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Temperature and Station Loads

The study made by Mr. Corning of the relations between temperature changes and power station outputs, and of which a résumé is printed in another column, throws light upon a phase of operation which has hitherto received comparatively little attention, and indicates with unmistakable emphasis how closely related are the component physical parts of every large electric railway system. It is not a little surprising that the output of such a system should follow such a close relation to the temperature throughout the entire year, in spite of the change from closed to open cars in the spring and back again to boxed-in bodies and heaters in the fall. Even during the same season a large number of observations show that a drop in temperature is accompanied by a substantial increase in load.

The explanation of these relations by the increase in friction due to greater viscosity in the car lubricants as the atmosphere grows colder appears reasonable, though it is an interesting problem just how far the behavior of oil or grease can be charged with the variations outlined in the data printed. The riding habits of the population, the number of cars in service, the general weather conditions, the status of the line and return circuits, the motor efficiency at different seasons of the year, and the condition of the track, all bear upon the load curves at the generating plants. To a considerable extent in a large city these latter factors may offset one another, and certainly the increased friction of cold bearings can be allowed to account for an important share of the day-to-day temperature load variations in the light of the supplementary coasting tests made by Mr. Corning.

The striking lesson of the investigation is undoubtedly the importance of studying the car lubrication problem as a whole in a thoroughly scientific way. It is customary now to use different lubricants for summer and winter service, but it may be desirable to vary the number or composition or both of the lubricants used much more than is done at present. Much emphasis has been laid of late on the possibility of saving oil by working from the car house end, by keeping careful records of the consumption of different cars in terms of gallons per thousand miles or per month, and by watching out for waste in handling the oil. All this is desirable, but it is equally important to select the proper oil for the most reliable service and for the best long-run economy. We are gradually getting away from the point of view which regards low oil consumption as the index of mechanical operative efficiency. To save a few cents in the oil bill of the car and lose dollars in excess from power generated is a policy of doubtful economy. It is very probable that the effect of temperature variations upon bearing friction may be responsible in part for the discrepancies in train resistance measurements often noted in comparing different authorities. Mr. Corning's study shows that whoever sets down any scientific investigation of technical relations in electric railway service as of purely academic interest is taking dangerous ground, and it is to be hoped that further study will be made by operating companies and oil experts of this important subject of lubrication.

Concerning Concrete

The extent to which concrete is now being used as a building material for car houses, sub-stations and even

power houses warrants a further consideration of the topic than has been given in these pages. For the past two or three years the country seems to have been entering upon an age of concrete building to an extent that could scarcely have been imagined a decade since, and it is now high time to look about and take account of stock. A first-class article of cement concrete properly proportioned and honestly mixed is a wonderfully strong and reliable material. It gets harder and harder as time goes on until the structure is almost as solid as a monolith. Yet concrete is now customarily employed in cases where it requires and receives steel reinforcement to adapt it for purposes for which it is by itself mechanically unsuitable. What is going to be the fate of the steel thus embedded after the lapse of twenty-five or fifty years? This question has been asked often enough, but as yet the data are lacking for an answer. A little fairly old reinforced concrete has been examined, and the results have been generally rather encouraging. The uncertainty resides mainly in the fact that the earlier examples of concrete show that the material was used in a rather conservative manner and was itself of a richer and more carefully blended mixture than is now common. In plain English, jerry building in reinforced concrete is of rather recent origin and it is still too early to tell how bad it really may be. With concrete good enough to form almost an hermetical seal about the reinforcement, steel would probably acquire merely a superficial protective coating of oxide and would then last almost indefinitely.

