type, supported on a sector bar under the car platform, the radius bar being centered upon a pin set in a cast steel auxiliary bolster bolted to the center sills about 2 ft. 7 in. in advance of the body bolster. Reaching back from this pin to the body bolster, where it is fastened in a similar way, is a continuation of the radius bar, the above mentioned pin construction being designed to form a sort of knuckle in the radius bar, which cannot be made long enough to reach all the way back to the body bolster because of the 90-ft. radius curve around which the cars are designed to run. At either side of the draw-bar, safety coupling chains have been provided, fitted with springs and anchor forgings fastened to the anti-telescoping plate under the platform end sill. To carry the weight of the radius bar, its outer end is carried in a sector guide directly over the draw-bar proper, just back of the draw-head. The buffer beams are of oak, faced with ½-in. x 6-in. steel plates. Details of the draft gear are given in Fig. 7.

ROOF

The roof framing of the car consists essentially of the carlines, arching across the side plates. They are made in a single piece of bent steel angle, reinforced by additional short pieces of angles at the bends which constitute the deck posts. These small angle reinforcing pieces are for the purpose of supporting the deck sills and furring strips to which

the headlinings and roofing are fastened. Fig. 1 shows how the roof connections are made.

The roof of the vestibule is supported on arched angle-bows which are riveted to the end bows and to the end carlines, which are of a little heavier angle than the other carlines, and are in duplicate on account of the peculiar construction of the body end post previously described.

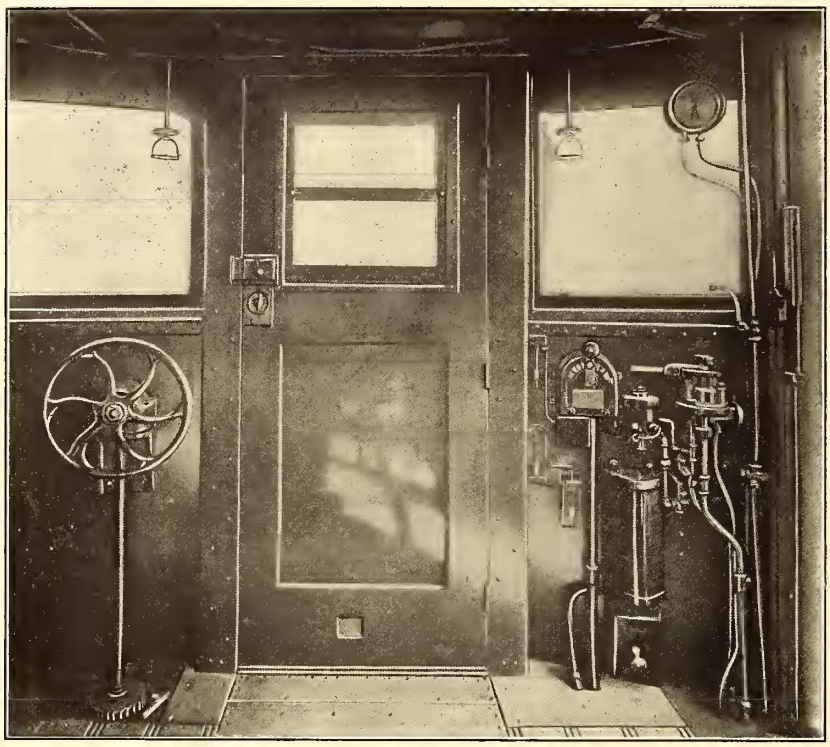


FIG. 8.—VESTIBULE OF STEEL MOTOR CAR

The roof carlines are connected by purlines of light steel angles. The carlines are secured to malleable iron castings which are riveted to the side plates, and the purlines, which are of about the same weight angle as the carlines, are riveted to the former with small angle braces. The carlines and purlines are faced with a furring of maple, secured by bolts, to which the roofing and headlining are fastened by wood screws. Maple blocks are also secured to the side plates, and hood bows, for the support of the roof covering and the headlinings. The deck sills and deck plates are of maple, so that the roof and its lining can be readily put up with wood screws.

A very light roof covering is used, consisting of composite board ⅜-in. thick, except over the vestibule, where it is of No. 16 gage sheet steel, the whole being covered with heavy canvas laid on with white lead.

The eaves of the car are made waterproof by running the canvas cover down over a strip of No. 22 sheet copper 3 ins. wide. This laps over and is soldered to the eaves molding, which is composed of extruded metal riveted over the side plate and end bows, and joined together at the corners of the car by special castings. The eaves molding, in turn, extends down over the letterboard.

VESTIBULES

The vestibules are of the Gibbs patent type with floors of steel plates. The vestibule side doors are arranged to slide in pockets in the sides of the car, leaving the entire platform to the passengers. These doors close against pneumatic cushions so as readily to release the clothing of passengers if caught by the closing of the door. The device for operating the side doors consists of a series of bell cranks and levers so arranged that the movable parts are either overhead in the vestibule or entirely outside of it, leaving the entire interior of the vestibule clear. The side doors are operated by brakemen standing outside of the doors at the extreme end of the vestibule. Side steps are provided, with plain wooden treads, the gangway being fitted with trap doors of 3-16-in. sheet steel, to enable the use of the entire width of the vestibule when the side doors are closed. The vestibule floor and drop doors are covered with the Mason patent floor covering. The vestibule end door, when in the extreme open position, is folded over the master controller, the brake valve and all other apparatus in the motorman's compartment. The upper half of this door is glazed, like the others. When this door is shut, and the side doors closed, the entire vestibule is available as a motorman's compartment, and the above mentioned control apparatus is then entirely exposed. A view of the vestibule under these conditions is shown in Fig. 8.

FIG. 9.—STEEL MOTOR CAR

The body end doors are of the double sliding type and are fitted with a door coupling device that will hold them in any desired position to prevent them from closing when trains are rounding curves. The marker lamps which are mounted on the hood over the vestibule platforms are operated from

inside of the vestibule by handles extending through the canopy sheathing. The handles are fitted at the lower end with discs carrying colored crystals that correspond to the color of the lenses on the four sides of the marker lamps.

In the vestibule at the motor end of the car, just forward of the end door pocket on the left-hand side facing forward, is placed a swinging door, made convex, of pressed steel so

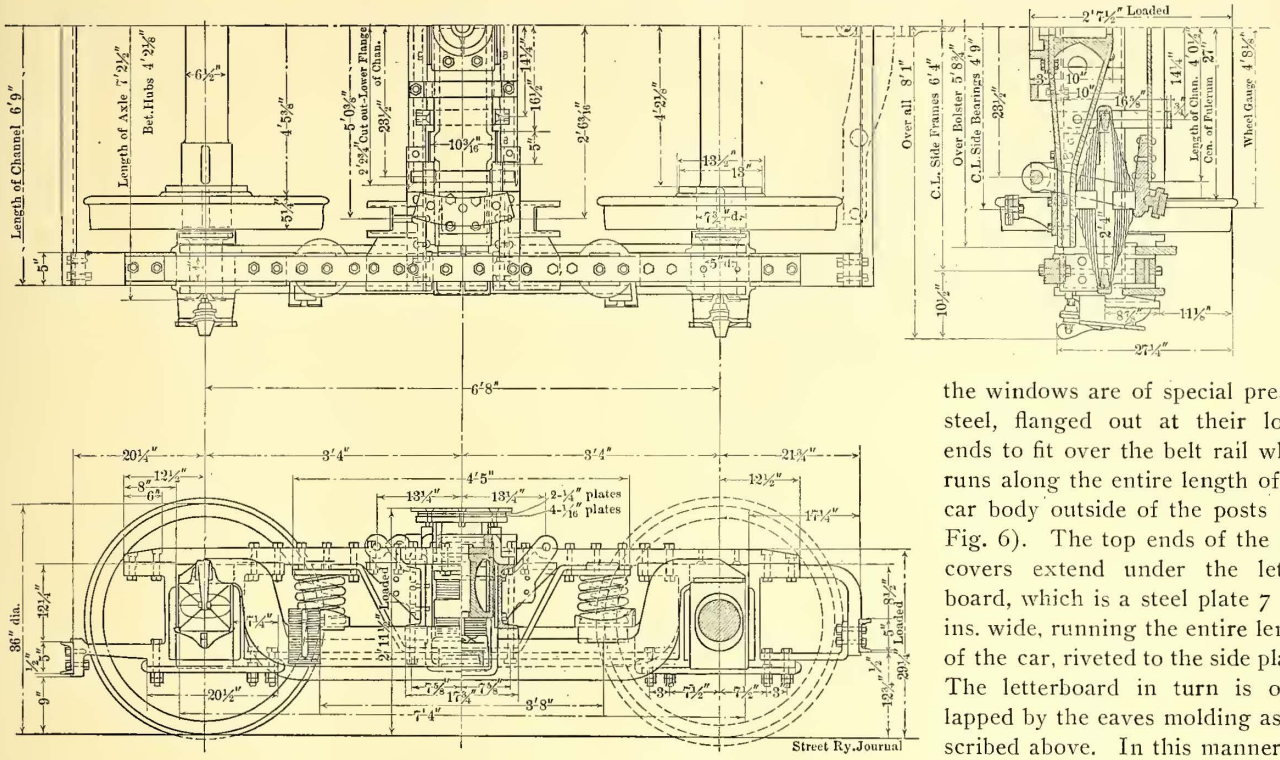


FIG. 10.—DETAILS OF MOTOR TRUCK

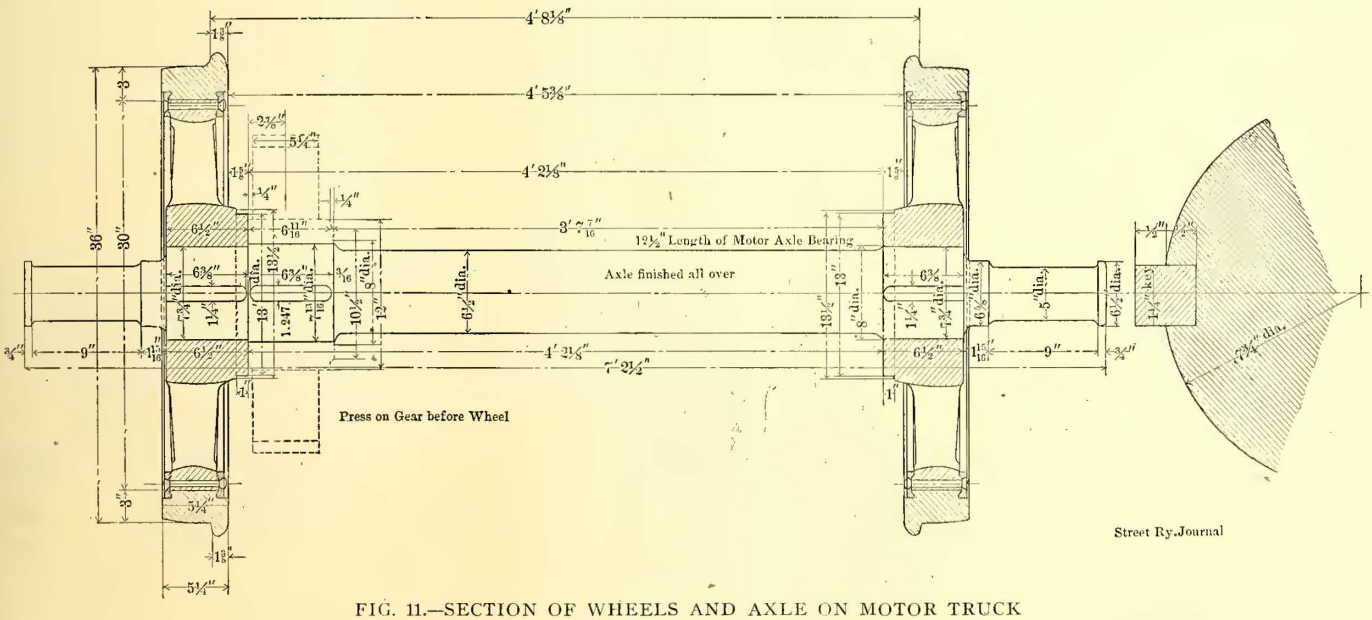


FIG. 11.—SECTION OF WHEELS AND AXLE ON MOTOR TRUCK

as to form a pocket to contain the auxiliary control switchboard panel, which will be described next week.

All motor cars are equipped with pilots suspended from the platform buffers, and the vestibules are fitted with pantagraph safety gates and guard chains to prevent trainmen and passengers from falling between the cars. The usual grab handles are also fitted to the sides and ends of the vestibules. An air whistle is also provided over each vestibule, with its operating valve situated conveniently to the control apparatus. Wooden paddles are carried in the vestibules of all cars, which are used to raise the contact shoes from the conductor rail when necessary.

SHEATHING

The side sheathing of the car consists of steel plates ⅛ in. thick, their lower edges being flush with the bottom of the sill. The bulb angles which form the belt rail and the window sills overlap this sheathing. The post covers between the windows are of special pressed steel, flanged out at their lower ends to fit over the belt rail which runs along the entire length of the car body outside of the posts (see Fig. 6). The top ends of the post covers extend under the letterboard, which is a steel plate 7 1-16 ins. wide, running the entire length of the car, riveted to the side plates. The letterboard in turn is overlapped by the eaves molding as described above. In this manner the entire outside covering of the car is waterproofed by simply overlapping its component parts, avoiding all cracks into which the water can run by gravity. All joints between the side sheathing plates are covered with sheet-metal battens, laid on with thick red lead and secured by rivets.

FINISH

The flooring of the car body is of corrugated sheet iron, and is supported by the longitudinal sills and the steel-plate bridging that is riveted across the space between the sills. The corrugated sheets are provided with metal clips which

are riveted to the sheets at about 10-in. centers, to secure the "Monolith" plastic floor upon which, after being finished, the maple floor strips are laid with brass screws. This monolithic floor is absolutely fireproof and is laid on in the form of a cement, which, when set, has a smooth, hard finish. The construction is shown in Fig. 4.

The interior of the car is finished as follows: The window panels, end panels and mouldings inside of the car are of sheet steel painted a dark green color and relieved by gold stripes. The headlinings are composite board, painted light

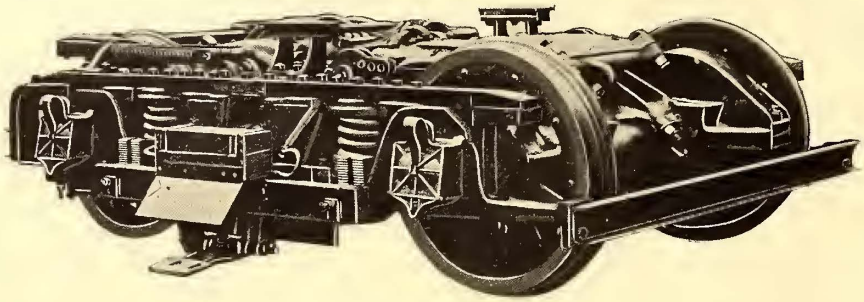


FIG. 12.—MOTOR TRUCK

green, decorated in gold. The hardware fittings are of lacquered bronze. The arrangement of the seats is similar to that used in subway and elevated railway cars generally. The seat frames are of steel construction carried upon brackets riveted to the side posts. The cushion and seat backs are of rattan. The seating capacity of each car is 52 persons. Strap rails of polished mahogany are also provided running along each side of the car in the clere story, supported in bronze brackets.

The wainscoting is of steel, backed by asbestos "Ceilinite," so as to make it conduct heat less readily.

The side windows are arranged to raise from the bottom, and glass in all doors and windows is polished plate. The deck sash are arranged to secure ample ventilation without drafts, all being operated simultaneously by operating levers at both ends of the car. They are fitted with double-thick, chipped sheet glass.

The side windows and the body end doors are provided with Pantasote curtains. The window sash are fitted with counterbalancing steel springs, and sash locks and lifts of an improved type. All window cappings and other moldings inside of the car are of aluminum shapes, secured by nickel-plated brass screws. The front windows of the vestibules are stationary. Ventilation in the vestibules is secured through the movable sash in swinging doors, or through side vestibule doors which are equipped with combination doorholder and motorman's arm rest.

All the metal work used in the body framing is given one coat of protective paint before assembling and two coats after assembling. After completion, the outside of the car was cleaned perfectly smooth by the sand-blast process, painted with two priming coats, two surfacing coats and with two coats of Indian red, the Railway Company's standard form of lettering and striping in gold leaf, and finally varnished three coats.

The surfaces of the sash, doors and moldings are painted and given three coats of the best wearing body varnish. The floors were all given two coats of paint. The headlinings were given three coats of inside rubbing varnish and rubbed to a dull finish. The roof was given one heavy coat of white lead paint before applying the canvas, another coat along the flashing after fastening it down, and two coats of metallic paint and pure linseed oil after completion.

There are 130 motor cars and four trailers, all of which were built at the Berwick, Pa., shops of the American Car & Foundry Company. They were personally designed by George Gibbs, chief engineer of electric traction of the Long Island Railroad, and a number of United States and foreign patents have been issued to him covering the various features of the construction.

Fig. 9 is a view of the completely equipped steel car, showing the vestibule end door closed, as it appears when the vestibule is being used as the motorman's compartment.

TRUCKS

The motor and trailer trucks are of the M. C. B. type, the wheel base of the motor trucks being 6 ft. 8 ins. for 36-in. wheels, the trailer trucks being 5-ft. 6-in. wheel base for 30-in. wheels. The distance between truck centers is 34 ft. A drawing of the motor truck is given in Fig. 10, and its general dimensions are as follows:

Gage of track, 4 ft. 8½ ins.
Distance between backs of wheel flanges, 4 ft. 5⅜ ins.
Height of truck center plate above rail, car body loaded with 15,000 lbs., 31½ ins.
Height of truck side bearings above rail, car body loaded with 15,000 lbs., 35½ ins.
Wheel base, 6 ft. 8 ins.
Weight of truck complete with two gears, but without motors, 11,800 lbs.
Weight on center plate with car body loaded, 30,885 lbs.
Weight of one motor on truck transom, 3500 lbs.
Torque of one motor on truck transom, 3000 lbs.

The truck bolster and track center plates are steel castings machined to the proper dimensions. The side frames are of wrought iron, machined on four sides. All bolt holes in the side frames are accurately drilled to templates. The end frames are of steel channels. The pedestals are forgings lipped over the sides of the car frames and are machined on all surfaces where they have a bearing, either on the side frames, pedestal caps, or the journal boxes. The transom consists of rolled-steel channels resting in the side frame

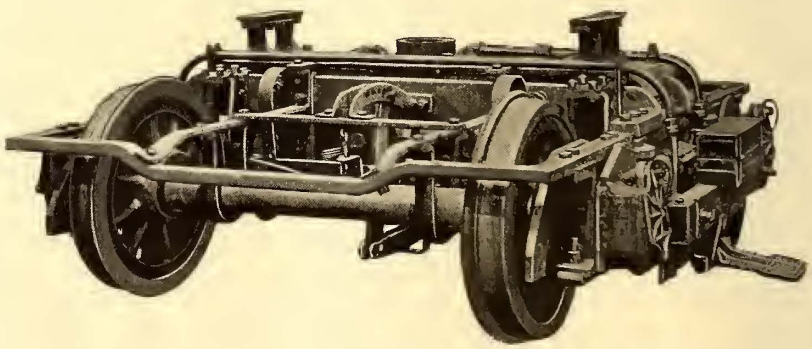


FIG. 13.—TRAILER TRUCK

castings, and provided with chafing plates of wrought iron. The equalizer bars are of wrought iron in one piece, without welds, machined on top edges for spring seats, and on the bearing surfaces over the journal boxes.