If, however, the concrete mixture is lean and slapped together haphazard the chances are that in some situations at least the steel will be accessible enough to moisture to degenerate into something hardly more tenacious than a streak of rust. The danger lies in hasty and careless work and to judge from some of that we have personally observed, as well as from some of that from which failure has been already recorded, such work is not, to put it mildly, exceedingly rare. There has not been sufficient lapse of time to bring the deterioration of the reinforcement prominently to view, but for every instance of absolute failure of the concrete there are probably several, possibly many, which are saved from immediate failure only by the initial excellence of the reinforcement. What will be the fate of these when the reinforcement is impaired? Some experiments have already been made showing the possible dangers from electrolytic action in concrete and steel beams. Such action is probably not very common, although cumulative in its effect and ultimately, perhaps, destructive.

The fact is that concrete construction gives almost unique opportunities for scamping, and it cannot be watched too closely. There are plenty of reputable firms who can be trusted to do good work and plenty of the other kind who cannot. When contracts for such work are being drawn, they should be most carefully safeguarded, and during execution should be superintended with the utmost vigilance. Granting that the contractor is scrupulously honest it is still possible for very serious mischief to be done in a few hours by a negligent or unskilled foreman, and mischief, too, that is at once covered up and undetectable until the day of reckoning. Concrete has certainly come to stay and a most excellent material it is—at its best. It is likely, however, that there is much still to be learned regarding the safe limits of its employment, and it is well to be cautious lest one furnish a sorry lesson.

Giving the Workmen a Definite Aim

When there is something definite to work for, or when two or more persons are competing, an individual is more inclined to put his best efforts into his work. The operation of many electric railway systems could no doubt be carried on more cheaply and the men doing the work would be brought to enjoy it in a greater degree if the aim at reduction in costs were kept before the men and a rivalry were developed between the department foremen to see which could conduct his department at the least expense.

This would involve the introduction, into a large portion of the work, of some kind of a competitive plan. Where there are several line crews under separate foremen and each has charge of separate sections of the line, expenses of maintaining the line could be reduced to cost per mile per month, or probably a more accurate basis would be cost per car-mile per month with allowances for curves, etc., if this would not involve too much work. Again where there are several sub-shops doing inspection and light repairs on cars or at least the same class of work the costs in each shop could be gotten out in cents per car-mile at the end of each month. Further comparisons could be made between labor and material costs. The plan would include a comparison of the records of the different shops or of the different line crews each month, so that each foreman could find out just where he stood in comparison with his fellow foremen. The workmen themselves might be acquainted with the costs in order to imbue them with a spirit of rivalry.

Power-house foremen usually work against the cost per kilowatt-hour, but it is not customary to acquaint the foremen and engineers with the results. If these men are of the proper stamp and have the company's interests at heart no harm could result and possibly much good would be accomplished if they were kept informed of the records each month. The firemen would, of course, be more interested in the pounds of water evaporated per pound of coal, and if they were kept constantly informed of the figures obtained from month to month the pleasure of trying to accomplish something would often result in them firing more carefully and more economically.

The engineers should be directly interested in the pounds of water per kilowatt-hour and in order to reduce the quantity from month to month they would probably be more thoughtful about running units at their most economical loading. The desire to reduce costs in general would probably result in a hundred little economies in the power-station operation, which in the aggregate would amount to a substantial saving.

Some earnest thought along this line might result in the development of plans peculiarly suited to the local conditions of every system, whereby men could be brought to feel that they were working with a definite aim in view with resulting economies.

Protecting Trees from Wire Injuries

The question of protecting trees from the effects of high voltage currents and from improper guying and attachment of wires, has received considerable attention from electric light and power companies, and to a less degree perhaps,

electric railways have been interested in the subject. There is no doubt that the attitude which an operating company takes in regard to tree protection exerts a wider influence on public sentiment than is generally realized. It is advisable that all suggestions from responsible authorities on the growth of trees and their protection against improper wiring should be given a careful consideration by street railways, though in some cases, of course, the treatment recommended may not be feasible from the company's standpoint.