The pedestal caps are of wrought iron, of the individual type, machined and carefully fitted to the pedestals, being secured with hammer-driven turned bolts in reamed holes. The transom top braces are of wrought iron secured by turned bolts in reamed holes. Safety hangers and swing hangers are of wrought iron. The spring plank is of steel channel. The brake hangers, rods, levers and equalizing beams in the brake rigging are of forged iron, and the pins

throughout the brake rigging are accurately turned to dimensions, all wearing parts being case-hardened to prevent rattle. The motor suspension consists of a steel wearing plate on the transom on which the motor nose rests with a wrought-iron strap reaching over the nose and bolted to the transom.

The wheels are steel tired, with separate cast-steel spoke centers. The dimensions are as follows:

	Ins.
Outside diameter of tire	36
Total width of tire	5¼
Width of flange	1¼
Height of flange	1⅛
Width of hub	6½
Bore of hub (finished)	7¾

The tires are of Latrobe steel with standard M. C. B. tread, 3 ins. thick, fastened by shrinkage and with double-lipped retaining rings. Tests of the tire steel showed about 125,000 lbs. tensile strength per sq. in. The axles are of open-hearth steel and conform to the test requirements of the Pennsylvania Railroad Company's standard specifications. Key seats are milled in the wheel seats and gear seats. The gears are forced on at about 50 tons pressure and the wheels at about 75 tons. Fig. 11 shows the details of the motor truck wheels and axles.

The double elliptic bolster springs are of crucible steel. The equalizer springs are of double-coil pattern of open-hearth steel. Brake release springs are of the single-coil type. The track bolster is of cast steel, with seats for the center plate, side bearings, spring cap, and the chafing surface, cast on and machined. The bolster spring seats and their bearings are also of cast steel, as are also the side bearings, which are bolted to the bolster with turned bolts. The center plate is of cast steel machined and secured to the bolster by turned bolts. Combination bracket and guide castings supporting the brake release springs are also of cast steel, securely bolted to the side frames.

The journal boxes are of the cast-steel "Symington" type, machined on the inside for the M. C. B. standard journal bearing and wedge and on the outer faces for the box cover, and are provided with "Soule" dust guards. The brake head is of standard M. C. B. pattern of cast steel. The brake shoes are of the "Diamond S" type, composed of soft grey iron with chilled inserts and provided with wrought steel backs. The finish comprises three coats of paint, the last coat being mixed with varnish. Fig. 12 shows the truck with the motors and the third-rail shoes mounted upon it.

The trailer trucks are of generally similar type, but of 5-ft. 6-in. wheel base and somewhat lighter construction. The bolsters are of white oak, in three pieces, with iron plates placed between the timbers, securely bolted together with rough machine bolts, which also carry the bolster chafing plates. The center and side bearing plates are of the same height above the rails as in the motor trucks. The bolster is gained on the top for the center plate, on the bottom for the spring seats, and on the sides for the chafing plates. The spring plank is also of white oak, in one piece. The center plate, side bearings, bolster spring caps, seats, equalizing spring caps and seats, chafing plates and journal boxes are of cast steel. The frames, pedestals, pedestal caps, tie bars, transom, equalizing bars, frame braces swing and safety hangers, spring plank axles, and brake rigging are of forged iron. The brake head and shoe are similar to those in the motor trucks. The weight of a trailer truck is 9400 lbs.

The wheels are steel-tired, with separate cast-iron spoke centers. The following are the dimensions:

	Inches.
Outside diameter of tire	30
Total width of tire	5¼
Width of flange	1¼
Height of flange	1⅛
Diameter of axle at center	4½

The tires are of the same type and are secured in the same manner as those on the motor trucks, and the wheels and axles also conform to the same specifications respectively. The journals are 4¼ ins. x 8 ins. The finished truck is illustrated in Fig. 13. Both motor and trailer trucks were manufactured by the Baldwin Locomotive Works.

THIRD-RAIL SHOES

The standard third-rail shoes on the Long Island cars are of the hinged-slipper type, supported on the usual wooden beam, which is clamped against the notched face of the equalizer spring seat castings, providing means for vertical adjustment. Upon the center of the beam is placed a 600-amp enclosed-type fuse in a wooden box, with a hinged cover and lined with asbestos. The arrangement is shown in detail in Fig. 14.

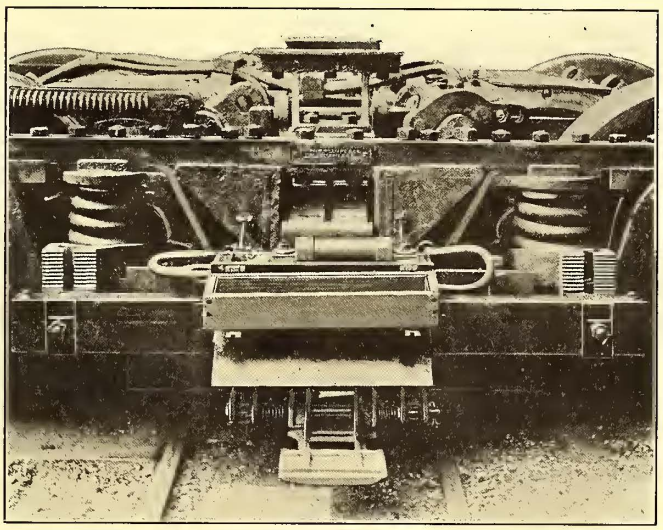


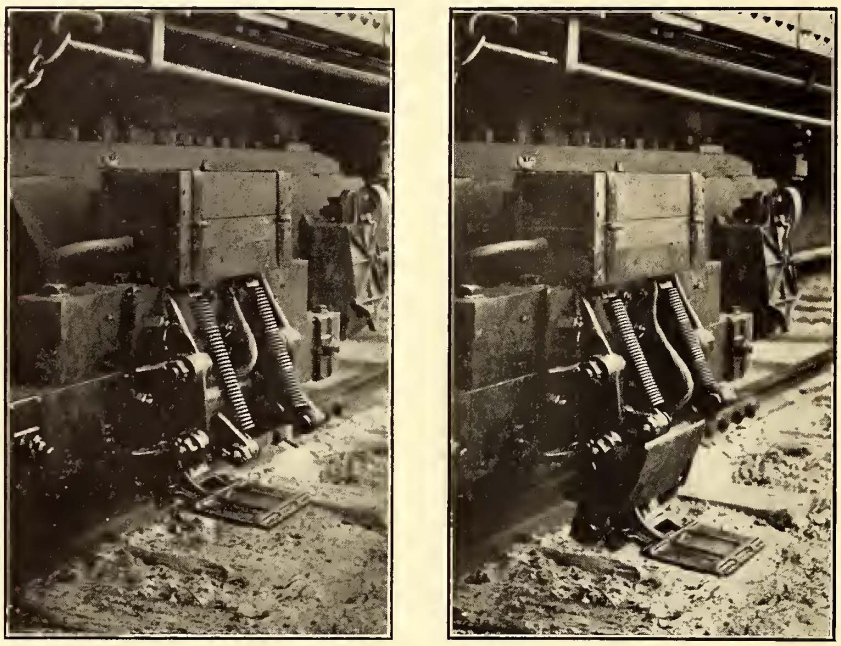
FIG. 14.—THIRD-RAIL SHOE, FUSE AND CONNECTIONS

Trains from the Brooklyn Rapid Transit Company's elevated lines operate over the Atlantic Avenue and Rockaway Beach Divisions by way of Chestnut Street Junction to Rockaway Park. The Brooklyn elevated lines have been for some years operated by the third rail, but the location of their rail is 22¼ ins. outside and 6 ins. above the track rail, while the Long Island Railroad third rail is 26 ins. out and 3½ ins. up. This made it necessary to devise some form of adjustable third-rail shoe which would operate with equal facility over both third rails and be able to change from one to the other at reduced speed without requiring attention on the part of the motorman or train crew. Such an arrangement has been worked out, and patents on it have been applied for by James C. Boyd. It consists essentially of a hinged slipper-type of shoe mounted upon a movable lug which is held in either position by means of coil springs and is actuated by an arm that engages with a stationary cam mounted alongside of the track, in line with the third rail. The movement of the car past this cam in one direction changes the shoe from the inner to the outer low position, while a reverse movement of the car past the cam changes it from the outer to the inner raised position. The appearance of the shoe in the inner position is shown in Fig. 15 on the left and in the outer position on the right. The cam as it appears in the third rail is shown in Fig. 16.

These adjustable shoe equipments have been fitted to such cars of the Brooklyn Rapid Transit Company as are to operate over the lines of the Long Island Railroad.

AIR BRAKES

The cars are equipped with hand brakes and with the Westinghouse quick-service automatic air brake. This brake is of the new design developed from the quick-action brake, and was described quite fully in the Street Railway Journal for April 22, 1905, in connection with the equipment of the cars of the Metropolitan West Side Elevated Railway Company, of Chicago. Compressed air is supplied to the system by a Westinghouse D-2 electrically driven air compressor on each motor car, controlled by a standard Form "J" governor. This pump has a rated capacity of 24 cu. ft. of free air per minute, and supplies both the air brake and the pneumatic control system, but the brake and the control systems are operated from separate reservoirs.



Inner Position Outer Position

FIG. 15.—ADJUSTABLE THIRD-RAIL SHOE IN TWO POSITIONS

The Westinghouse quick-service brake differs from the standard apparatus in the passenger service in that it has (a) quick serial service application, (b) graduated release of cylinder pressure, (c) quick charging of auxiliary reservoirs, and (d) protection against over-pressure. The quick serial service application is obtained by venting the train pipe air into the brake cylinders, in each service application, in the same way as is done by the quick-action brake in emergency. The time required to fully set the brakes in service is in this way reduced approximately one-half as compared with the usual apparatus. The cylinder pressure can be gradually reduced by any desired amount just as with the old straight air system. This is made possible by a special arrangement of ports in the triple valve, and a partial release of the air from the cylinder is effected by a slight raise of the train pipe pressure by the motorman through the motorman's brake valve.

The quick charging of auxiliary reservoirs is done by providing an additional supply port in the triple valve connecting train pipe on each motor car with the main reservoir, through the feed valve. When the brakes are released, the train pipe and auxiliary reservoirs are supplied from all the main reservoirs of the train, thereby permitting the auxiliary reservoirs to be charged at a rate that makes it impractically impossible to deplete the effective pressure as long as the main reservoirs are supplied by the compressors. Protection against over-pressure is effected by supplying the train pipe with pressure equalized from all the main reservoirs in the train.

By means of the modifications above described, the air brakes are applied more rapidly and the distance required to stop the train is materially lessened. The efficiency of the brake is still further increased by the graduated release feature. The average time required for stopping the train in local service with this device is reduced from 30 to 40 per cent.

The advantage of quick charging of the auxiliary reservoirs is apparent in rapid transit traffic where very frequent stops are necessary. This arrangement makes available the full reservoir pressure at every application, even though the applications be made but a few seconds apart.

The use of the train pipe in service applications also effects a substantial economy in the use of the air stored in the auxiliary reservoirs, and the graduated release is an important factor in reducing the amount of air required for braking, due to the fact that a single strong initial application is usually all that is required to make a stop, the ability of the motorman to gradually reduce the cylinder pressure enabling him to make the stop at exactly the right place. The standard brake usually employed hitherto requires two or three applications.

The method of locally venting the train pipe in service applications enables the quick response of the triple valve to slight reduction in the train pipe pressure.

The main reservoir pressure is from 80 to 95 lbs., and the train pipe pressure is 70 lbs. A conductor's valve is also provided by means of which the train pipe pressure may be reduced by pulling the cord which passes through the car, and may be quickly reached from any part of it.

FIG. 16.—CAM IN THIRD RAIL FOR CHANGING ADJUSTABLE SHOE

All the motor and trailer cars are provided with automatic adjusters which automatically take up the slack in the brake rigging and keep the piston travel uniform throughout the train.

ELECTRICAL EQUIPMENT

A full account of the electrical equipment of the cars described above, and of the tests by which the capacity of the motors were determined, will appear in the next issue of this paper. Particulars will also be given of the car-wiring and car shops and inspection sheds at Morris Park and Dunton.

THE SINGLE-PHASE RAILWAY AT THE MILAN EXHIBITION

Visitors to the Milan Exhibition are greatly interested in the electric railway which runs from the part of the exhibition situated in the park to the second half in the Piazza d'Armi. The recent astonishing developments of single-phase traction both in America and Europe have caused much interest in the technical press, and the announcement which occurred recently of Dr. Finzi's separation from the Broschi Gadda Company and his union both for patents and all interests with the Westinghouse Company, of America, makes some account of this railroad exceptionally interesting. The advantages offered by the simplicity of this system have always been apparent, and hard work, close study and experience have produced a brilliant example of technical skill, due not only to Dr. Finzi, but also to the additional practical experience of the engineers employed by the Unione Elettrotecnica Italiana.

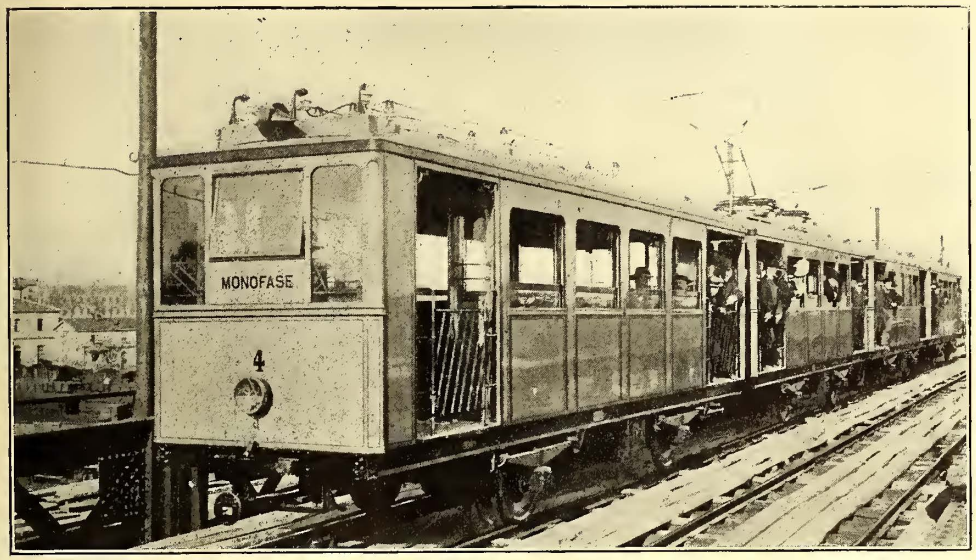
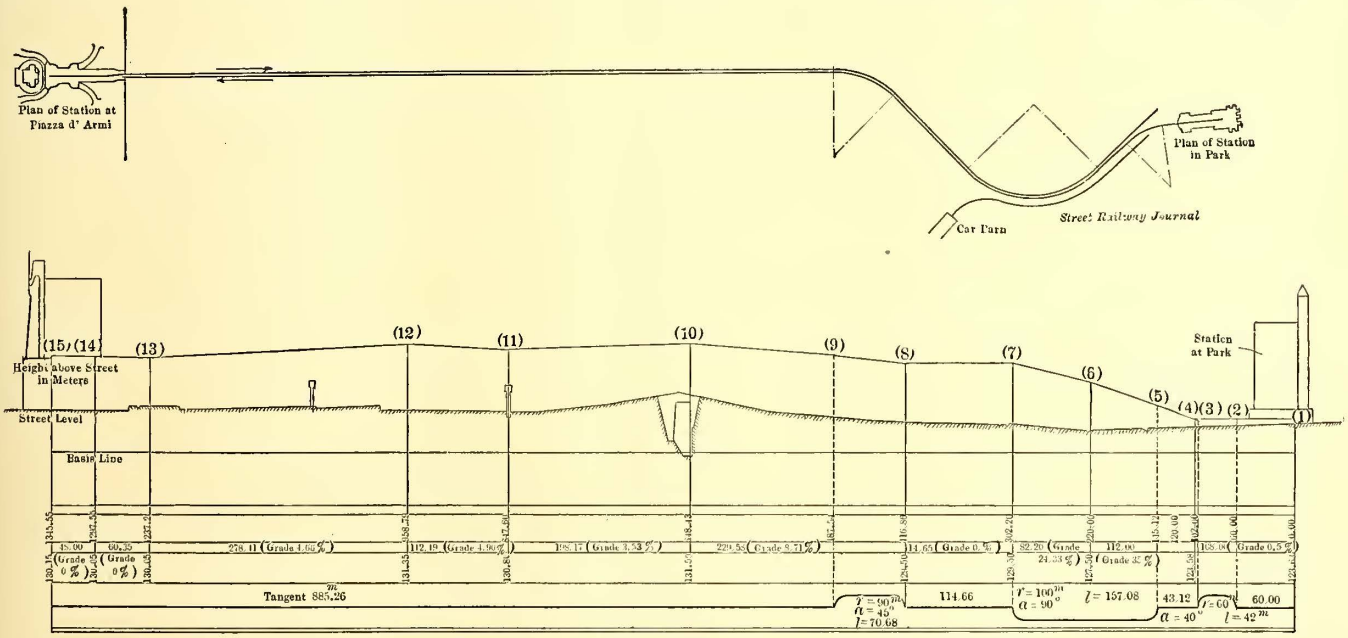


FIG. 1.—A TRAIN OF SINGLE-PHASE CARS AT MILAN

Dr. Finzi states that this railway embodies the results of his latest practical experiments with large cars on the Milan-Mussoco road, which started in 1903 and has been carried on with vigor ever since. The essential feature of success is the choice of a low enough frequency, in this case 15 cycles. The modifications introduced by Dr. Finzi consist chiefly in neutralizing the armature reaction by means of a subsidiary winding placed at an angle of 90 degrees with respect to the field magnet coils. The track passes over the streets of Milan, and also crosses the railroad and passes over part of an intervening park. The track is double throughout its entire length, except at the stations, and an auxiliary siding is provided at both stations, which can be made use of for emergency. The plan of the railroad is shown in Fig. 2.

The length of the line is about 1600 yards, the radius of the only curve is 300 ft., and the steepest gradient is 1 in 30. The rails are of the type known as the Rete Adriatica, and weigh 60 lbs. per yard. The return current passes along them, and copper bonds with a section of .1 sq. in. are used. The rails rest upon a viaduct constructed of wood except where the track passes over the railway lines and streets en route, in which case iron is used. Reference to Fig. 3 shows the profile of track and ground of the line as originally built, the only change at present being the substitution of two Siemens bows instead of the single pantagraph type of collector shown in Fig. 4, which type was first installed to avoid danger due to the motorman forgetting to pull down two Siemens bows, if one were placed on each end of the train, and some examination of apparatus became necessary. Due, however, to some difficulty in the patent situation, the ordinary Siemens bows were used, and though they resulted in a fatal accident during the early part of June, they have not yet been replaced.



FIGS. 2 AND 3.—PLAN AND PROFILE OF SINGLE-PHASE RAILWAY FOR CONNECTING THE PARK WITH THE PIAZZA D' ARMI

In Fig. 5, showing the section of the viaduct, the method of trolley wire suspension employed is shown. This line consists of two wires of hard electrolytic copper, .075 sq. in. in area, and the trolley pressure is 2000 volts. The height above ground is 18 ft., and the special metallic elastic suspensions which enable the use of cement to be abandoned are noteworthy. Additional insulation of trolley wire from earth is secured by the span wires, which are fixed to double petticoat insulators on the top of the posts. At the stations at either end of the line all danger to passengers is avoided by carrying the line on the usual hanger, which itself is supported by two insulators attached to a wooden beam.

As it is proposed at the end of the exhibition to carry on experimental tests with voltages in the neighborhood of 10,000, the insulation of the line has been installed with this idea in view. Two horn-type lightning arresters are used at each end.

The generating station, situated under the platform of the Piazza d'Armi station, as shown in Fig. 6, contains a single-phase, 2000-volt alternator built with six poles and operating at 300 r. p. m., this machine being driven by a three-phase motor wound for 3600 volts and bolted to a common cast-iron base. The output of the set is approximately 600 hp. A small alternator, direct coupled to a Langen & Wolf gas engine, is also operated, and these two machines have up to

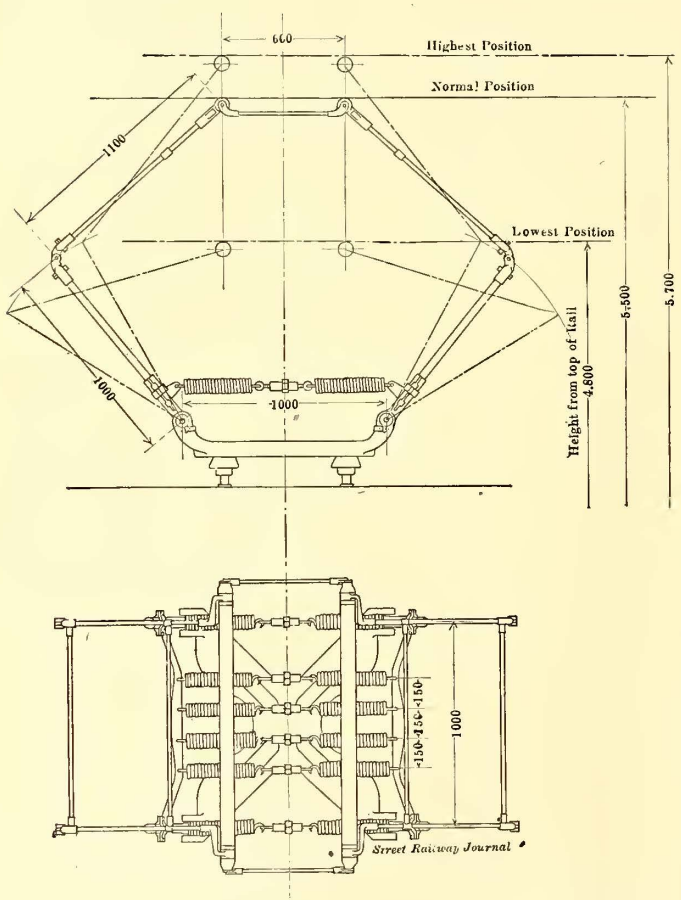


FIG. 4.—ELEVATION AND PLAN OF FINZI COLLECTOR FIRST USED

the present been ample to meet the demands of the railroad. The rolling stock consists of four regular trains, each containing four cars, with two more as reserves (see Fig. 7). The length of the cars is approximately 32 ft., the wheel base being 13 ft. Each train is stated to accommodate 250, but contains only 96 seats, a large space, however, being provided on the end platform to which passengers are admitted. The maximum speed is limited to about 20 miles per hour by the exhibition authorities on account of the light construction of the viaduct, but speeds in the neighborhood of 28 miles per hour have already been attained.

The wiring diagram of the train for motive power is shown from Fig. 8, and it should be noted that the system is easily controlled from either end of the train. This is obtained by dividing the transformer into two parts, one being in the front carriage and the other in the last. The current

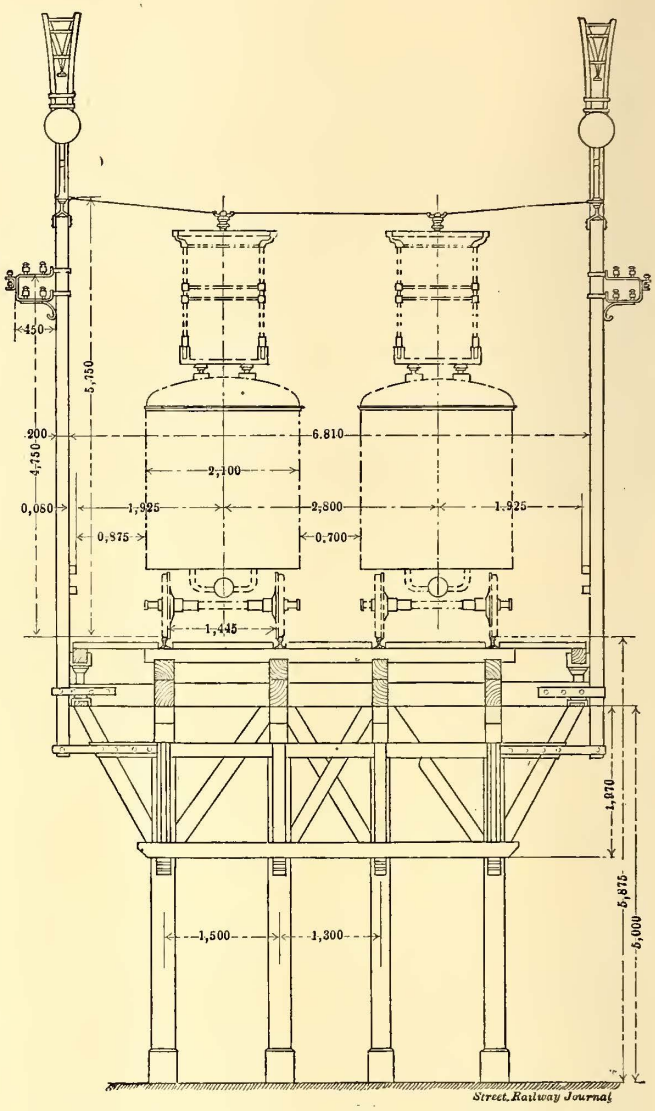


FIG. 5.—TRANSVERSE SECTION OF VIADUCT. DIMENSIONS GIVEN IN MILLIMETERS

enters the collector at 2000 volts 15 cycles, and after passing through the choke coil of the lightning arrester enters the relay of the main switch, which can be operated automatically or by hand. From the relay through the switch, main fuse and then to the primary of the transformer in the first carriage, passing along the train through one of the three wires placed on the roofs of the cars, it then enters the primary of the second transformer at the other end of the train, and finally returns along the track to the generating station. The third high-tension line just referred to is for placing the primary of the first transformer in parallel with the main switches.

The complete equipment of the train consists of six motors, two on each of the end or driving cars, and one on each of the intermediate or passenger cars, these six motors being arranged in groups of three for each transformer. The motors start on the first position of the controller, which gives approximately half normal voltage, which Dr. Finzi states is in general the best starting pressure.

Following the position of the controller handle, from 1 to 7, after the first application of half-normal pressure, each step of the controller adds 30 volts to the secondary, thus bringing the voltage up from 180 to 360 volts, which for the three motors in series means an average value of 120 volts per motor. The reversal of the motors is obtained in the same way as with the direct current. The motor and transformer is shown in Fig. 9. The motor is provided with laminated poles and compensating winding for the production of the flux at right angles to the field. The effect of this is to neutralize the armature self-induction and increase the power factor. The brushes are the same in number as the poles, viz, six, and are carried on rigid rings. They are made as long and narrow as possible, so as to improve the commutation. It is noteworthy that the commutation segements, which are constructed of very thin copper plates, are connected to the conductors without any resistance. The armature is built up with steel stampings containing altogether sixty-five conductors in slots.

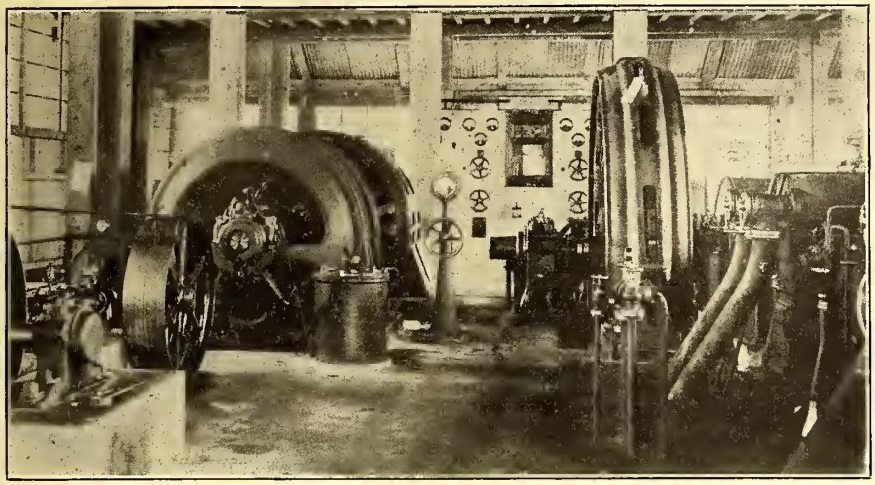


FIG. 6.—POWER STATION AT PIAZZA D' ARMI FOR SINGLE-PHASE LINE

On first inspecting the car the visitor is impressed by the size of the controller, but the currents handled are in the neighborhood of 700 amps., and ample size is imperative. The design of the controller is adapted to enable either continuous or alternating current to be employed. To pass from one position of the controller to the next without breaking the circuit and without causing excessive current is taken care of by the provision of a choking coil inserted during the moment of change of contact.

The acceleration of the motor at starting is stated to be one-half foot per second, and reference to Fig. 10 will show that the starting always takes place on a slight up-grade. The operation of the motor is apparently extremely satisfactory, the commutation being very good. It is, however, somewhat too short a time for any serious difficulties to arise, but by the time of the Engineering Congress in September some valuable experience should be available.

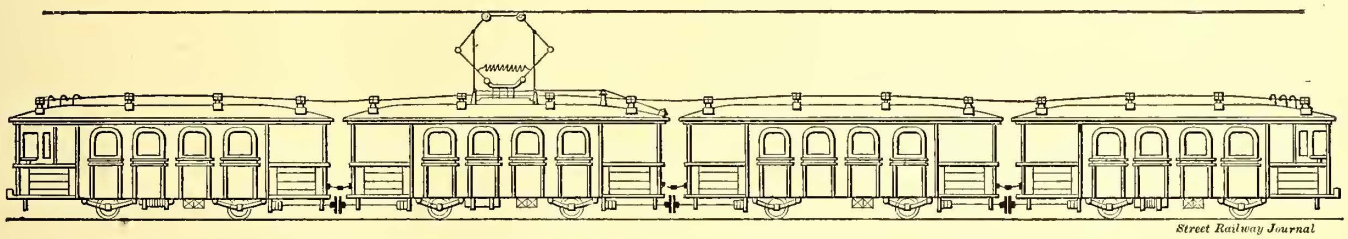


FIG. 7.—A COMPLETE TRAIN ON THE MILAN EXPOSITION RAILWAY

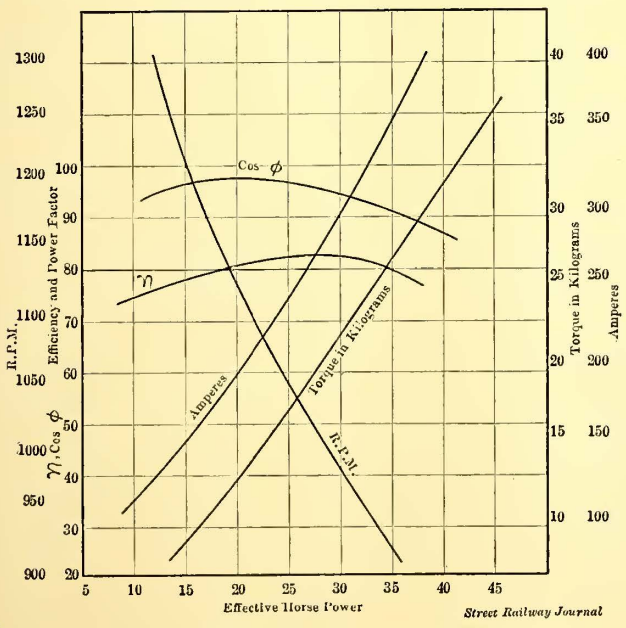


FIG. 10.—CHARACTERISTIC CURVES AT 100 VOLTS

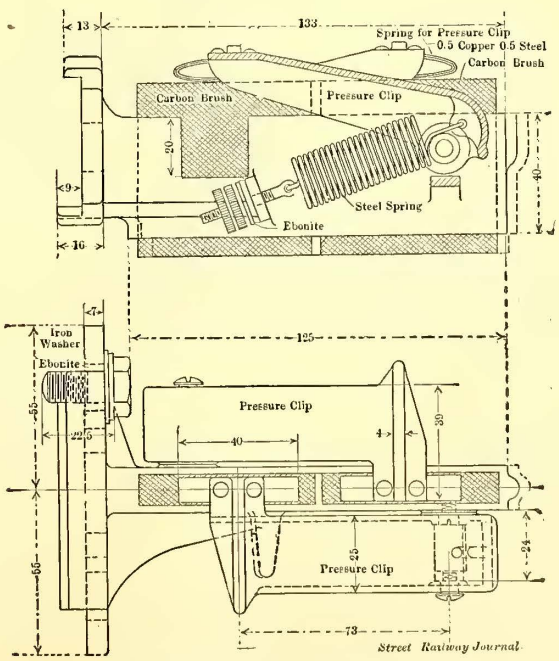


FIG. 11.—DETAILS OF BRUSH-HOLDER

The details of brush holders, dimensions of brush, pressure clip, etc., are shown in section and plan in Fig. 11.

Details of the Finzi pantagraph collector are of great interest and are shown in Fig. 4. Fig. 10 shows characteristic curves of the M. F.-25 motor used on this railroad, and thoroughly explains the principles underlying its design. Fig. 11 shows the stator of this motor.

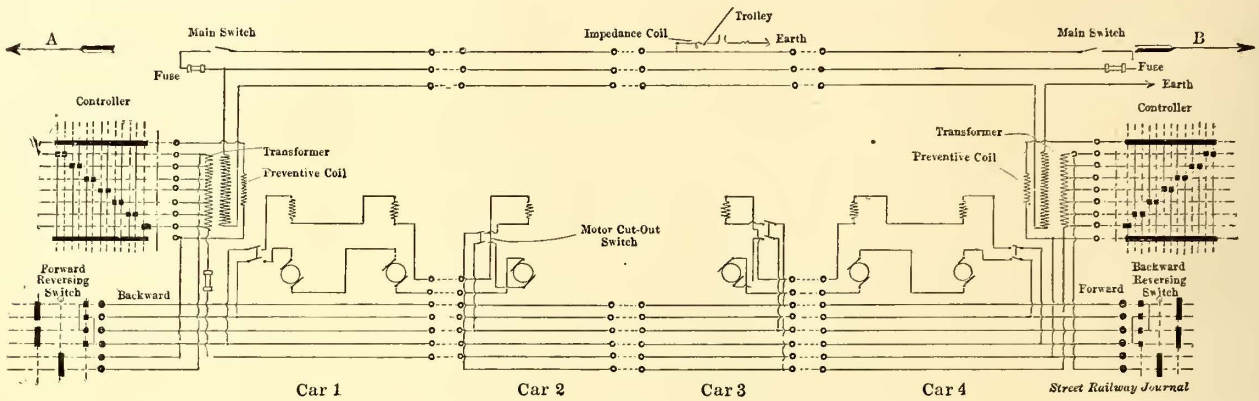


FIG. 8.—DIAGRAM OF TRAIN CIRCUITS

The system was laid down for a three minutes' service, and this is at present easily maintained. This railway, though

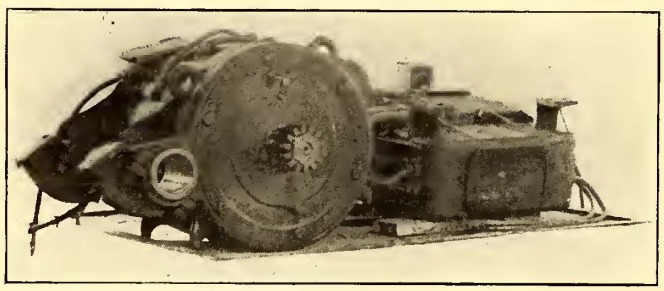


FIG. 9.—SINGLE-PHASE MOTOR AND TRANSFORMER

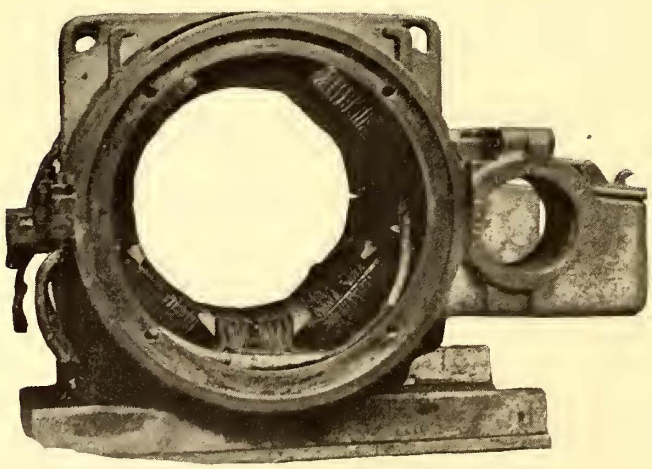


FIG. 11.—STATOR OF SINGLE-PHASE MOTOR

slightly less than a mile in length, offers an interesting example of the latest development of European practice with this type of motor.

The United Railways (of St. Louis) Band, composed of about sixty musicians employed on the different divisions of the system, was entertained by General Manager McCulloch one evening recently in the hall on the third floor of the headquarters building. The band practices in the hall every Tuesday and Friday evening, and employees of the company, with their wives and families, assemble to enjoy the concert.

PROFIT-SHARING TO BE TRIED IN ALBANY, N. Y.

The United Traction Company, of Albany, N. Y., is about to inaugurate a profit-sharing plan, the beneficiaries of which will be the motormen and conductors only. By the new scheme the men will have a chance to participate in the distribution of 75 per cent of $75,000, and it is thought that the men who, because of their record, are entitled to participate in this fund, ought to make from 10 to 15 per cent of their annual salary by the new scheme, averaging between $50 and $90 each.

Vice-President Culver announced that, beginning Aug. 1, an individual record for all motormen and conductors would be established, which would in effect amount to a profit-sharing arrangement. The personal injury expenses of the company for the last year was approximately $75,000, which represented 1,500,000 fares. This expense was largely due to the carelessness of the car crews, and it is proposed to encourage the men to be more careful. Therefore, it is proposed to give to each man who at the end of the year has a clean record his pro rata share of the 75 per cent of what they save by their carefulness, using the $75,000 as the basis of estimate.

The company will establish a board of review, on which the men will have a representative, which will from time to time decide who is entitled to participate in the fund. All men start Aug. 1, with a clean record and on an equality. If, by care, attention to passengers and keen supervision of the company's property, a man closes the year with a clean record and without an accident he will be placed on the roll to participate in the profit-sharing fund, which amount will be paid to him at the end of the year in cash. Those whose records are not clean will not participate. By this scheme the company hopes to make the matter of carefulness a sort of mutual affair and those who deserve it will receive their reward. It will undoubtedly result in more care and a lessening of the annual expense to the company, every man thus constituting himself a policeman to guard the company's property and being paid extra for his services. This proposition comes as a voluntary offer from the company, and shows that it is prepared to meet the men more than half way. The men get 22 cents an hour and average between $600 and $800 a year. There are about 500 men employed by the company in Albany and Troy who will be entitled to participate in the new scheme.

A special election will be held in Seattle, Sept. 12, to vote on the proposed municipal ownership of the street railroad system, outlined by the city engineer, at an estimated cost of $7,579,980. A bond issue, to be authorized later, is part of the program.

REGENERATIVE CONTROL AND THE BOW COLLECTOR

BY GERALD HOOGHWINKEL, M. I. E. E.

The latest series of accidents in England, mostly due to the use of the hand brake as a working brake and of the magnetic or the electric rheostatic brake as an emergency brake, have once more drawn attention to the shunt or compound motor as a tramway motor.