A paper by Prof. Geo. E. Stone, of Amherst, in a recent number of "Woodland and Roadside," treats the protection of trees in a broad way which seems fair both to the electric companies and the public, and it includes a number of practical suggestions worth mentioning in these columns. It appears that some methods of attaching wires to trees are extremely injurious, while others are not so harmful, and if properly employed will seldom or never cause the tree to be damaged. For example, Professor Stone states that the usual method of guying a pole to a tree by means of a log bolt driven into the back side of the tree, the wire being kept away from the tree by rough bits of wood, is to be condemned, since in a few years the wire is certain to become imbedded in the bark and cause partial girdling, and the log bolt will also become imbedded as the tree grows. Placing a wire around a tree directly is sure to cause strangulation and kill the trunk or limb to which it is attached. According to Professor Stone, the best method of guying to trees consists in having a large loop of wire passed around the tree, the tree being protected from the wire by oak or hard pine blocks grooved in the middle. The loop should be made large enough to allow for the future growth of the tree and should be clamped in place.

Such injury to trees has been prevented by the use of wooden sleeves which surround limbs where wires would come in contact with them. In some cases, notably in Boston, good results have been secured by sleeving the feed wire as it passes the trunk or limb. Professor Stone points out that many cases have been known in which trolley feed wires have been in direct contact with sleeve-protected trees without producing the slightest burning. Attaching wires to trees by means of a porcelain insulator does not prevent leakage in wet weather, and many deaths of trees are attributed to this cause by Professor Stone, who states that trees often get severe shocks by this method of connecting. He states that lightning discharges sometimes pass to trees in this way via trolley guy wires. From the standpoint of the operating company, however, it is hard to see how protection against lightning can be expected of it in its attachments of this kind.

Professor Stone concludes with a plea that trolley poles be braced in Portland cement instead of by wooden guys where they are in close association with trees, urging that the life of the pole in the ground will be increased in addition to the protection given the tree. He concludes that guying to a tree is preferable to unsightly makeshifts of any character. The cost of imbedding poles is something of an item, but it is certain that if more thought is given to specific pole line installations in relation to their surroundings, many operating companies will not regret the consideration paid to the subject, from the standpoint of policy alone, leaving aside the actual physical results. In fact, there is more than one electric railway in the United States attractive to the trolley tourist because of giant elms, oaks and other trees along the wayside. The protection of such trees is surely a matter of self-interest to the local railway as well as to the community.

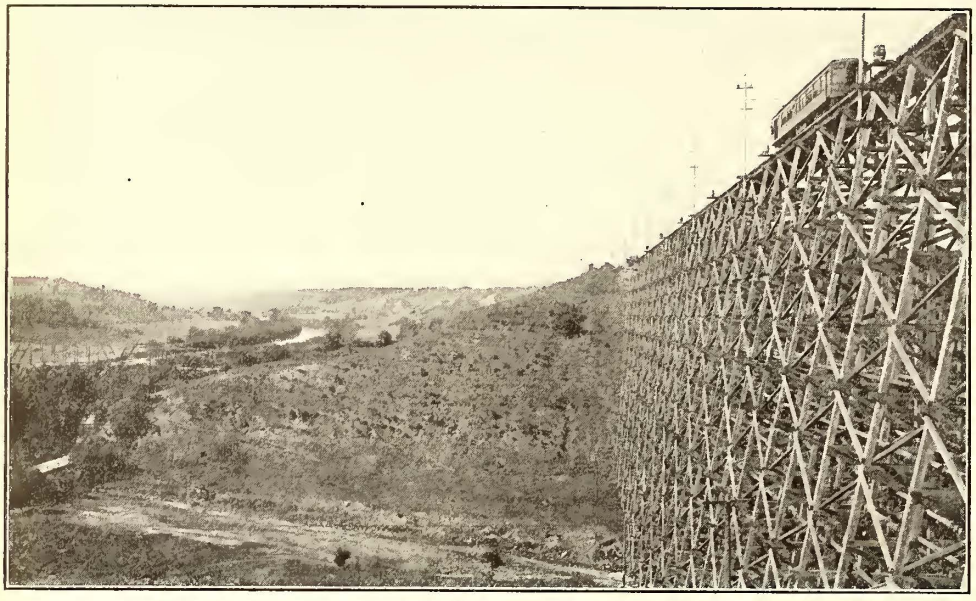
The Action of Steam in Cylinders

Though Hirn by his careful experiments and scientific investigation may be admitted to have laid pretty firmly the foundation of the theory of steam action in a cylinder and to have thoroughly established the theory of cylinder condensation, certain experimenters in Great Britain have for some time been seeking doubtful laurels in overturning Hirn's conclusions, or rather should we say in endeavoring to overturn them, for it cannot be said that any convincing figures have been advanced by the new school. Indeed, from figures which have appeared from time to time it may be said that the conclusions drawn by Hirn are strengthened rather than that the contentions of the new school are in the least borne out. Hirn, it is well known, argued that since the steam in a cylinder is constantly varying in pressure and therefore in temperature, the cylinder metal must be continually striving to attain the same temperature as the steam. The steam and the cylinder metal are but a very brief time in contact, and it is argued by the new school that this time is too short to produce the effects noticed, so the theory of leakage is advanced to explain the facts. A study of the indicator diagrams certainly gives no support to this hypothesis. The *Engineer* (of London) now comes forward and endeavors to show that even if the time of exposure of the steam to the cylinder surfaces is not sufficient to allow of the interchange of heat sufficient to produce the results so well known, it is possible that a film of water globules on the surface would do so. We admit that this is so and we see no objection whatever to this rendering of Hirn's theory. Indeed, we never knew an upholder of Hirn to omit the consideration of water action. Is not the cry for superheat simply an endeavor to abolish the film of water? Has it not always been held that if there be no water to re-evaporate there can be little cylinder cooling and so again still less water?

But granting that the metal surface reactions are intensified by water globules, we would have no one forget in this contention that when the gases from a boiler furnace pass over the heating surfaces of a boiler they do so at a high velocity, yet they lose their heat in an incredibly short space of time. Thus in the case of water tube boilers half the heat of the gases is abstracted in the course of a passage of two or three rows of tubes. Why should the wet gas in a steam cylinder be less active in the interchange of heat than the dry, non-conducting gases of a furnace? We think that a little attention to this curious phase of the steam raising problem may do much to clear up this interesting problem. We see nothing yet to push Hirn's theory off its pedestal, and we might add as another example of rapid interchange of heat the rapid dearth of steam in the surface condenser. The instant formation of a good vacuum seems to us to prove that so far as regards moist steam the transfer of heat to or from metal of a different temperature hardly calls for much time.