There cannot be, or rather there should not be, two opinions as to the question whether a shunt motor is the traction motor "par excellence." Automatic and sure braking, constant and fixed speed for every definite position of the controller, are and have always been recognized as desirable qualities, and their early introduction has only been hampered by constructive difficulties, long since overcome. As early as 1896 the writer was instrumental in introducing them in the town of Essen, where fairly heavy grades are constantly met. Two years afterward they were replaced by series motors, as there was considerable trouble due to sparking at the commutator, and piercing of the field coil insulation due to the higher pressure between the coils. These constructive defects have long since been remedied by carbon brushes, auxiliary poles and better insulating materials, and the present regenerative motors on the market run perfectly. Mr. Raworth in England has added various improvements which in the writer's mind have completely swept away the causes for distrust, generally based on lack of initiative and the fear of the new, or apparently new. The series parallel controller has done away with the only drawback to the constant-speed motor, and the speed regulation leaves nothing to be desired.

In his present practice, in addition to tramway work, the writer has to give considerable attention to electric winding problems, and the electrical driving of rolling mills. Although different in detail, this class of work presents sufficient analogy with tramway work, and still in no case are series motors thought of.

These applications of electricity being of more recent date, the shunt motor, or its equal, the induction motor, was adopted at once as the only motor suitable for this work, and it needs only the correct appreciation of its qualities to enable the shunt or compound tramway motor to oust the series motor, even on quite flat lines.

Two other points should be at once considered, however, in connection with the wholesale introduction of the regenerative motor:

(a) A storing and equalizing device at the power station.

(b) A collector which does not de-wire.

The first condition has been at once recognized in the application of the shunt motor before mentioned, and batteries, the equalizing booster, and lately the Ilgner flywheel equalizers, have been introduced. The usefulness of the storage battery is not generally recognized even yet. To enable the full benefit to be derived from regenerative control a battery with a reversing booster, or in some cases a flywheel booster, should be installed in most cases. Of course with the present series motors a battery or its equivalent, at least in all smaller undertakings, is desirable.

The second condition is even more important, especially when considered in connection with the recent brake accidents. To be effective the regenerative equipment must be in constant communication with the source of supply, and the trolley wheel has an unenviable reputation of leaving the wire at the moment its connection is most urgently required. On other grounds the writer has frequently advocated its use, and being himself very much in favor of the bow system under most circumstances, and having constructed several continental lines on that system, he has tried on several occasions to elicit an opinion as to its merits from our electric traction specialists. The answer has invariably been an evasive one, with a slight inclination toward hostility while referring to a particular antiquated and obsolete system in the Isle of Man. Some of these specialists drew appalling pictures of molten grease dripping from the overhanging bow upon the defenseless passengers when used with the double-decked cars employed in England. But double-decked cars are used in Sheerness, and the writer has not yet heard of these calamities. Others compared the graceful (sic) trolley pole to the, at a distance, almost invisible bow. Objections from an engineering or commercial point of view could not be obtained, and the only thing was to equip a line and invite criticisms.

The first equipment of this system of overhead collection in Great Britain was laid down by the writer for the Sheerness electric tramways, one of the affiliated companies of the Electrical Power Distribution Company, Ltd., and has proved a complete success during the three years it has been in operation. This result was of course to be expected, as fully one-third or more of the electric tramways on the continent are constructed on the bow system, and even all the latest undertakings, i. e., Cologne, Amsterdam and Vienna, etc., have adopted it after a careful inspection of its merits.

The line has been built and runs to every one's satisfaction, and particularly to that of the Board of Trade. Some trouble was experienced at first through the breaking of several standards which had been made of cast-iron instead of steel as specified. As the strain on these standards at certain points, as on curves, was somewhat more severe than with an ordinary trolley, this could have been expected. The standards, however, have now been changed and converted to an inside spring pattern like our ordinary trolley standards; the first had an outside ring fixed on the top.

The latest report from Sheerness, which should be especially noted with reference to the overhead gear, is as follows:

> During the whole time the tramways have been running (over three years) no repairs have been necessary to the overhead equipment, beyond renewals of section insulators, strips and about half a dozen span wires.
>
> The trolley wires are still in very good condition. The life of an aluminum bow strip is, roughly, about 5000 running miles; these cost 6s. 6d. to renew, without allowing for the old strips which weigh about 3 lbs., which fetches 2s. 6d. as scrap.

In view of the successful operation of this line, the writer wishes to go a step further, and strongly advocate the bow system for all large cities where many crossings and pieces of complicated overhead construction are to be met, and as a matter of course for all interurban lines where the speed exceeds 20 to 25 miles per hour, and where no third rail is used. If we remember that according to the Board of Trade statistics 80 per cent of all accidents on electric tramway lines may be ascribed to the trolley leaving the overhead lines, not only causing much damage to the overhead gear, but often resulting in serious loss of life, and that this contingency is of course impossible with the bow system, that advantage alone should be considered sufficient for its general adoption.

But there are other more visible advantages. As the contact is able to displace itself laterally along the bow, it is clear that the contact wire need not follow in curves the center of the track, and needs even less points of suspension and poles than the side-trolley system. This does away with many pull-off and hangers, etc. There are no frogs and switches as a matter of course, and this rids us from the most objectionable overhead device. The pressure (12 to 15 lbs.)

of the light bow, which need not be protected from jumping off the line, against the latter is very much less than with the trolley. Therefore the entire overhead equipment has less points of suspension and the material used can be much lighter, and therefore less unsightly or objectionable, than with the trolley. This advantage should be of prime importance in our big cities with their large squares where several lines cross. The smaller number of poles and the absence of frogs and crossings also reduces the first cost and maintenance of the line.

The contact surface of the bow consists of a grooved aluminum strip, greased if necessary, and the wear and tear on the trolley wire is therefore, and has been proved to be, much less than with the trolley wheel. The trolley wheel requires higher spring pressure and pounds the wire with considerable force at the points of suspension, especially at the curves and crossings. On the contrary the bow, with much less pressure, runs smoothly, and shows no or very little sparking. The trolley wire will last much longer when using the bow, and the writer has had ample occasion to verify this statement on lines like those of Dresden and Budapest, where the same trolley wire has now been in use for over twelve years.

The effect of the trolley wheel, especially on sharp curves, is an increased wear on the sides of the wire, caused by the flanges of the wheel. This wear and tear is reduced to a minimum by the use of the bow, which only causes a slight wear on the under side of the wire, and if the bow is used with a lubricating groove, is hardly noticeable even after many years. The writer found upon examination of some wires used in Dresden that the section after four years' use on one of the busiest lines represented still 96 per cent of the original section. This removes a source of danger of breaking wires at the curves, which need careful and frequent inspection where a trolley is used.

Lubrication of the bow-groove has the additional advantage of minimizing the noise. Moreover, it is possible to use on curves a secondary contact wire, which can be easily renewed without much cost.

The overhead line has to be slightly zigzagged in order to insure even wear on the bow surface, but the contact strips cost very little (4s. or $1) to renew (every six weeks). If sufficient care is taken to fix the spring pressure at the proper figure most suitable to the overhead equipment, and reasonable precaution is taken by the man, it will be found that the maintenance of the overhead equipment and bow gear is less than on the trolley system.

Roughly speaking, therefore, the bow system possesses the following features:

(a) Safety at any speed, especially with regenerative control.

(b) Easier handling.

(c) Lighter, cheaper, and less unsightly overhead construction.

(d) Less wear on the contact wire.

The writer is well aware that the above notes contain nothing that is absolutely new to street railway engineers, but strange to say, the many advantages of the bow system have never been properly discussed or shown either in England or America.

The introduction of the shunt motor as the proper tramway motor should go hand in hand with the bow-controller.

It is said that plans are being made for electrifying the mountain division of the Mexican-Vera Cruz Railroad, power to be generated near Cordova.

A WIDE-AWAKE PURCHASING AGENT AND HIS METHODS*

BY CHARLES T. DOERR

Purchasing Agent and Superintendent of Stores, Birmingham Railway, Light & Power Company, Birmingham, Ala.

The subject assigned to me is one upon which a great deal might be said. I do not consider it necessary to go into the minor details, but will give the gist of what should be the qualifications of a buyer who is modern and up to date.

The successful operation of any business, whether it be private or a public corporation, is dependent upon the attention paid to details, not the least of which is the purchase of material. I have followed closely for a number of years the proceedings of the Street Railway, as well as the Accountants' Associations, but I do not find that the work of the purchasing agent has been given the attention which the importance of the position deserves. The handling and accounting of stores is the source of much study and discussion, but the cost and quality of the material and supplies delivered into the companies' storerooms and barns, which is of equal importance in my mind, seems to have been overlooked.

The buyer at the present day is recognized as an indispensable member of the cabinet of every progressive business man, and from the very nature of his position comes into touch with details of the entire property that no other department head ever sees, unless he is sufficiently interested to look for them. A question often asked is: What are the characteristics of a good purchasing agent? I will say that in addition to the requisite of intelligence and common sense should be added, most emphatically, politeness and patience. A purchasing agent must be from start to finish a gentleman. No matter how busy, no matter how worried, every caller, even though he be the twentieth man, should be treated courteously and affably. Traveling men are very clannish, and it is a matter of policy to have the good will of every man on the road. It sometimes means many dollars to the company. It does not follow that he should be a "hail fellow, well met" with every salesman who comes into the office. Intimacy is to be avoided even more than boorishness. It seems almost needless to say that absolute honesty and unswerving integrity, requisites to any position, are a hundred times more necessary in this. Trickery and deceit, which some buyers consider clever work, may now and then secure a desirable price, but the practice is bad and the results are never satisfactory. Be frank and fair, and—as Mr. Roosevelt says—give every one a square deal.

The tendency of modern times is toward specialism, and it is natural that success will follow constant study of any exclusive work, but the purchasing agent must be a specialist of specialists. He must be an encyclopedia of deep knowledge and useful information. Requisitions for supplies may include articles from a carload of car wheels to a barrel of flour, from a box of bank pins to a season's supply of gas ranges. I have even bought monkeys. His information as to prices and bases of supply should be so systematically compiled as to be at his hand in any emergency. His catalogue file must be carefully arranged, as it bears the same relation to him as a library does to the student. His files should contain tables and statistics of all kinds, not omitting a good engineer's handbook. Daily attention should be given to market reports and the influences which affect prices carefully studied. Causes seemingly remote may have effects which are directly felt in the operating expenses, and it is only by the closest attention that these effects may be dis-

* Paper Read Before the Newman Properties' Association at Knoxville, Tenn., in June, 1906.

counted. I have found the New York "Journal of Commerce" to be of great help to me in my work, and I am sure that the subscription price has been saved many times over.

In the purchase of material a desirable price is not the only consideration—any schoolboy can place an order with the lowest bidder. Hence it is necessary that the purchasing agent be familiar with the specifications governing a vast assortment of supplies. The grading of lumber should be learned and applied. The distinction between "A" and "B" grade glass should be understood. It is a serious matter to pay for one and receive the other. The adulteration of white lead is a common matter, but the live buyer should be able to apply a simple test and satisfy himself that he is getting pure lead if he pays for it. In the purchase of insulated wire, although the weights are now guaranteed, it is necessary that the specifications be carefully scrutinized to avoid paying for cotton and rubber at the price of copper. This is of even greater importance in the purchase of underground cable, which requires the closest study to determine the best material at the lowest price.

The thousand and one articles used by a public corporation have each their characteristics, which must be understood to enable the buyer to make an intelligent selection. Thus it goes through the entire list. Nothing is taken for granted and everything must be inspected and tested and weighed.

I want to say a few words relative to the purchase of material from out-of-town points. While it may relieve the accounting department of a great deal of work, I believe the prepayment of freight, except in particular instances, is not a sound business policy. The handling and approval of expense bills enables the purchasing agent to check the rate and classification, and you would be surprised to know the number of errors made by transportation companies, and always in their favor. I have seen trolley poles classed as electrical machinery and billed under first-class rates. The purchasing agent should also study transportation lines so that he may direct the routeing and take advantage of differentials, or make such selection as he may find desirable for more than one reason. Economical purchase made under careful conditions does not end his responsibility. He should keep in touch with the man using the material, whether it be the station engineer, the master mechanic, or the track foreman, and through close attention, study for himself the efficiency of the material he has purchased, and not depend blindly upon the judgment or selection of others who may be more or less prejudiced.

The routine of a well regulated purchasing department is a matter of personal preference. We find that a triplicate order system, forwarding duplicates to the auditor, and filing the third copy numerically, works out in a very satisfactory manner. All bills and invoices are sent direct to the purchasing agent, and after approval are numbered, recorded, and after notation on office copy of order, are forwarded to the auditor with evidence of delivery attached.

I have endeavored to show the complex nature of this position and how necessary it is for one to give close attention and careful study to every detail in order to make his administration a success and lend a hand in the reduction of operating expenses.

There has been a steadily increasing demand for sightseeing cars in San Francisco, because of the number of tourists visiting the city to view the ruins. With four special cars assigned for this service, carrying nearly 250 people, people are frequently turned away to the regular cars.

TESTING HIGH-TENSION INSULATORS

To test high-tension insulators under working conditions, the Insulatorwerke A. G. in Pankow, near Berlin, recently erected an experimental line equipped with insulators made by the Ambroin Werke (Kleinsteuber patent).

A description of this line should be of interest, since a pressure of 100,000 volts is used, and furthermore in addition to the transmission line in the open a part of the line is carried indoors and under conditions which could scarcely be called favorable. At two points in particular, special care was required, namely, where the conductors passed through a masonry wall and a doorway, respectively.

The line commences in a room containing a 20-kw transformer built by the British Westinghouse Company and having a ratio of 2:1000. In the forepart and at the right is the switchboard for the transformer. It is equipped with a two-pole switch, an overload circuit breaker, a hot-wire voltmeter and a hot-wire ammeter, all in the primary circuit. Although the voltmeter is connected in the primary circuit, the scale reads the secondary voltage. The ammeter is fastened at the side of the switchboard. The primary current

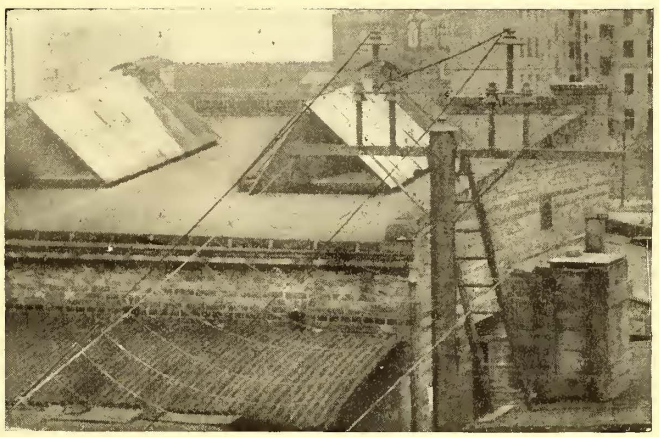


FIG. 1.—ARRANGEMENT OF INSULATORS DURING TEST

measured 18 amperes with the secondary on open circuit at 100,000 volts.

In front of the switchboard is a regulator similar in construction to a railway motor controller which permits the variation of the pressure in steps of 10,000 volts. The sudden jumps from one voltage to the next higher, which were necessary evils with this regulator, often caused surges which would operate the breaker in the primary circuit. On account of these annoyances this regulator was replaced by an induction regulator which permits a gradual change from the lowest to the highest voltage.

The line conductors, which consist of bare zinc plated copper wire 1.5 mm in diameter, are carried through the wall above and at the left of the transformer. The entry consists of an Ambroin plate 1000 mm x 1000 mm x 25 mm through which are passed two Ambroin tubes, 60 mm outside diameter, 26 mm inside diameter, 600 mm long and 500 mm between centers. Round metal rods are fastened in these tubes with Ambroin sleeves, the ends of the rods being provided with clamps for connection to the line conductors. There is also a hemp string net strung underneath the line throughout its length to catch broken conductors and prevent them from reaching the ground. (The net was purposely made of non-metallic material to prevent condenser effect.)

The conductors next pass through a narrow floor, and are here carried upon Ambroin insulators supported upon wall brackets. Passing through the entry in the door the line

reaches the open air. This entry is constructed like the one in the transformer room, except that the conductors are placed side by side instead of one above the other. The last stretch of the line passes over the factory court yard and ends on a wooden pole five meters high, upon which are mounted the insulators to be tested. The insulators shown in the illustration do not belong to the so-called standard types, but were special forms used only in the first few tests.

From Fig. 1 it is seen that the connections are so made that the insulator at the left is subjected to the full working line voltage, while the one at the right, in this case, serves only to insulate the incoming line. The four supports under the insulators, which are also made of Ambroin, serve to increase the insulation to the pole or ground or to insulate the insulator from the pole. There is also an arrangement whereby a considerable number of insulators can be set upon level ground and tested. For this purpose wires are led from the main line to the various points in the factory court yard where insulators are mounted to be tested under all sorts of weather conditions.

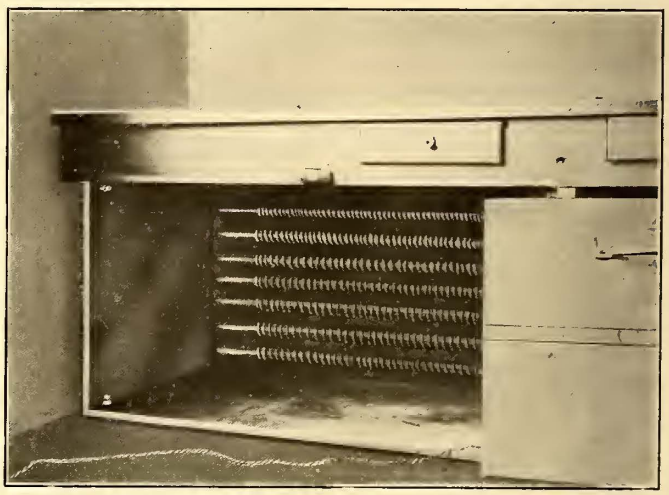
The first tests were limited to simple trials made to determine the safety and reliability of the installation. These consisted of impressing full voltage (100,000 volts) upon the line for one hour each day for three successive days. On the first day there was a heavy rain and on the two following days there were big snowstorms, nevertheless there were no noticeable disturbances. The only trouble experienced was caused by the opening of the circuit-breaker, when the voltage was raised too rapidly. Since the voltage was varied in steps of 10,000 volts, an extra rise in current accompanied each advance of the voltage. When the operator did not pause about 15 seconds on each step the surges were so great as to cause the circuit-breaker in the primary circuit to operate. When care was taken to pause at each step the disturbances were greatly reduced, but since the installation of the induction regulator there has been absolutely no sign of trouble from this source. The extra rise in potential could be detected along the line by a sharp clicking sound, so that the observer stationed in the factory court yard could follow the adjustment of the regulator from step to step without being in communication with the attendant in the transformer room. At 40,000 volts there is a perceptible corona about the wires and a humming sound which denotes the passage of electricity into the atmosphere. At 100,000 volts there is a corona at the points where the conductors pass through tubes in the entry plates. The transformer terminals, and, in fact, everything connected to the line are surrounded by a glow of light. After the reliability of the installation had been proven, by the preliminary tests, the actual tests upon insulators were begun. The testing plant has now been in almost daily use for six months and works as well now as the first day it was put in service.

FIG. 2.—FORMATION OF CORONA AT HIGH VOLTAGE

Fig. 2 shows one of the insulators mounted upon the wooden pole while being tested with 100,000 volts. The corona on the conductors is sharply outlined against the dark night sky and many points of light can be seen radiating from the edges of the insulator as well as at the point where the insulator is joined to the support. The successful operation of this testing plant has proved that an installation operating at 100,000 volts, when properly insulated, is perfectly feasible even for conductors carried indoors.