THE FORT DODGE, DES MOINES & SOUTHERN RAILWAY OF IOWA

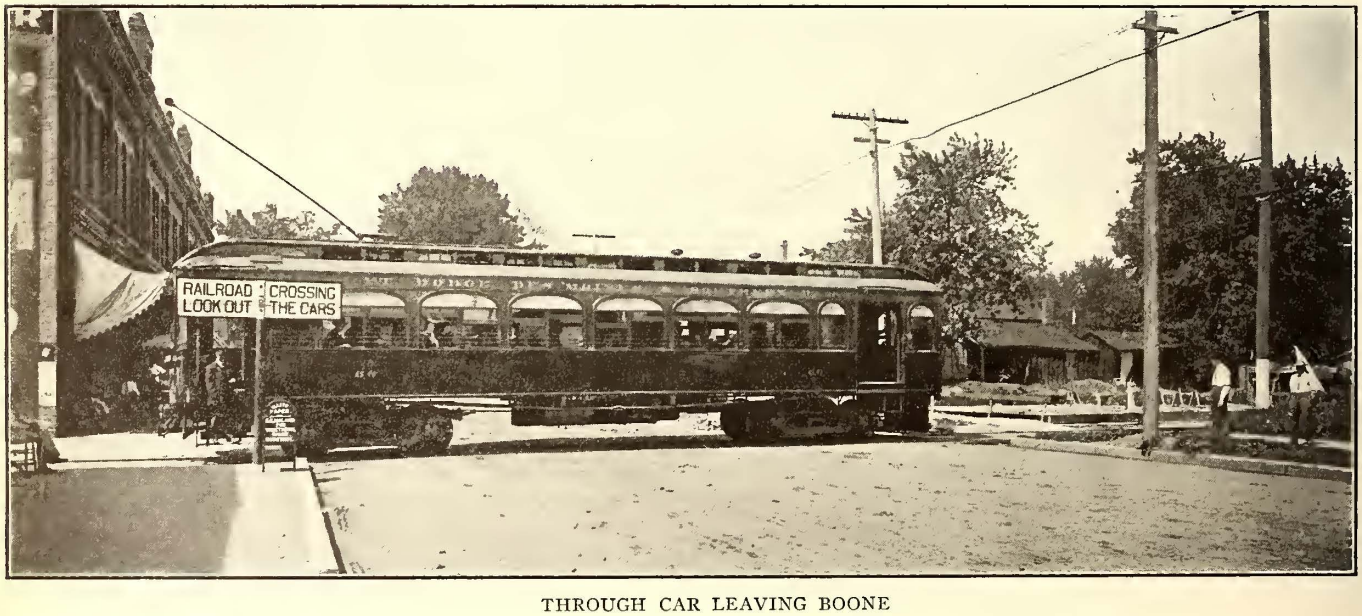
The cities of Fort Dodge, Boone and Des Moines, Iowa, separated by a total distance of only about 90 miles, were for the first time on Nov. 4 placed in direct railway communication by the opening for traffic of the Fort Dodge, Des Moines & Southern Railway. This system combines the electrification of a steam road with new interurban construction. Fort Dodge, like Des Moines, is a very active business town and is also a railroad center of importance. The town of Boone, located midway between, is also an active center. Each of these three cities is situated on one or more important trunk line railways, which in no case connect directly with the other cities. The railroads in question are the Illinois Central and Chicago Great Western at Fort Dodge, the Rock Island and Chicago, Milwaukee & St. Paul at Des Moines, and the Chicago & Northwestern at Boone, all of which with one exception lie practically parallel. The new system links the towns, and therefore connects the railroads at these points, and it will readily be seen that its operation bears vitally on the local traffic problems of the trunk lines concerned, although it is essentially an independent interurban property. The operation of this railway will undoubtedly afford data useful to steam roads in the general problem of the electrification of branch lines.



HIGH TRESTLE WEST OF BOONE, LOOKING UP THE VALLEY OF THE DES MOINES RIVER

When the project was undertaken there was a small steam railroad property, the Newton & Northwestern Railroad, running about northwest from Newton through Boone to Rockwell City, or almost in the direct line between Fort Dodge and Des Moines, though without reaching either city. Briefly then the present project has consisted in the electrification of 42 miles of this steam road and the construction of 25 miles of new line from each end of the electrified section to Fort Dodge and to Des Moines, respectively. A branch line 5 miles long has also been built from Kelley on the main line to Ames, where the Iowa State College is located.