AN INEXPENSIVE ARMATURE OVEN

In the accompanying illustration is shown an inexpensive oven for baking armatures and fields in use in the shops of the Clinton Electric Railway Company, Clinton, Ia. The oven was constructed under a work bench to economize



ARMATURE OVEN BUILT UNDER BENCH

space, and is 4 ft. 6 ins. long, 2 ft. 6 ins. high, and about 3 ft. deep. It is lined with asbestos covered with sheet iron. In the rear are seven coils consisting of No. 7 wire wound helically on 1¼-in. gas pipe covered with asbestos. A glass in one side of the oven permits a thermometer on the inside to be read. With the present wiring the temperature rises to about 220 degrees and then remains constant.

TRUCKS FOR THE HUDSON COMPANIES

Referring to the notice on page 145 in the Street Railway Journal for July 28, entitled "Trucks for the Hudson Companies' Cars," it is interesting to add that the contract for the first 100 trucks ordered by the Hudson Companies was placed two months ago with the Baldwin Locomotive Works, of Philadelphia. Some time subsequent to that date an additional order was placed with the American Locomotive Company, but for trucks not required until some time next year; therefore, the tunnels will be opened and operated with Baldwin trucks.

The Baldwin Locomotive Works contract with the Hudson Companies calls for fifty motor trucks and fifty trailer trucks. The details of these trucks conform to the data in the article referred to above. They are the regular Baldwin double-bar equalized M. C. B. type, and embody also a special form of center casting arrangement designed by L. B. Stillwell, consulting engineer of the Hudson Companies, with a view of facilitating the removal of cars from trucks in case of accident. The motor-truck wheels are 34¼ ins. in diameter, and of the steel-tired, cast-steel, center type, with Doyle-Brinkerhoff extended hubs. The trailer truck wheels are to be 30 ins. in diameter, and of the solid forged and rolled-steel type. Both types of wheels are to be made by the Standard Steel Works.

STANDARDIZATION OF TREAD AND FLANGE OF WHEELS

The Committee on Standardization of the American Street and Interurban Railway Association has issued a circular on tread and flange of wheels upon which data are desired. This circular is being sent out by Secretary Swenson, to whom all replies should be directed.

The active work of making the standards devolves upon the Engineering Association committee. This committee has decided to devote its attention at present to the standardization of brake-shoes, journals and journal boxes, tread and flange of wheels, and rails for street and interurban railways. Considerable work has been done along all four lines of standardization, but the present communication relates only to the subject of tread and flange of wheels. It should be especially noted that the data sheet asks for sketches with dimensions. It is quite essential to the latter work of the committee that the material asked for is prepared and sent in by the various companies. The information obtained will be carefully collated by the engineering committee, and together with other material upon this subject, will form the basis of the report of this committee on the standardization of brake shoes. The letter is signed by the following committee members: H. Wallerstedt, chairman; H. A. Benedict, W. H. Evans, H. B. Fleming, J. M. Larned, F. H. Lincoln, and Paul Winsor.

American Street and Interurban Railway Association
60 Wall Street, New York

Office of the Secretary

American Street and Interurban Railway Engineering Association
Committee on Standardization
Flange and Tread of Wheels

Data Sheet No. 10 August, 1906

1. Company .....
2. City .....(3) State .....
4. No. miles of track (a) Single.....(b) Double.....(c) Total.....
5. Gage of track.....6. Average speed of cars.....
7. Maximum speed of cars (approximately).....
8. Single-truck cars
   (a) No. operated .....
   (b) Weight of heaviest car complete (without load).....
9. Double-truck cars
   (a) No. operated.....
   (b) Weight of heaviest car complete (without load).....
10. Kind and approximate number of wheels.

	Motor Axle	Pony Axle
A. Motor trucks		
Chilled cast iron	.....	.....
Cast steel	.....	.....
Solid rolled steel	.....	.....
Solid forged steel	.....	.....
Steel-tired wheels	.....	.....

B. Motor-car trailer trucks.	C. Trailer-car trucks .....
Chilled cast iron.....	Chilled cast iron.....
Cast steel	Cast steel .....
Solid rolled steel.....	Solid rolled steel.....
Solid forged steel.....	Solid forged steel.....
Steel-tire wheels	Steel-tire wheels .....

11. What is the diameter of the wheels when new?
    Motor trucks (a) Motor axle.....(b) Pony axle.....
    Motor-car trailer trucks.....
    Trailer-car trucks .....
12. Flange.
    A. Give height of flange when new on cars operating over
       (a) Urban lines.....(b) Interurban lines.....(c) Both urban and interurban lines .....
    AA. Give features limiting height of flange when new on cars operating over
       (a) Urban lines .....
       .....
       (b) Interurban lines .....
       .....
       (c) Both urban and interurban lines.....
       .....
    B. Give thickness of flange when new on cars operating over
       (a) Urban lines.....(b) Interurban lines.....(c) Both urban and Interurban lines .....
    BB. Give features limiting thickness of flange when new on cars operating over
       (a) Urban lines .....
       .....
       (b) Interurban lines .....
       .....
       (c) Both urban and interurban lines.....
       .....
13. Tread.
    A. Give width of tread when new on cars operating over
       (a) Urban lines.....(b) Interurban lines.....(c) Both urban and Interurban lines .....
    AA. Give features limiting width of tread when new on cars operating over
       (a) Urban lines .....
       .....
       (b) Interurban lines .....
       .....
       (c) Both urban and interurban lines.....
       .....
14. Flange and Tread.
    A. Give total width of flange and tread combined on cars operating over
       (a) Urban lines.....(b) Interurban lines.....(c) Both urban and interurban lines .....
15. Outline Sketches.
    Give outline sketch with dimensions of flange and tread when new of cars operating over
       (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.
    Give outline sketch with dimensions showing features which limit dimensions of flange and tread of wheels, of cars operating over
       (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.
16. Suggested Standard.
    Kindly send dimensioned sketch showing what you consider would be a good standard for flange and tread of wheels, on cars operating over
       (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.

Remarks: .....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Signed .....
Title .....

Notice.—This information blank is sent you in duplicate form. Please fill in the information asked for at your earliest convenience, and return one copy to Bernard V. Swenson, secretary American Street and Interurban Railway Association, 60 Wall Street, New York City. You will receive a bulletin later announcing the results of this investigation.

NEW HAVEN INSTRUCTING MOTORMEN FOR ITS ELECTRIC SERVICE

A bulletin has been issued from the electrical department of the New York, New Haven & Hartford Railroad Company, stating that electrically equipped trains will be run from the Grand Central Station in New York to Stamford at an early date, and that the motormen, who will supersede the locomotive engineers, will be paid $3.60 per day for ten hours' work and their helpers will be paid $2 per day for the same time.

Engineers and firemen will be given the opportunity of taking their positions. If they are not filled by the required time conductors and brakemen will be given a chance to take them. A strip of roadbed has been fitted up at Rye, N. Y., for the instruction of the men in the new line of work.

After Sept. 1 the work of continuing the electrical system to Bridgeport will be taken up and it is expected that some time in the winter after Jan. 1 the electrical cars will be run to Bridgeport.

President James J. Hill, of the Great Northern Railway, announces that the Portland & Seattle Railway, a branch line which is now being built between Portland and Seattle, will be equipped with electricity.

EXHIBITS AT COLUMBUS

Work on locating the exhibitors at the Columbus convention is proceeding rapidly and enough exhibitors have already applied for and have been assigned space to insure a larger exhibit than ever before. A general plan of the State Fair Buildings at Columbus was presented in the STREET RAILWAY JOURNAL for May 26, and a detailed plan is published herewith. As will be remembered, there are six brick buildings, forming the group which will be used for the convention. One of these will be devoted to the meetings, one has been reserved for possible future use, and four have been assigned for exhibits. The following is a list to date of those who have applied for space at Columbus:

Allis-Chalmers Company, Milwaukee, Wis.
American Brake-Shoe & Foundry Company, Mahwah, N. J.
American Instrument Company, Philadelphia, Pa.
American Railway Supply Company, New York.
A. & J. M. Anderson Manufacturing Company, Boston, Mass.
Armstrong Oiler Company, Philadelphia, Pa.
Atlas Railway Supply Company, Chicago, Ill.
American Mason Safety Tread Company, Boston, Mass.
American Steel & Wire Company, Chicago, Ill.
Atha Steel Castings Company, Newark, N. J.
Adams & Westlake Company, Chicago, Ill.
Acme Automatic Street Indicator Company.

Bayonet Trolley Harp Company, Springfield, Ohio.
Blake Signal & Manufacturing Company, Boston, Mass.
J. G. Brill Company, Philadelphia, Pa.
Harold P. Brown, New York City.
Buckeye Engine Company, Salem, Ohio.
Burnham, Williams & Company, Philadelphia, Pa.
Brady Brass Company, New York.
S. F. Bowser & Company, South Bend, Ind.
L. M. Booth Company.

Cleveland Frog & Crossing Company, Cleveland, Ohio.
Consolidated Car Fender Company, Providence, R. I.
Consolidated Car Heating Company, New York.
Cook's Railway Appliance Company, Kalamazoo, Mich.
Curtain Supply Company, Chicago, Ill.
Creaghead Engineering Company, Cincinnati, Ohio.
Cambria Steel Company, Philadelphia, Pa.
Carnegie Steel Company, Pittsburg, Pa.

Dearborn Drug & Chemical Works, Chicago, Ill.
D. & W. Fuse Company, Providence, R. I.
Duff Manufacturing Company, Pittsburg, Pa.
Dayton Manufacturing Company, Dayton, Ohio.
Jos. Dixon Crucible Company, Jersey City, N. J.
Duplicate Transfer & Rebate Company, Philadelphia, Pa.
Duquesne Steel Foundry Company, Pittsburg, Pa.
Dossert & Company, New York.
Dressel Railway Lamp Works, New York.

O. M. Edwards Company, Syracuse, N. Y.
Electric Railway Equipment Company, Cincinnati, Ohio.
Electric Storage Battery Company, Philadelphia, Pa.
Chas. I. Earll, New York.
Electric Service Supplies Company, Chicago, Ill.
Eclipse Railway Supply Company, Cleveland, Ohio.

Franklin Car Heating Company, Syracuse, N. Y.
Franklin Electric Manufacturing Company, Hartford, Conn.
Felt & Tarrant Manufacturing Company, Chicago, Ill.

Galena Signal Oil Company, Franklin, Pa.
W. R. Garton Company, Chicago, Ill.
General Electric Company, Schenectady, N. Y.
Gold Car Heating & Lighting Company, New York.
Goldschmidt Thermit Company, New York City.
Globe Ticket Company, Philadelphia, Pa.
Griffin Wheel Company, Chicago, Ill.
General Systems Company, Dayton, Ohio.

Hale & Kilburn Manufacturing Company, Philadelphia, Pa.
F. P. Harrison Electric & Manufacturing Company, Inc., New York.
Albert B. Herrick, Ridgewood, N. J.
Heywood Bros. & Wakefield Company, Wakefield, Mass.
George S. Hastings & Company, Cleveland, Ohio.
Helios Manufacturing Company, New York.

Indianapolis Switch & Frog Company, Indianapolis, Ind.
Ingersoll Company, Pittsburg, Pa.
International Register Company, Chicago, Ill.
International Sprinkler Company, Philadelphia, Pa.

H. W. Johns-Manville Company, New York City.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Kinnear Manufacturing Company, Columbus, Ohio.
Keystone Brake-Shoe Company, New York.

Lagonda Manufacturing Company, Springfield, Ohio.
Lorain Steel Company, Philadelphia, Pa.
Lord Electric Company, Boston, Mass.
George W. Lord Company, Philadelphia, Pa.
Lumen Bearing Company, Buffalo, N. Y.

Massachusetts Chemical Company, Walpole, Mass.
John W. Masury & Son, Brooklyn, N. Y.
Maryland Steel Company, Sparrow's Point, Md.
Miller Anchor Company, Norwalk, Ohio.
McGuire-Cummings Manufacturing Company, Chicago, Ill.
McGraw Publishing Company, New York City.

National Brake Company, Buffalo, N. Y.
National Brake & Electric Company, Milwaukee, Wis.
National Lock Washer Company, Newark, N. J.
Niles Car & Manufacturing Company, Niles, Ohio.
R. D. Nuttall Company, Pittsburg, Pa.
National Car Wheel Company, Pittsburg, Pa.

Ohio Brass Company, Mansfield, Ohio.
Ohmer Fare Register Company, Dayton, Ohio.

Pantasote Company, New York City.
Pressed Steel Car Company, Pittsburg, Pa.
Pennsylvania Steel Company, Philadelphia, Pa.
Pittsburg Insulating Company, Pittsburg, Pa.

Quincy, Manchester, Sargent Company, Chicago, Ill.

Rail Joint Company, New York City.
Recording Fare Register Company, New Haven, Conn.
Jos. T. Ryerson & Son, Chicago, Ill.
Frank Ridlon Company, Boston, Mass.

Sherwin-Williams Company, Cleveland, Ohio.
Southern Exchange Company, New York City.
Speer Carbon Company, St. Marys, Pa.
Standard Paint Company, New York City.
Standard Steel Works, Philadelphia, Pa.
Peter Smith Heater Company, Detroit, Mich.
Security Register & Manufacturing Company, New York.
Standard Varnish Works, New York.
Star Brass Works, Kalamazoo, Mich.
St. Louis Car Company, St. Louis, Mo.
Sterling Varnish Company, Pittsburg, Pa.
The T. H. Symington Company, Baltimore, Md.
Schoen Steel Wheel Company, Philadelphia, Pa.
St. Louis Car Wheel Company, St. Louis, Mo.
Sterling-Meaker Company, Newark, N. J.
STREET RAILWAY JOURNAL, New York City.

Taylor Electric Truck Company, Troy, N. Y.
Trolley Supply Company, Canton, Ohio.

United States Metal & Manufacturing Company, New York.
United States Engineering Company.

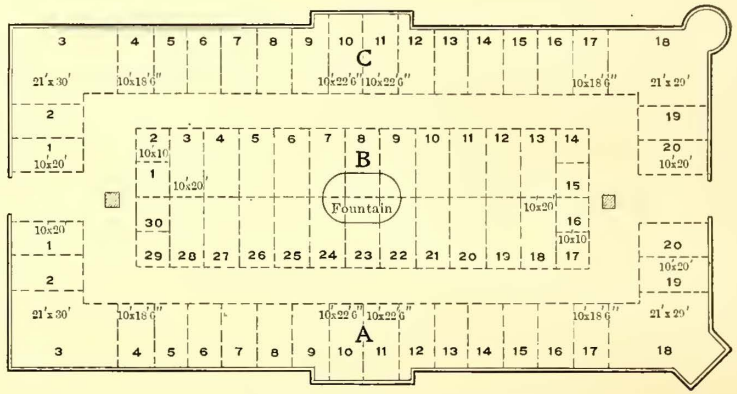
W. T. Van Dorn Company, Chicago, Ill.
Van Dorn & Dutton Company, Cleveland, Ohio.

Wallace Supply Company, Chicago, Ill.
Western Electric Company, Chicago, Ill.
Westinghouse Companies, Pittsburg, Pa.
William Wharton, Jr., & Company, Philadelphia, Pa.
Wheel Truing Brake-Shoe Company, Detroit, Mich.
Wilson Company, Chicago, Ill.

Yale & Towne Manufacturing Company, New York.

(Reserved for Exhibits if necessary)

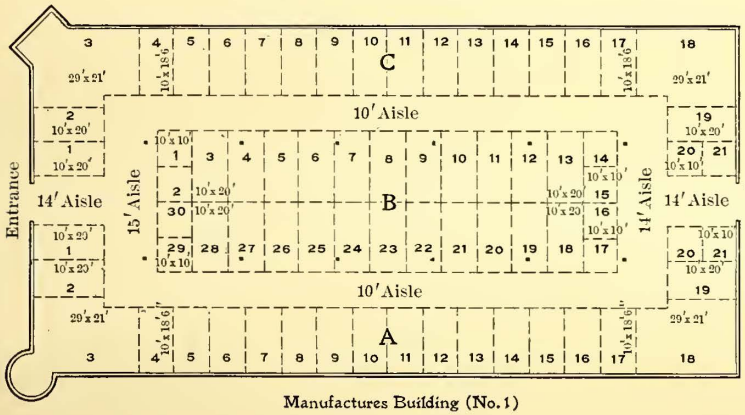
CONVENTION HALL
West Central Building



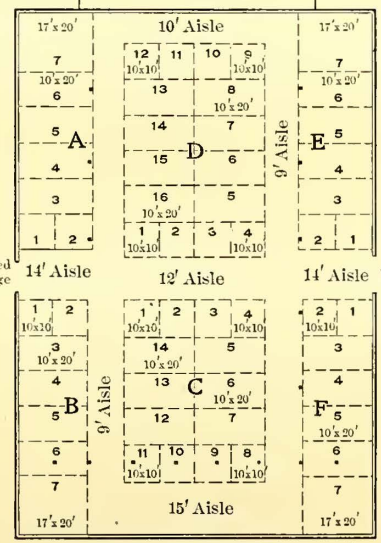
Horticultural Building (No.4)

EXHIBITION HALLS
FOR THE
25th. ANNUAL CONVENTION
OF THE
AMERICAN STREET and INTERURBAN
RAILWAY ASSOCIATION
State Fair Grounds—Columbus, Ohio.
1906.

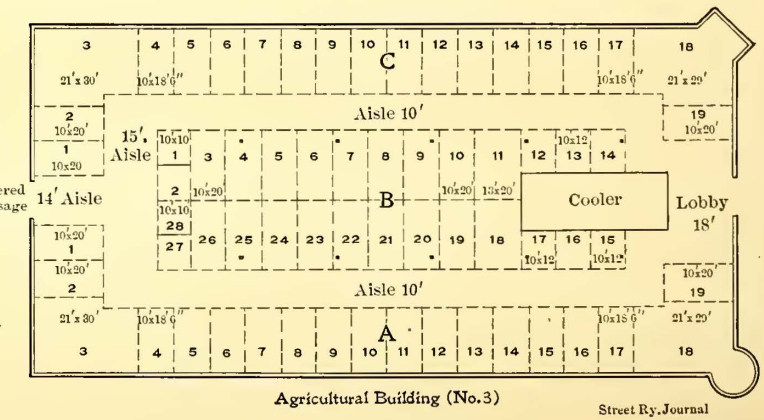
Issued by the
AMERICAN STREET AND INTERURBAN
RAILWAY ASSOCIATION



Manufactures Building (No.1)



East Central Building (No.2)



Agricultural Building (No.3)

Street Ry. Journal

CORRESPONDENCE

CORRUGATED RAILS

New York, Aug. 6, 1906.

Editors Street Railway Journal:

As an additional contribution to the subject of corrugated rails that was discussed in your editorial of July 21, it may be well to call attention to one class of corrugations, the cause of which can be very directly traced.

Within the past week I have had occasion to examine a piece of steam railroad track on which spots resembling the corrugations mentioned are of frequent occurrence. They are not, however, situated very close together, nor at regular intervals, though there are places where this does occur. Frequently they are from 1 ft. to 18 ins. apart, with some isolated spots remote from any others. In the case in hand these spots are undoubtedly caused by the slipping of the heavy driving wheels of the engines that are used. The markings are unmistakable. There are scoriations as distinct as a glacier mark, with a rolling up of the metal in the direction of the slip, so that the veriest tyro in railroad work would recognize the cause on sight.

It is quite true that these spots are not exactly like those of the corrugations of the rails of electric tracks, nor like those described by the Indian engineer mentioned in your editorial, but it is possible that the clue thus furnished may assist in the final solution of the problem.

The suggestion that these corrugations may be due to vibration and over pressure on the rail is worthy of every consideration, but is it not also quite possible that slip may also have something to do with it?

We have heard for years of the imperceptible slip of driving wheels of locomotives without ever having any definite information on the subject. We do know, however, that where engines are over-cylindered there is a very decided slip and a good deal of it. Again the torque and power of the motors commonly used in electrical equipment is such that slipping is exceedingly common. Is it not possible that it may be a combination of the imperceptible slip that has become quite perceptible with the vibration pressure to which you called attention that have produced these troublesome corrugations?

As you state in your editorial, the matter is well worth the careful investigation of those who are financially interested, and it certainly does not seem that if the work is taken up systematically and with the idea of probing to the bottom of the real cause that the matter will not turn out to be "one of those things no fellow can find out." P. Q. J.

HIGH-VOLTAGE DIRECT-CURRENT LINES IN EUROPE

Oerlikon, July 5, 1906.

Editors Street Railway Journal:

We have read the article in the Street Railway Journal for June 16, about high-voltage direct-current lines on the Continent. It may perhaps interest your readers to learn that we are at this present moment building, together with Messrs. John Jacob Rieter & Co., Ltd., an electric railway for direct-current railway with a line potential of 1500 volts. The maximum grade of this railway is 6 per cent.

We may add that we have built and equipped since 1902 a number of direct-current electric railways with 800 volts potential or over. The principal lines of this kind are the following:

Bremgarten-Dietikon, 800 volts; Chemin de fer Veveysans, 800 volts; Fribourg-Morat-Anet, 800 volts; St. Gallen-Speicher-Trogen, 800 and 550 volts; Wetzikon-Meilon, 800 volts; Montreux-Oberland-Bernois, 700 and 1100 volts; Sernftal, 800 volts; Schaffhausen-Schleitheim, 800 and 550 volts.

Maschinenfabrik Oerlikon.

A NEW BRAKE SHOE COMPANY

A new corporation, to be known as the Keystone Brake Shoe Company, has been organized under the laws of the State of New York. The incorporators are Charles H. Platt, Charles A. Decker and A. N. Allen. Mr. Platt was formerly general manager of the New York, New Haven & Hartford Railroad. The company has secured the patents of a new type of brake shoe which has been undergoing severe tests for some months past. It is claimed the factor of safety in the Keystone shoe is much greater than shown by the types of shoe now in general use. The new shoe is designed to wear out without scrap, to be applicable to any wheel from 30 ins. or 36 ins. in diameter, and to form a standard shoe for traction equipment, regardless of the different heads or trucks. Another advantage claimed for the new shoe is the saving in cost of labor in applying the shoe to a head as compared with other types of brake shoes.

The Keystone Brake Shoe Company is planning to make an exhibit at the Columbus convention in October, and the company expects by that time to have manufacturing arrangements completed which will make possible the prompt filling of orders.

STREET OILING IN CALIFORNIA BY THE HUNTINGTON ELECTRIC RAILWAY COMPANIES

The Huntington street car companies will assist the members of the Board of Public Works in its plans for oiling between 50 and 60 miles of the city's streets within the next twelve months. W. E. Dunn, attorney for the Huntington lines, has notified the board that when the city oils a thoroughfare traversed by any of the Huntington tracks the company will oil between and along the sides of its rails. This plan, if carried out, would greatly benefit both the city and the railway company, as it is estimated that the saving to the city will be between 30 and 40 per cent, and if the entire street is oiled the space between the tracks and along the sides lasts much longer. When the streets are oiled, which will be as soon as the Board of Public Works can secure the necessary appropriation, those streets along which car tracks are laid will be the first to be improved, as the dust nuisance is greatest on those streets.

SIX TICKETS FOR A QUARTER IN PHILADELPHIA

The sale of "six tickets for a quarter" was begun at midnight, July 31, by the Philadelphia Rapid Transit Company. The demand was large. The tickets in strips of six are printed upon a stiff light buff-colored paper, and have very little printing upon them. Each conductor as he reports for duty is supplied with $20 of new tickets. Hundreds of patrons called at the office of the Rapid Transit Company in the Land Title Building and at Eighth and Dauphin Streets endeavoring to buy some of the tickets in advance. All such requests were refused. Exchanges will be sold as heretofore. Tickets will be honored for fares on all lines and free transfers will be given. The ticket and 3 cents will not purchase an exchange, the latter being sold to cash fare patrons only.

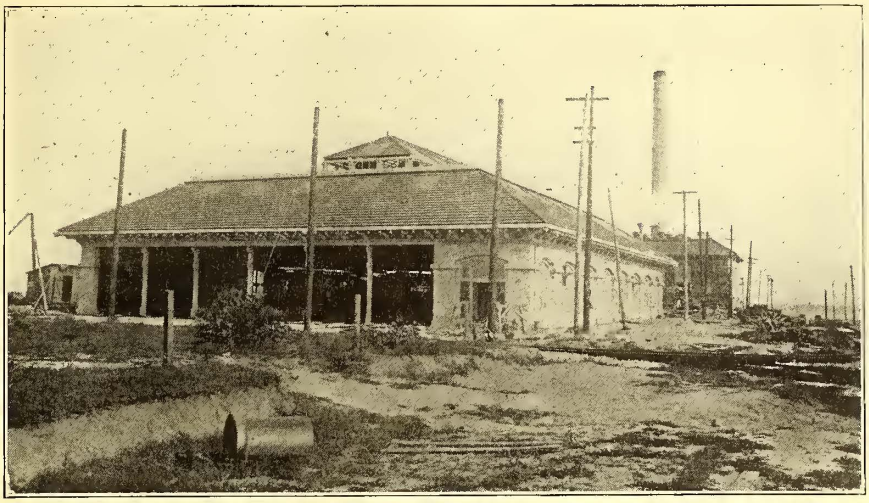
EQUIPMENT FOR NEW LINE BETWEEN GULFPORT AND BILOXI, MISS.

The J. G. Brill Company shipped a few weeks ago to the Gulfport & Mississippi Coast Traction Company ten combination passenger and smoking car bodies, mounted on the builders' 27-E1½ type of truck. The exterior of the car is given an imposing appearance by using the arched-top twin-window arrangement. This does not interfere with the groovelesspost semi-convertible feature; the details of the Brill system are carried out in exactly the same manner as in the ordinary type of window. It will be noticed that the curvature of the arch is designed in such a manner as to give a large window opening and not have an objectionable appearance as viewed from the interior. A more pronounced arch could be used with this company's semi-convertible window system if desired, but the design shown in the Gulfport cars is considered to be the most effective, and at the same time does not materially reduce the window space.

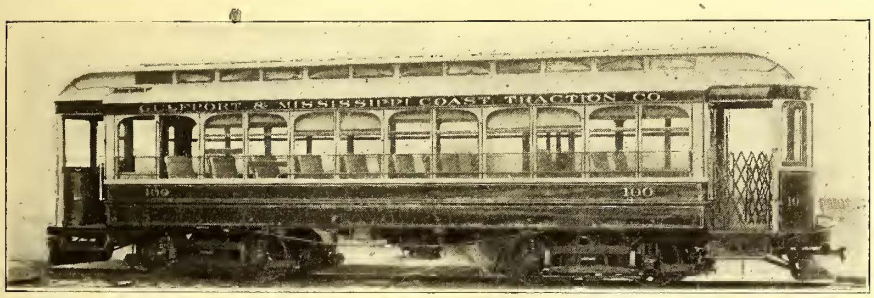
Throughout the entire car elegance has been combined with comfort, the interior being fitted with such accessories as basket racks, arm rests, push buttons, etc., and the high rollback seats, 38 ins. in length, of the car builder's manufacture afford additional comfort to passengers. The compartment for smokers occupies the space of one and a half double windows, or three single windows, and is separated from the passenger compartment by a swing door. The inside finish is of natural cherry and the ceilings are of a decorated birch. The cars will haul trailers and the car company's radial draw bar is employed for this purpose. Other specialties of the builder are angle-iron bumpers, signal bells and alarm gongs, steps, folding gates, etc.

The trucks have a wheel base of 6 feet and four motors of 50-hp capacity each are installed on each bar. The chief dimensions of the car are as follows: Length over the end panels, 33 ft. 4 ins.; length over the crown pieces and the vestibules, 42 ft. 9 ins.; width over the sills, including the panels, 8 ft. 2½ ins.; width over the posts at the belt, 8 ft. 6 ins.; sweep of the posts, 1¾ ins.; centers of the posts, 2 ft. 8 ins.; size of the side sills, 4 ft. x 7¾ ins.; size of the end sills, 5¼ ins. x 6⅞ ins.; size of the sill plates, 12 ins. x ⅜ in.; width of the aisle, 22 ins.

The Gulfport & Mississippi Traction Company operates about 3 miles of tracks in Gulfport and about 7 miles in Biloxi, and between these two coast towns a new line has just been opened, and from the fact that Biloxi is a flourishing resort and Gulfport is a big shipping and railroad center and has a fine harbor where ocean steamers may find roadway, heavy traffic is expected. Midway between Gulfport and Biloxi, and reached by the company's new line, is

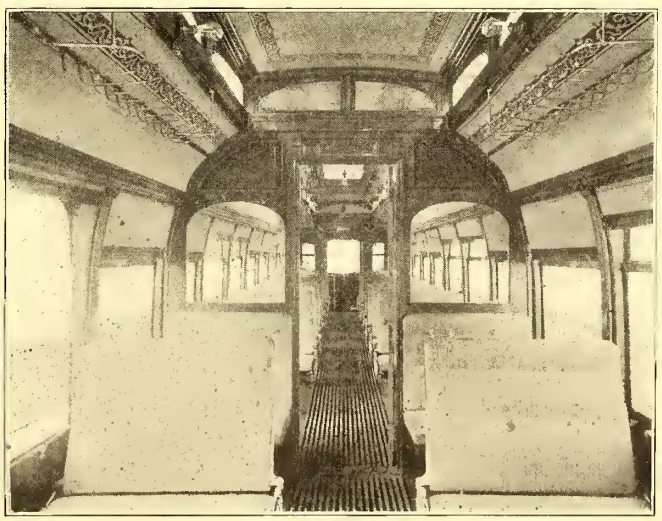


VIEW OF THE GULFPORT & MISSISSIPPI COAST TRACTION COMPANY'S CAR HOUSE, POWER HOUSE IN THE REAR



STANDARD CAR FOR THE GULFPORT & MISSISSIPPI COAST TRACTION COMPANY

A VIEW ALONG THE LINE PARALLELING THE SHELL BEACH ROAD BETWEEN GULFPORT AND BILOXI



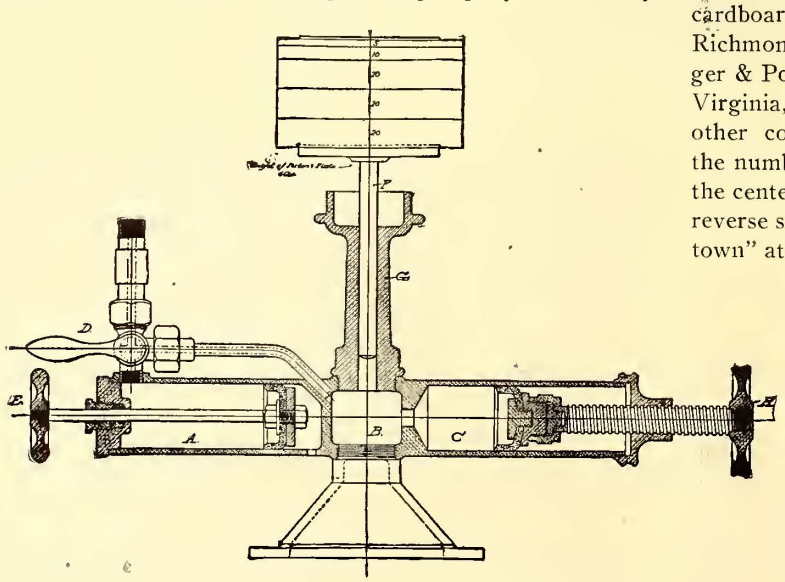
INTERIOR OF STANDARD CAR, SHOWING COMPARTMENTS AND SEATING

Mississippi City, located in a great fruit-producing region. The traction company will also build in the near future a line from Gulfport to Pass Christian, the latter being the most popular and fashionable of all the gulf resorts, being known as the "Newport of the South." When this line is completed the traction company's system will embrace about 35 miles. One of the accompanying views shows a car being operated over the famous shell beach road between Gulfport and Biloxi. The new power house and car houses which have just been completed, are also shown in the illustration. The power house has a capacity of 1500 kw.

A DEAD-WEIGHT GAGE TESTER

The American Steam Gauge and Valve Manufacturing Company, of Boston, Mass., has added to its numerous steam specialties a new dead-weight gage tester which it considers a radical improvement over similar devices in use. All tests are made with dead weights in 5-lb. units, and the apparatus can be furnished for any desired pressure up to 1500 lbs. It is claimed that this tester possesses all the advantages of the mercury column enclosed in a much smaller space, besides doing away with the necessity of returning test gages to the manufacturer for periodical readjustment to be assured of their accuracy.

Its novel features consist of an auxiliary cylinder *A* connected with the gage and main pump cylinders *B* and *C* through the three-way cock *D*, the connection being made by turning the lever cock connected with either gage to the main pump cylinders as is desired, eliminating the necessity of pouring the oil in and out of the pump cylinders before and after testing. The auxiliary oil chamber *A* and the main pump cylinders *B* and *C* are filled with a light mineral oil, cylinder *A* being filled through the pump cylinder *G* by



SECTIONAL DRAWING OF GAGE TESTER

removing the plunger *F* and turning the three-way cock to connect the cylinders *A* and *B* through the connecting tube. Before the oil is poured in, the plunger *E* is withdrawn, and as the oil is poured in the plunger *E* is pushed in, drawing oil over through the tube and cock and thus filling cylinder *A*. The main pump cylinders *B* and *C* are filled through the pump cylinder *G* by screwing out on screw plunger *H* as the oil is poured in; in testing, it is not necessary to continually screw in on the plunger *H*. This is said to be necessary in some other makes of dead-weight testers.

After the table and piston *F* have been lowered by the first application of weights and have been raised with the screw plunger, it is only necessary to raise the table and plunger twice while testing to 500 lbs. Another feature is the fact that after completing the test of the gage, the cock may be turned connecting the gage with the cylinder *A*, and by pushing in on plunger *F* the connections and gage tube can be drained of the oil, thus preventing spilling when the gage is disconnected.

The gage to be tested is attached to the nipple connected by the union above three-way cock *D*. The gage and fittings are then filled by withdrawing piston *E*; the three-way cock then turns in the position which places the gage in communication with chamber *A*. When the movement of the index hand indicates what pressure is on the gage, the three-way cock is turned so as to put the gage in communication with chamber *B*. The weights are then applied to the desired pressure, being revolved from time to time to obviate friction. The table and piston *F* operate the pressure about 5 lbs. per sq. in., and the 5, 10 and 20-lb. weights sent with tester are used to obtain the desired pressure for test. After the weights are first applied, the table should be raised to a position of 2½ ins. above cylinder *G* to prevent the table from striking. The table is raised by screwing in the plunger *H*. The pump is neatly boxed and furnished with the following fittings: Necessary wrenches, hand set, hand jack, four connection nippers and plyers. The accompanying weights are furnished in a separate box.

SPECIAL RAILWAY TICKETS FOR THE JAMESTOWN EXPOSITION IN 1907

The Virginia Passenger & Power Company has ordered several million special street car tickets for use during the Jamestown Exposition. The tickets are printed on white cardboard. On the face is printed in black ink: "One Fare. Richmond Passenger & Power Company. Virginia Passenger & Power Company," so arranged as to have "Richmond, Virginia," appear in one line. Underneath the names of the other companies appears "Richmond Traction Company," the number of the ticket and the names of the receivers. In the center of the ticket appears the head of Pocahontas. The reverse side carries the tower of Jamestown and "1607 Jamestown" at the top and "Exposition, 1907," at the bottom.

EXCURSION RATE WAR IN OHIO BETWEEN STEAM AND ELECTRIC LINES

The Lima & Toledo and the Western Ohio lines have precipitated an excursion rate war between Dayton and Lima and Chicago and Cleveland. The Pennsylvania, Erie and Nickel Plate roads have been in an agreement not to make cheap excursions to Chicago and Cleveland. Without making an actual alliance with the Nickel Plate railroad, the electric cars arranged with the steam line to honor its prepaid ticket orders at Ft. Wayne and Findlay for Chicago and Cleveland respectively. While not the same as an interline ticketing arrangement, this scheme answered the same purpose, and the Erie and the Pennsylvania are now retaliating by reducing their rates between the points mentioned.

According to officials of the operating companies, the earnings of the State Street line and the Blue Island line, the first two cable lines in Chicago to be trolleyized, have increased greatly since the change in motive power.

FINANCIAL INTELLIGENCE

WALL STREET, Aug. 8, 1906.

The Money Market

There has been no appreciable change in the monetary situation during the past week. Notwithstanding the increased activity in the securities markets, the demand for money from stock commission houses has been comparatively small, while the offerings of money for all maturities up to nine months have been rather free. Money on call ranged from 3 to 2 per cent, the average rate for the week being about 2¾ per cent. In the time loan department sixty and ninety-day money was freely offered at 4 and 4½ per cent, respectively, while for five and six months' accommodations were obtainable at 5½ per cent. For the maturities extending into next February and March, funds were offered at 5½ per cent, but borrowers were not disposed to commit themselves for so long a period. It is not expected that money rates will advance materially in the near future. It is true that the clearing house banks are losing money to the Sub-Treasury, but this is due to the fact that pension payments are at the lowest ratio of the month, while customs collections are fairly large. The receipts of currency from the interior show a falling off as compared with the preceding week, due in part to the fact that banks at the principal inland cities are already making provision for crop-moving purposes, which is somewhat earlier than usual. This, it is expected, will result in the movement from this center beginning earlier than in previous years, but as the position of the New York City banks is strong, little apprehension is felt on this score. The payment for the Panama Canal bonds has been in progress throughout the week, the total amount paid to date being nearly $8,000,000. As the bulk of this money is almost immediately redeposited in the banks the transaction has been made without the slightest disturbance in the market. It is not expected that any stringency will develop as a result of the shipments of funds from New York to the interior for crop-moving purposes, although all the crops promise to be large and will call for a considerable amount of money. As a matter of fact, it is said that the Secretary of the Treasury has given this matter some consideration, and a repetition of last year's tension in the money market will doubtless be averted. It is pointed out that the Secretary of the Treasury has about $50,000,000 free capital at his disposal, and may be used for the purchase of Government bonds, or by the deposit of Government funds with the national banks. A feature of the week has been a sharp upward movement in the rate for sterling exchange, prime demand bills advancing about ½ cent to 4.85.35, thus eliminating all possibilities of gold importations from Europe. The advance in exchange was due largely to the Russian disturbances, which resulted in rather heavy selling of American securities by Paris and London. The bank statement published last week was rather favorable, the decrease in cash was only $649,200, or considerably below the preliminary estimate. The reserve required was $4,120,600 larger than in the preceding week, and resulted in a decrease in the surplus reserve of $4,769,800. The total surplus on Aug. 4 was $14,122,675, as against $12,163,525 in the corresponding week of 1905, $56,308,850 in 1904, $21,587,075 in 1903, $9,031,250 in 1902, $20,952,950 in 1901, and $29,144,875 in 1900.