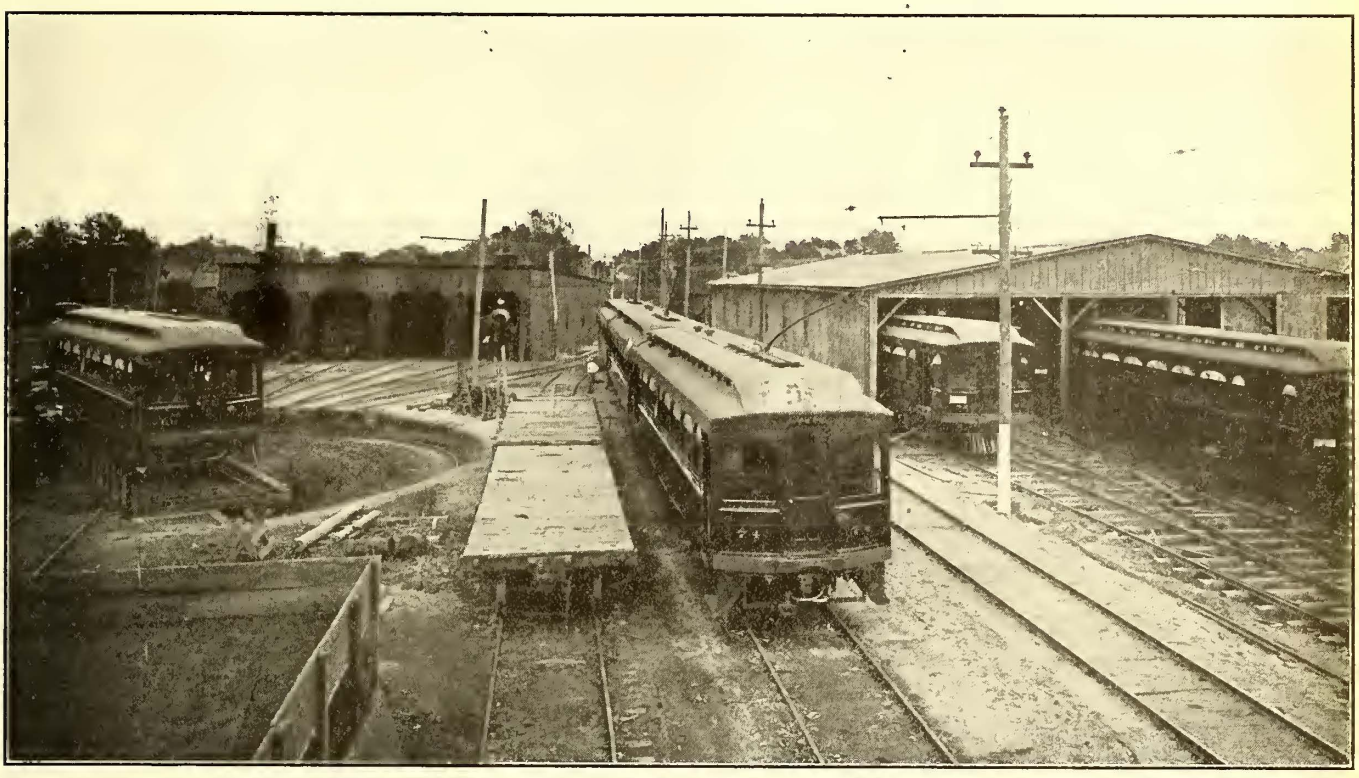
The extension and electrification of the Newton & Northwestern Railroad were carried out on the basis of an estimate of the earnings of the altered property, and the results attained in the brief period of electric operation are better than estimated. No comparison can be made of electric operation with steam operation, as the conditions are materially changed by the extensions. The plans originally contemplated and now in force involve the operation of through electric cars between Des Moines and Fort Dodge, but certain portions of the original Newton & Northwestern, which now become spurs to the through route, are still operated by steam.