The Stock Market

The stock market during the week developed pronounced strength, and prices are higher all along the line. This is the result of a general short covering movement. The most important development from the bull standpoint has been the action of the directors of the United States Steel Corporation, in restoring the common stock to the dividend ranks by the declaration of two quarterly dividends of one-half of 1 per cent each, covering the first two quarters of the year. This was accompanied by a statement for the second quarter showing that net earnings were of record volume, and that after making all deductions the balance available for dividends was $27,036,025, and after providing for the preferred there remained $20,731,106 for the common. Special deductions were $15,500,000, leaving $5,231,106, or more than sufficient for the 1 per cent on the common, while for the six months the surplus amounted to $5,715,081. The unfilled orders on hand amounted to 6,809,589 tons, and the position of the corporation was shown to be very strong. This applies equally well to all the iron and steel companies, and reflects a remarkably satisfactory condition of trade in all lines. There has been a revival of deal and merger rumors, which include the proposed lease of the Great Northern ore lands to the Steel Corporation, control of the St. Paul by either the Union Pacific or the Northern Pacific, a further rearrangement of the railway map in the Northwest, and by rumors of increased dividends by several companies, including the Union Pacific and the Atchison and by expectation of an early initial dividend on Southern Pacific. In fact all the news favored market improvement and caused a retreat on the part of the short interests. Crop conditions have been encouraging, and the Government report on grain to come out on Friday is expected to make a good showing. The Russian situation is less alarming, even if not really better, and the monetary outlook has been improved by the assurance that Secretary Shaw will render all necessary relief to prevent any stringency during the crop-moving period. This is of the greatest importance if the present upward movement in prices is to continue. It appears that the big interests are disposed to move the market to a higher level before any political agitation of tariff or other reforms, and the advance is now fairly under way. Barring some unexpected accident there does not appear to be any serious obstacle to such a movement.

The local traction stocks have been strong, with a sharp advance in Brooklyn Rapid Transit on a forced covering of shorts, put out on expectation of a decision against the company in the 5-cent fare controversy.

Philadelphia

Dealings in the local traction issues have been upon an extremely small scale during the past week, but prices generally reflected the strength prevailing in the general market. The trading was heaviest in Philadelphia Rapid Transit, of which about 1,200 shares changed hands from 31 to 30¼. Philadelphia Company common was extremely quiet at the opening, with sales at 49, but towards the close the price advanced to and closed at 51⅝, on transactions aggregating about 700 shares. The preferred stock was extremely quiet, with sales at 50½ to 51¼. Union Traction advanced ½ to 64, on purchases of odd lots, and Philadelphia Traction rose a fraction to 98¾. Other transactions included American Railways at from 52 to 52½ and back to 52⅛, United Companies of New Jersey at 255, and Railways General at 6⅝.

Baltimore

Trading in the Baltimore traction issues was extremely quiet. There was no disposition to trade actively, but at the same time there was no marked pressure to sell. The feature was United Railway issues. The income bonds, after opening at 71¾, ran off to 71 on sales of less than $100,000. The 4 per cent bonds ruled firm, with sales at 91¾ and 92. The certificates representing income bonds deposited sold at 70½ for a small amount, and the new funding 5s sold to the extent of $11,000 at 90½ to 90. Lexington Street Railway bonds were steady at 101⅝.

Other Traction Securities

In the Boston market trading was dull, but prices generally held firm. Boston Elevated, after selling at 153, declined to 150, ex the dividend. Boston & Worcester common sold at 30 for 100 shares, while odd lots of the preferred brought prices ranging from 79 to 79¾. Boston & Worcester rights sold at 4c., Massachusetts Electric common sold at 20¼, and the preferred changed hands at 68¾ and 69. West End common advanced from 94 to 95, while the preferred rose from 109½ to 110. West End 4s of 1915 sold at 100¾. The Chicago market has been quiet but firm. North Chicago, after a decline from 41 to 39, recovered to 40. Union Traction, after selling at 5⅛, ran off to 4¾, and recovered a small fraction. The elevated railroad issues were strong, Metropolitan Elevated sold at 30, and South Side Elevated at 97½. Chicago & Oak Park brought 5⅞ for small amounts. In the bond department, Northwestern Elevated 4s sold at 91, Metropolitan gold 4s at 92¼, and South Side 5s at 96.

Security Quotations

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

	Aug. 1	Aug. 8
American Railways	52	52⅛
Boston Elevated	a153	*147
Brooklyn Rapid Transit	80¼	80⅛
Chicago City	170	160
Chicago Union Traction (common)	4	4¾
Chicago Union Traction (preferred)	13¾	15
Cleveland Electric	81	81
Consolidated Traction of New Jersey	78	78
Detroit United	94½	94¾
Interborough-Metropolitan, W. I	38½	36½
Interborough-Metropolitan (preferred), W. I	78¼	77⅛
International Traction (common)	—	a55
International Traction (preferred), 4s	—	78
Manhattan Railway	148½	147
Massachusetts Electric Cos. (common)	20	19¾
Massachusetts Elec. Cos. (preferred)	68½	69½
Metropolitan Elevated, Chicago (common)	27	28
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	—	—
North American	96⅞	95½
North Jersey Street Railway	27	27
Philadelphia Company (common)	49½	50¾
Philadelphia Rapid Transit	30⅜	30⅜
Philadelphia Traction	98½	98¾
Public Service Corporation certificates	68	68
Public Service Corporation 5 per cent notes	95½	95½
South Side Elevated (Chicago)	95	96
Third Avenue	124	124
Twin City, Minneapolis (common)	113¼	113
Union Traction (Philadelphia)	63⅜	63⅝
West End (common)	—	—
West End (preferred)	—	—

a Asked.

Metals

Unprecedented activity is reported in all branches of the iron and steel trade. It is estimated that the finished iron and steel tonnage placed in July was the largest in the history of the trade. Pig iron continues scarce, and no trouble is experienced in obtaining prices if deliveries can be satisfactorily arranged. Birmingham producers report free sales at $14. Bessemer is firm at $18 valley furnaces. Tin plate is active, although this is usually a dull season, and indications point to some large orders being placed this month. Copper metal is firm and unchanged at 18⅝ and 18¾c. for lake, 18⅜c. asked for electrolytic, and 18 and 18¼c. for castings.

MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION TO CONSIDER PUBLICATION OF TARIFF SHEETS

At the call of Secretary Merrill, of the Central Electric Railway Association, a meeting was held last week at the Algonquin Hotel, Dayton, to pass upon the plans for publishing the first of a number of interline tariff sheets for the roads in the district covered by the association. The first sheet covers the routes out of Indianapolis, including all the Indiana roads and over Ohio lines connecting Toledo, Marion, Zanesville, Lancaster and Cincinnati and all local stations between. Representatives of ten properties were present. It was decided that the general form of tariff should include the destination, routeing one way and round-trip rate and rules and regulations for the transportation and transferring of baggage. In cases where there are several routes between two points, the short line rates will be indicated and will prevail on over-all routes without reference to mileage, this action being in accordance with the rule that the initial line shall indicate the route to be used. As the association has been unable thus far to come to an agreement on the matter of charging for baggage, this question will be taken up at another meeting to be held in the near future with a view to securing some concession on interline baggage. The announcement was made that arrangements had been made for transferring baggage in Dayton and Springfield, where there are no union stations, the cost of transfer to be borne by the two companies concerned. It was proposed that separate meetings of the traffic men be held preceding each of the meetings of the Central Electric Railway Association, such meetings to be open only to the officials in charge of traffic, the idea being to promote rules and regulations for the handling and development of long-distance business over interurban lines. President Spring was authorized to take up this matter with the executive committee and to arrange for such a meeting to be held a day or so prior to the next meeting of the association, Sept. 26, at Fort Wayne, Ind.

DETROIT UNITED RAILWAY FRANCHISE OFFER

An agreement has been reached between Mayor Codd, of Detroit, and President Hutchins, of the Detroit Railway, as to the terms of the new street railway franchise for the company. All of the franchises are to expire in 1924, when the city will have the right to buy the property. The company will make a number of concessions, including an offer of ten tickets for 25 cents during workingmen's hours, six tickets for 25 cents at all other times and general transfers. It will also pay a 2 per cent tax on its gross earnings. A majority of the Aldermen are in favor of granting such a franchise, and it will probably be carried.

CORONER'S REPORT OF STREET RAILWAY ACCIDENTS IN CHICAGO—CHICAGO CITY RAILWAY COMPANY BORROWS $3,000,000 TO IMPROVE SERVICE

According to a report gotten out by the Coroner of Cook County there have been 225 deaths due to street railway accidents in Chicago in the last nineteen months. The accidents are classified as follows:

Class 1, crossing car tracks	121
Class 2, knocked off wagons	20
Class 3, crushed between cars	16
Class 4, falling off cars	31
Class 5, getting on and off cars	17
Class 6, hitching on cars	3
Class 7, brushed off running board	7
Class 8, collision between cars	6

High speed through congested districts, running cars in trains instead of singly, defective equipment and track, and overcrowding of cars, according to the report, are some of the causes of the accidents. The Coroner suggests as a remedy that better car equipment be obtained, lower speeds be inaugurated through congested districts, and that every passenger be given space inside the car. Deaths due to getting on and off cars, he says, could be prevented by the use of an automatic gate such as is supplied in Minneapolis and St. Paul. The Coroner asks that each police wagon sent to a street railway accident be accompanied by a special officer, whose sole duty shall be to make an immediate personal investigation, and to transmit full information, with names of persons and other data, to the Coroner's office, so that the Coroner and his deupties could issue the summons and make fuller investigations than now.

He also suggests that two expert machinists, attached either to the Coroner's office or the police department, make investigations of the mechanical condition of cars immediately after the accident.

The Chicago City Railway Company has obtained a loan of $3,000,000 from a syndicate composed of Chicago banks. The money will be spent in trolleyizing and improving the lines, and will be expended in the following manner:

New cars	$650,000
Trolleyizing, placing of feed wires, etc	600,000
Purchasing power during negotiations with city	750,000
Building sub-stations for power and re-equipping old cars	800,000
Incidentals, including installation of transformers, etc.	200,000
Making up the total of	$3,000,000

E. K. Boisot, vice-president of the First Trust & Saving Bank, who negotiated the loan, said:

"The banks represented in the loan have ample security in the tangible property of the company, which is estimated to be worth $20,000,000. But there is another element in the loan; the banks believe the good sense of the people of Chicago is an element, and notwithstanding the agitation of the question of municipal ownership, there is every indication that it is good service that the people demand, and not city ownership."

ENTERTAINMENT TO STAFF BY PRESIDENT OF THE NEW YORK CITY RAILWAY COMPANY

On Aug. 1, President Vreeland, of the New York City Railway Company, entertained the staff and heads of departments of the New York City Railway Company at his home in Brewster, N. Y., where they enjoyed a genuine Rhode Island clam-bake. These outings have been given annually for the past eight years, or since Mr. Vreeland has lived in Brewster, and are one of the most delightful events of the year to those fortunate enough to secure an invitation. Although the sky was overcast the day proved an ideal one for the trip. A party of about 125 rode in three special cars attached to the Harlem Railroad express, to Brewster, and enjoyed an elaborate clam and fish dinner at the Tonetta Outing Club. Later the guests were driven to Mr. Vreeland's country residence, "Rest-a-While," where they received a cordial reception from Mrs. Vreeland and a number of Brewster ladies. The party returned to New York by special train about 9 o'clock in the evening. These outings are characteristic of the cordial relations existing to all of the rank and file of the New York City Railway Company, and are one evidence only of the regard of the president for all those with whom he is associated in business.

In addition to the members of the New York City Railway Company there were a few other invited guests at the clam-bake, including: Edward A. Maher, president, Union Railway; G. Tracy Rogers, president, Binghamton Railway Company; E. P. Bryan, vice-president, and Frank Hedley, general manager, Interborough Rapid Transit Railway Company; W. G. Besler, vice-president and general manager, and W. McIntosh, superintendent of motive power, Central Railroad of New Jersey; H. S. Hayward, superintendent of motive power, Pennsylvania Railroad; C. H. Ketcham, division superintendent, Delaware, Lackawanna & Western Railroad, and B. B. McCoy and M. Bronson, of the New York Central & Hudson River Railroad.

PENSIONS PROPOSED IN VICTORIA

J. A. Buntzen, managing director of the British Columbia Electric Railway, has submitted to the employees of the company for their ratification a pension scheme, which more than likely will be adopted. The proposition is an annual payment of $3.00 from each man, taken from the dividend payments by the company from its profits, to its employees. To this the company will add dollar for dollar. The pensions are to be paid to employees reaching the age of 60, who have been in the employ of the company fifteen years. The amount of the pension shall consist of one-half or one-quarter of the salary last received as recommended by the committee of the union. All attaining a salary of $100 per month are placed outside of the provisions of the scheme. According to this plan it will be seen that the employees will not be asked to pay anything out of the wages earned by them.

A NEW LINE FOR ST. LOUIS

Articles of incorporation were filed Aug. 3 for a new street railway which will mark the re-entry into the traction business of St. Louis of the former owners of the Union Depot Railway, including John Scullin, Thomas W. Murphy, James Scullin and others. Thomas Scullin was superintendent and general manager of the Union Depot system under the regime of the Scullins, and he very probably will assume a similar position with the new company. Since John Scullin retired from the street railway business at the time Brown Bros., of New York, bought and consolidated the St. Louis lines of the present United Railways Company, there have been various reports at different times that he would build an elevated railway and also surface lines, but nothing definite was done until the actions of Aug. 3. The route of the road will be from Broadway to the city limits on the Hall's Ferry Road, a distance of 1 mile, for which a franchise was granted recently by the Municipal Assembly. The route of the road in the county will probably extend from Hall's Ferry Road at the city limits through Jennings and Ferguson, but a franchise has not yet been secured for the county section of the road. The promoters of the new road are interested in a track of land in North St. Louis, embracing 200 acres or more. As soon as plans are arranged the company will begin the work of laying out a sub-division designed to be one of the best residence sections of the city. Engineers are engaged on plans for the new road. The company is capitalized for $50,000.

ROCHESTER, CORNING & ELMIRA COMPANY ORGANIZED

The certificate of incorporation of the Rochester-Corning-Elmira Traction Company, successor to the Rochester & Southern Railway Company and the Rochester & Elmira Electric Railway Company, has been filed with the Secretary of State at Albany and in the office of the Monroe County Clerk. The company is incorporated for a period of 1000 years for the purpose of building, maintaining and operating a street surface railroad between Rochester, Corning and Elmira, to be operated by electricity or any power other than steam.

The road will be 120 miles in length, and will extend from the intersection of Mount Hope and Elmwood Avenues, at the south line of Rochester, to the intersection of State and East Water Streets, Elmira. The company is capitalized at $4,000,000, divided into 40,000 shares of a par value of $100 each.

The board of directors is constituted for the first year as follows: Max H. Schultze, C. O. Geer, Frederick Eckstein, Henry Brunssen, Harry Velthusen, Horace G. Abel and Tracy S. Buckingham, of 42 Broadway, New York; and Samuel M. Levy and Henry H. Kaufman, of 141 Broadway, New York. Those directors, whose address is given as 42 Broadway, are either members or employees of the firm of Otto Heinze & Company, bankers and brokers, in which the control of the Rochester-Corning-Elmira Traction Company is lodged.

The original company, which was not incorporated, was the Rochester & Southern Railway Company, but the control passed to the Heinzes in February last. The initial hearing before the State Railroad Commission is to be held in Rochester on Sept. 18.

CAMDEN INTERSTATE COMPANY CHANGES HANDS

It is reported that State Senator William C. Sproul, of Chester, Pa., and business associates have obtained control of the Camden Interstate Railway Company, of West Virginia, Kentucky and Ohio, which owns the electric lines and lighting plants in the cities of Huntington and Kenova, W. Va.; Catlettsburg and Ashland, Ky., and Ironton, Ohio, together with the lines connecting those places. It operates about 50 miles of electric railway and runs about sixty cars. Senator Sproul is the president and principal owner of the Kanawha Valley Traction Company, of Charleston, W. Va., to which point the Huntington line is being extended. The Kanawha Valley road is being built to St. Albans. The directors of the Kanawha Company, besides Senator Sproul, are Rudolph Ellis, president of the Fidelity Trust Company, of Philadelphia; George W. Stevens, president of the Chesapeake & Ohio Railway, Richmond, Va.; Morris L. Clothier, of Philadelphia; Robert Wetherill, of Chester; ex-Governor William A. McCorkle and William E. Chilton, of Charleston, W. Va. It is understood that these persons are interested with Mr. Sproul in the purchase of the Camden Insterstate Railway.

ANNUAL REPORT OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

The annual report of the Westinghouse Electric & Manufacturing Company for the year ending March 31, 1906, was presented at the meeting of the stockholders July 25, and shows sales for the year of $24,939,602, as compared with $16,570,717 last year. The sales for the first five months of 1906 have averaged $2,850,000 per month.

The report has considerable to say in regard to the company's railway business. Its sales of railway motors have increased 51 per cent over last year, and those of the electro-pneumatic switch control 60 per cent over any previous year. The single-phase system is referred to at considerable length, and the following list is given of the companies which have adopted single-phase motors: In operation, Vallejo, Benecia & Napa Valley Railway, Warren & Jamestown Street Railway, Westmoreland County Street Railway, Indianapolis & Cincinnati Traction, Glen Cove branch of Long Island Railroad, Atlanta & Northern Railway. Under construction, New York, New Haven & Hartford Railroad, Grand Trunk Railway, Spokane & Inland Railroad, Ft. Wayne & Springfield Railway, Pittsburg & Butler Traction.

In other branches of the work the company reports contracts aggregating $6,000,000 for tramway construction in St. Petersburg, Russia; an increase in turbo-generator sales of 94 per cent, as compared with last year, and an increase in sales of subsidiary companies, like the Nuttall Company.

CLEVELAND TRACTION SITUATION

The traction situation in Cleveland continues to develop interesting phases. Mayor Johnson and Director of Public Service Springborn were tried for contempt of court in neglecting to stop the work of pulling up the tracks of the Cleveland Electric Railway on Fulton Street, which was referred to quite fully in this paper last week. Mayor Johnson was purged of contempt, but Director Springborn was adjudged guilty and fined $100. The court based his decision upon his opinion that Mayor Johnson had made an effort to learn what he was being enjoined from doing, while Springborn, who was in personal control of the railway ripping work, was remiss in not stopping the work when the writ was served. The judge rebuked the city authorities for their claim that the work had been continued merely to put the street in a passable condition, stating that it was clear that the real purpose was to put down the rails of the other company. The city has filed notice of an appeal for a new trial for Director Springborn.

Councilman Hitchins, who introduced the proposed ordinance for the Cleveland Electric Railway Company, has announced that he desires to make some changes in the ordinance before it goes to the vote of the people. He desires to make the proposed grant expire in twenty years instead of twenty-five years, and to insert a municipal ownership clause whereby the city may buy the property at the expiration of the grant. President Horace Andrews, of the company, has invited the Councilman to prepare a new ordinance embodying his views.

The low fare company has been quick to take up this situation, and in its interviews and advertisements intimates that the old company has been deserted by its chief sponsor. The war of words in the newspapers has been going on fast and furious. The old company continues to publish large advertisements in the morning papers bringing out the chief points of its proposition, while the new company answers them in the afternoon papers. A point has been reached where personalities are being indulged in. Mayor Johnson in an interview stated that the best of the old company's grants would expire within three years. The old company called him a prevaricator in as many words, and pointed to the report of Johnson's own man Bemis, who stated that the leading grants have seven years to run.

In an interview, Mr. Andrews said: "If Mr. Johnson continues such attacks upon this company, he will find that the battle will not be over or lost until the public is in possession of information which it is not now possessed of—information which will reveal Mr. Johnson's real relation to the Forest City Company, the so-called Municipal Traction Company, and also his relation toward certain other franchise matters which have been passed under his administration and with his aid. We believe that when all the facts are known, the traction question will be taken into the hands of the public itself for settlement, and will be settled right."

There are some interesting possibilities in this threat, and even Mr. Andrews' enemies agree that an official in his position who has always been noted for his conservative policy, would not make them without ample grounds. Mayor Johnson has all along denied any financial interest in the various low fare companies which he has openly fought for, and proof to the contrary would place him in a bad light.

The injunction restraining the city from further work on Fulton Street is still in force and the case is now being tried. Judging from the evidence presented, it is a safe guess, at this writing, that the court will decide that the city authorities had no right to take the law into their own hands and tear up the tracks of the old company.

Frank DeHass Robison, who formerly had a street railway system in Cleveland, and who announced that he would accept a franchise on a 3-cent fare basis, is said to be securing consents and arranging to apply for franchises over several routes covering about 50 miles of streets in various parts of the city .

UNFORTUNATE ACCIDENT ON LAKE SHORE

Disobedience of orders by a motorman, who paid for his error with his life, was responsible for a bad wreck on the Lake Shore Electric Railway 1 mile west of Vermillion last Sunday. A westbound Cleveland-Toledo limited crashed head on into an eastbound local car, telescoping both cars, killing two passengers and injuring about fifteen others, several of them quite severely. Both cars were late, and usually passed each other at Linwood Park, but in this case the despatcher gave both orders to pass at Siding 38, a mile beyond Linwood. The limited was running in two sections, and Motorman Moody, of the first section, instead of remaining on the siding tried to make the next siding, contrary to his orders. The collision occurred 1000 ft. beyond the siding, and both cars were running at high speed. The motorman of the limited jumped and struck a trolley pole and was killed instantly. The second section of the limited took the siding according to orders, and its crew telephoned to the despatcher that the first section had gone on. The limited was crowded with people, and in direct defiance of orders the motorman allowed a number of people to stand on the front platform. The written order instructing the limited to pass a local at Siding 38 was found in the motorman's cab after the wreck.

NEW YORK SUBWAY FLOODED

Joining forces with a broken water main the thunderstorm which broke over New York shortly after 7 o'clock p. m. Tuesday, Aug. 7, flooded the subway below Fourteenth Street, leaving the tracks a foot under water in places and completely tying up downtown traffic for the rest of the night. Trains were run to Fourteenth Street and shuttled back, but between Fourteenth Street and the Battery none were run. It was almost 7:30 o'clock when the first trains in the subway were held up by the water, and at least an hour later before anything like order was restored above Fourteenth Street. The flooding of the tracks and the breaking of the rainstorm were almost simultaneous. For several weeks laborers have been working at Franklin and Lafayette Streets, cutting an opening for ventilating the subway. Several water mains, leading from the Central Park Reservoir, had been moved. Among them was a 36-in. main, which was shifted about 10 ft. While it was out of place the water was supposed to be cut off. Degnon & Company, the contractors in charge of the ventilating work, had been notified that the pipe had been isolated and could be shifted. Just before the storm broke the supposedly "dead" pipe had been cut through. Preparations for the removal of the water remaining in the pipe had been made by putting a small pump in position. If it had not been for the sudden rain everything might have passed off as planned. As it was, however, the drainage from five streets poured into the subway, and the laborers were finally forced to abandon their position. When the storm was at its height the water main itself burst and the water splashed through into the subway.

THE PROPOSED LINE OF THE SOUTHERN KANSAS RAILWAY, LIGHT & POWER COMPANY

The Southern Kansas Railway, Light & Power Company has been organized to construct a single-phase interurban railway system in southeast Kansas and southwest Missouri. The capital stock of the company is $4,000,000. The officers are: R. C. Rawlings, president, Chanute, Kan.; J. W. T. Stephens, vice-president, New Orleans, La.; L. Rosenthal, treasurer, Chanute, Kan.; F. C. Dixon, secretary, Chanute, Kan., and J. J. Jones, Chanute, Kan.

This road is to start at Chanute, Kan., and runs from there to Thayer, Parsons, Mineral, Scammon, Columbus, Galena, in Kansas; thence to Joplin, Webb City, Carterville, Carthage, in Missouri. A spur will extend also from Parsons to Cherryvale, Independence and Coffeyville, Kan. The length of this projected line is 160 miles. It passes through a rich oil and gas field, thence across a fine farming country, thence across a coal belt, and from that into the great zinc and lead producing district of Missouri.

The main power plant will be located at Chanute, Kan., with sub-stations located as desired. Chanute has been chosen for the location of the main power plant, for the reason that at this point natural gas can be purchased at 2½ cents per 1000 cu. ft., besides which it is intended as soon as this line is completed to extend the main line north to Kansas City, thus throwing the power plant practically in the center of the system. The road will be equipped for the handling of both passenger and freight traffic, and a large volume of freight business has already been pledged. The company's plans also include the equipping of five pleasure parks at different points along the route.

The topography of the country to be traversed by the proposed railway is such that the cost of grading will be comparatively low.

PROGRAM OF THE AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' CONVENTION

The official program of the meeting of the American Street and Interurban Railway Accountants' Association, to be held at Columbus, Ohio, Oct. 16-18, in conjunction with the annual meeting of the American Street and Interurban Railway Association, as just announced, is as follows:

Tuesday, Oct. 16, 1906—10:00 a. m. to 12:30 p. m.

Call to order.

Address of welcome, by P. V. Burington, secretary Columbus Railway & Light Company, Columbus, Ohio.

Address, Hon. W. Caryl Ely, president American Street and Interurban Railway Association.

Address, B. V. Swenson, secretary American Street and Interurban Railway Association.

Annual address of president, W. B. Brockway.

Annual report of executive committee.

Annual report of secretary and treasurer, E. M. White.

Appointment of convention committees.

Tuesday, Oct. 16, 1906—2:00 p. m. to 5:00 p. m.

Paper, "The Accounting of Capital Expenditures," by P. S. Young, comptroller Public Service Corporation of New Jersey, Newark, N. J.

Question Box.

Convention photograph.

Wednesday, Oct. 17, 1906—Morning in joint meeting with other associations.

Wednesday, Oct. 17, 1906—2:00 p. m. to 5:00 p. m.

Paper, "The Use of Curves in Statistics," by A. Stuart Pratt, general auditor and treasurer Stone & Webster Companies.

Report, committee on standard classification of accounts.

Election of officers.

Wednesday, Oct. 17, 1906—8:00 p. m.

Informal reunion and dinner.

Thursday, Oct. 18, 1906—10:00 a. m. to 12:30 p. m., 2:00 p. m. to 5:00 p. m.

Review, "Depreciation as Applicable to Electric Railways," by Robert N. Wallis, treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass.

To be followed by discussion. This meeting will be an executive session.

Installation of officers.

BALTIMORE & ANNAPOLIS SHORT LINE AND MARYLAND ELECTRIC RAILWAY COMPANY CONSOLIDATE UNDER TITLE OF THE LATTER

Stockholders of the Baltimore & Annapolis Short Line have voted to consolidate with the Maryland Electric Railway Company under the name of the Maryland Electric Railway Company. Under the plan the holders of the $350,000 Short Line stock will receive three shares of the new for each share of Short Line stock held by them. Prior to voting on the consolidation the stockholders authorized an isue of $1,000,000 of first mortgage bonds to defray the cost of electrifying the line. It is unlikely that more than a third of this amount will be issued at this time. This is another step in the execution of the new financial plan of the United Railways & Electric Company. The new bonds of the Short Line become an underlying issue of the Maryland Company, which at an early date will authorize an issue of $8,000,000 first mortgage 5 per cent twenty-five-year bonds; $4,000,000 will be isued at once, and the proceeds will be used in building car houses, terminal stations and extensions to be leased to the United Railways & Electric Company at an annual rental equal to 6 per cent on the actual cost of the property. A syndicate has already been formed to underwrite the $4,000,000 bonds. The Maryland Company has organized by electing the following directors: John Wilson Brown, S. B. Brown, Austin McLanahan, Joseph C. France, Frank S. Hambleton, Harman B. Bell, Edwin S. Baetjer. The officers elected are: John Wilson Brown, president; S. B. Brown, vice-president; George May, secretary; Austin McLanahan, treasurer.

It is announced by President F. T. Read, of the Trinidad (Col.) Street Railway Company, that an extension of the local system will be made to Riley Canon, a distance of 5 miles.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JULY 24, 1906

826,551. Electric Signal; Allen B. Dungan, of Allentown, Pa. App. filed Oct. 17, 1905. A lever arm having a cam roller is pivoted above the trolley conductor so as to be displaced by the passage of a car. The movement closes a signal circuit which displays signal lamps within the block.

826,560. Loop the Gap Apparatus; Maurice Garanger, of New York, N. Y. App. filed Dec. 5, 1905. Provides an inclined track having a cam incline at its lower terminal end which acts upon a roller carried by the vehicle to impart a somersault to the latter when crossing the gap.

826,565. Trolley Stand; Boniface A. Grasberger, of Richmond, Va. App. filed Aug. 17, 1905. The trolley pole is normally held in raised position by a spring acting through toggle links. A sudden upward movement of the pole, however, displaces the links so that the spring becomes ineffective, and the pole drops.

826,627. Slow Release Magnet; Louis H. Thullen, of Edgewood, Pa. App. filed Dec. 22, 1903. Details of a magnet employed in railroad signal mechanism of a prior patent. The magnet has means for holding its circuit closed after the exciting current has ceased, so as to prolong the magnetization by the "extra current."

826,664. Life Guard Fender for Wheels; Joseph P. Kane, of Renovo, Pa. App. filed May 12, 1906. The wheel is completely surrounded by a cage formed of angle irons and sheet metal straps, all of which are supported by the journal box.

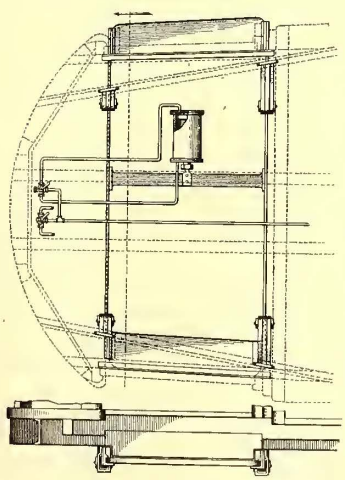
826,768. Wheel Guard; Edmund P. Craley, of McKeesport, Pa. App. filed April 30, 1906. A solid metal block depends from the brake-shoe in front of the wheel, so as to form a fender.

826,774. Street Railway Switch; Chas. W. Faitoute, of Summit, N. J. App. filed Jan. 25, 1905. A pair of tappets are inset in the rail so as to be selectively depressed by a bearer or wheel carried by the car. The tappets are guided in a curved channel so as to directly move the switch point.

826,780. Brake Setting Device; Ellsworth Godley, of Springfield, Ill. App. filed Feb. 16, 1906. A chamber connected with the usual air hose has a small weight therein which is displaced by violent movements of the car, so as to release a detent and open a valve to apply the brakes.

826,780. Trolley; John Grundl, of Pittsburg, Pa. App. filed Dec. 11, 1905. A pair of plates are pivoted to the usual harp and have cam rollers by which they are guided into upright position when passing hangers. The plates have cheeks which enter grooves in the hangers to prevent displacement of the trolley wheel.

826,799. Trolley Pole Controller; Andrew L. Prentiss, of Buffalo, N. Y. App. filed May 10, 1905. The trolley harp forms an independently moving section at the upper end of the pole and any sudden movement, as when the wheel leaves the wire, trips a valve to actuate the retrieving air cylinder.



NO. 820,926

826,926. Car Step; Delbert A. Faut, of Chicago, Ill. App. filed Jan. 23, 1906. Each of the steps are slideable in and out from beneath the car. The two steps are connected together and are moved simultaneously by an air pressure cylinder.

826,961. Car and Engine Replacer; Archibald M. Peebles, of Meadville, Pa. App. filed April 18, 1906. A metallic shoe is formed to straddle the track rail and has a small switch point thereon so as to guide the wheel flange to the proper side of the rail.

826,999. Electrically Operated Block Signal System for Railroads; Lester Dickey, of Perry, Ia. App. filed Dec. 6, 1905. Danger and caution signals are both connected to be operated by an electric motor through a reduction gear connection. A form of magnetic clutch is effective to select the appropriate signal to be actuated.

827,054. Railway Signaling System; Chas. P. Breese, of Norfolk, Va. App. filed Aug. 11, 1902. Provides a contact conductor having a plurality of contact sections and a signaling means which is controlled by the current fed to each of said sections. Has a shunt resistance to the motor to allow at all times a sufficient quantity of current to pass to the car to cause the operation of the signaling means.

Reissue, 12,510. Electric Controlling Device for Cars; James H. K. McCullum, of Toronto, Can. App. filed June 18, 1906. A complete diagram of circuits by which the motors are able to generate a current for the braking action when desired, all under control of the motorman.

UNITED STATES PATENTS ISSUED JULY 31, 1906

827,090. Trolley Pole Head; John M. Fleming, Ottawa, Can. App. filed July 13, 1905. The trolley wheel is swiveled on a vertical axis within a supporting framework and a spring blade is normally effective to keep the wheel in its proper plane.

827,122. Railway Signal System; William E. Schieble, Miamisburg, Ohio. App. filed March 24, 1905. A block signal system for single-track trolley roads. Relates mainly to mechanical construction of a detent for positioning a circuit closing wheel. Two detents co-operate to absolutely lock the wheel after movement.

827,142. Switch and Signal Apparatus; Clarence W. Coleman, Westfield, N. J. App. filed Nov. 2, 1903. Relates to signal systems operated by liquid carbonic acid gas stored at local points in tanks placed underground so as to be free from temperature variations. Has an explosion chamber and a system of valves for maintaining uniform pressure in the operating cylinders.

827,189. Electric Railway; Bartholomew M. Stack and James F. Burns, Chicago, Ill. App. filed Sept. 1, 1905. A trolley road of the type having contact plates in the roadbed and longitudinal conductor depending from the car. The contact plates are deeply set in grooved insulating blocks which serve to guide the conductor.

827,240. Car Step; Charles C. Hummel, Espy, Pa. App. filed Feb. 8, 1906. A car step for railway trains which can be thrown over by a lever system to constitute a platform when the train is in motion.

827,269. Electric Signaling; Jacob B. Struble, Wilkinsburg, Pa. App. filed March 12, 1902. An alternating current magnet in which the fields are energized by the track circuit while the armature has a pair of closed circuit coils in which a current is induced when the field current is alternating. This causes the armature to respond and be deflected for alternating current in the field, but not direct currents.

827,270. Electric Signaling; Jacob B. Struble, Wilkinsburg, Pa. App. filed March 12, 1902. A modification of the above in which the fields are energized by the track circuit and the armature is connected to the alternating power circuit. The reaction in case of alternating currents in the fields produces a displacement to close a signal circuit, but not in case of direct currents in the fields.

827,294. Track Sander; Fred B. Corey, Schenectady, N. Y. App. filed Feb. 15, 1904. A sand ejector having a nozzle for compressed air and an annular passage thereabout through which the sand normally flows by gravity.

827,313. Pleasure Railway; August Lauster and Frederick Pounds, Paterson, N. J. App. filed Feb. 21, 1906. The railway is led through a tunnel having closed sides so that the pasengers may have the experience of seeing the objects under water.

827,320. Motor Control; Jakob E. Noeggerath, Schenectady, N. Y. App. filed Nov. 17, 1905. A system by which motors may be connected in series without danger. A unipolar dynamo is connected in parallel with all the motors and taps from the armature thereof are led from the potential motors so as to keep the distribution uniform.

827,323. Electromechanical Switch-Thrower; James A. Posey, Midlothian, Tex. App. filed Sept. 14, 1905. The track switch is actuated in the usual way by taking current or not at the car controller in passing. The switch point is thrown by a mechanical tappet actuated by the weight of the car, selector levers being electrically positioned to determine the direction of throw.

827,325. Non-Reversing Two-Way-Running Trolley Pole; Hilary Quertier, Dunedin, New Zealand. App. filed Oct. 9, 1905. The trolley pole projects vertically from the roof of the car and is held in said relation by spring impelled struts which are directed thereagainst in a forward and rearward direction.

827,344. Trolley Retriever; Terry Blixt, Pittsburg, Pa. App. filed July 3, 1905. The trolley cord is reeved through a pulley on the pole and connected to a spring drum at each end. One spring drum normally tensions the cords and the other spring drum retrieves it when released by sudden movement of the pole acting to displace a lever through which the cord is guided.

827,395. Railway Switch; Henry A. Rosback, Chicago, Ill. App. filed March 19, 1906. In place of the usual frog the patentee provided a form of frog with a movable central point which is moved from side to side by a lever connection with the switch point.

827,407. Switch Mechanism for Railways; Thomas Bamford, Lebanon, Ill. App. filed April 27, 1906. The switch point is connected to a long spring blade adjacent to the track rail and a depressible bearer on the car bends said blade inward to throw the switch point.

827,411. Railway Traffic Controlling Apparatus and System; Henry Bezer, Westfield, N. J. App. filed Jan. 23, 1905. An arrangement of circuits for a block signal of the overlap type having track rails energized by a direct current and utilizing polarized rails.

827,446. Railway Car Seat; George H. Hopkins, Chicago, Ill. App filed April 9, 1906. A seat for the motorman of an electric train having a lever connection by which it is moved downward to constitute an ordinary passenger seat.

827,476. Rail Joint; James M. Tadlock, El Reno, Okla. Ter. App. filed Oct. 6, 1905. The rails are formed to have a splice joint, two engaging walls of such rails being grooved to constitute mortise and tenon connection.

827,628. Safety Block Signal; Lonzo V. Greene, Webster, Mass. App. filed April 28, 1906. A mechanical block signal having depressible bearer plates in the roadbed adapted to be engaged by suitable levers on the train, whereby the signals are set, and chain and rod connections to the distant signal.

827,681. Electric Railroad; George W. Browne, New York, N. Y. App. filed Feb. 23, 1905. The third rail is sectionally energized during the passage of a train. Tappets adjacent to the rail are engaged to throw knife-blade switches and charge the rail in advance of the train.

827,683. Signal Apparatus; Clyde J. Coleman, New York, N. Y. App. filed May 7, 1902. A system for the operation of semaphore signals by local reservoirs of liquid carbonic acid gas. Has claims on the utilization of liquefied gas at local points for signal purposes.

PERSONAL MENTION

MR. H. D. HAGGERTY has been appointed general manager for the Little Rock Railway & Electric Company, to succeed Mr. C. O. Simpson, resigned.

J. G. WHITE & COMPANY, of New York, announce that Mr. E. N. Chilson has been appointed purchasing agent of the company, and that Mr. E. V. Peters will continue to act as assistant purchasing agent as heretofore.

MR. FRANK R. PHILLIPS, of Cincinnati, has been appointed chief engineer of the Michigan United Railways Company, and will have his headquarters in Lansing. Mr. Phillips held a similar position with the South Covington & Cincinnati Railway.

MR. H. P. BRUCE, formerly general manager of the Demerara Electric Company, of British Guiana, and lately a member of the firm of Rockwell & Bruce, of 26 Cortlandt Street, died suddenly in New York on July 26. Mr. Bruce leaves a wife and one child. Mr. Bruce entered the electrical field in the early days of the Thomson-Houston Company, and had charge of some of the largest work in the East. Before going to Demerara, where he was located for from two to three years, Mr. Bruce was associate engineer of the Pittsburg Railways.

MR. H. A. JOHNSON, who for twelve years has been identified with the South Jersey division of the Public Service Corporation of New Jersey, as chief engineer of the railway department, resigned his position Aug. 1. He will at once go to Davenport, Ia., where he has accepted a position as general superintendent of the Tri-City Electric Railways & Lighting Company. Mr. J. N. Akarman, from the North Jersey division of the Public Service Corporation, and formerly of Worcester, succeeds Mr. Johnson. He has been given the title of general superintendent of railways, South Jersey division.

MR. DANIEL B. BANKS, who as chief engineer had charge of all the track and other construction work of the United Railways & Electric Company, of Baltimore, has resigned to take up independent consulting work. It is said that the company will not name successors, with like authority, to Mr. Banks and to Mr. P. C. Keilholtz, who resigned lately as consulting engineer. Part of their duties will be filled by the staff of Mr. L. B. Stillwell, of New York. At the present time Mr. Stillwell's electrical assistants are making an examination of the Pratt Street power station.