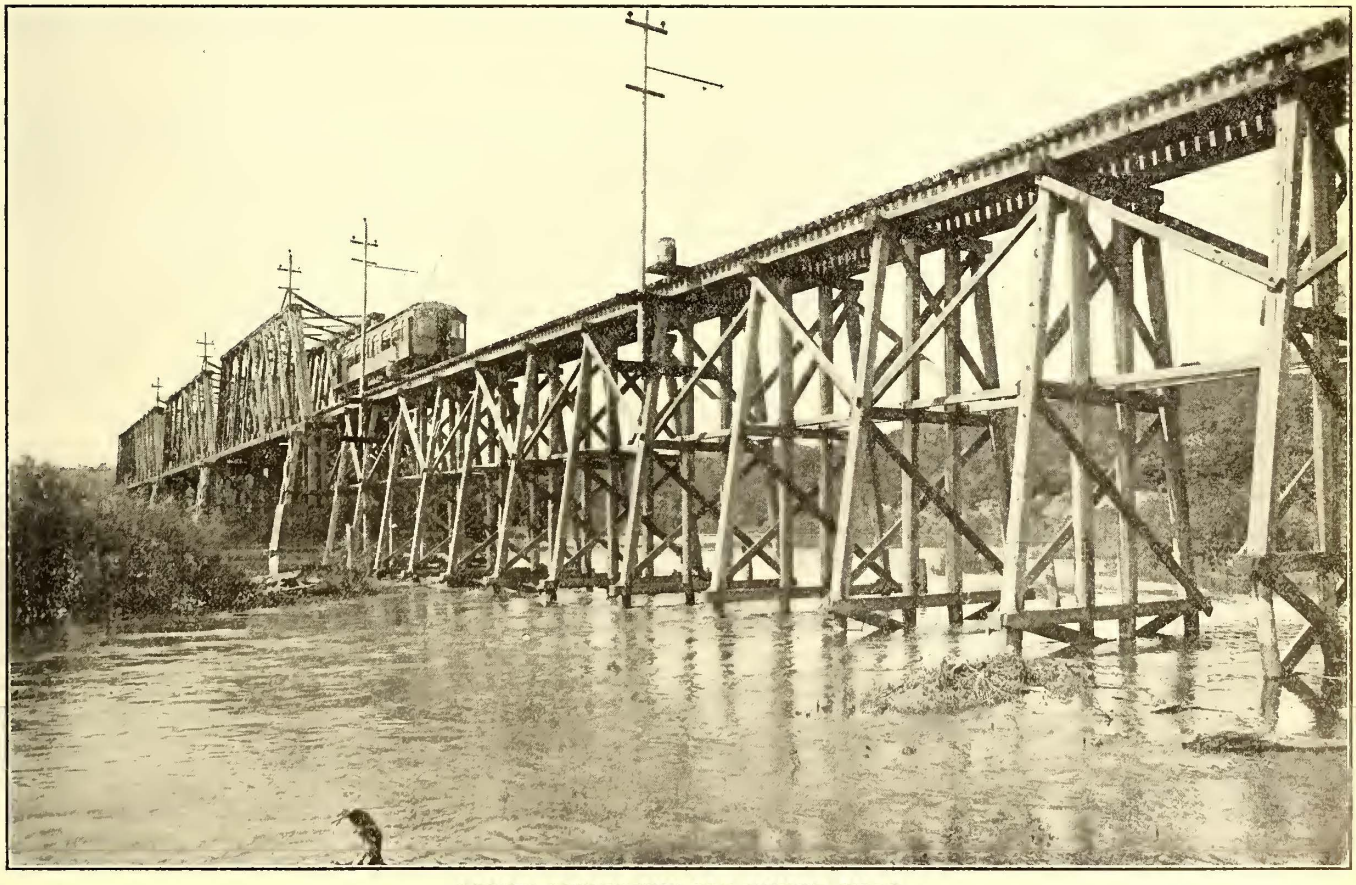
THROUGH CAR LEAVING BOONE

In the details of passenger, express and freight tariff collection and in other operating features the Fort Dodge,

Des Moines & Southern Railway is administered according to steam railroad practice. Passenger ticket offices and express and freight offices are established at all regular stations and the aim is to eliminate cash fares. Mileage books for 500 miles are sold for $7.50. A rate of 1¾ cents per mile is established for round-trip tickets, while one-way fares are sold at the rate of 2 cents per mile. Through passenger traffic arrangements have already been made with the Illinois Central and the Chicago Great Western railroads to connect them with Des Moines and Boone from Fort Dodge and the through express business promises equally well.

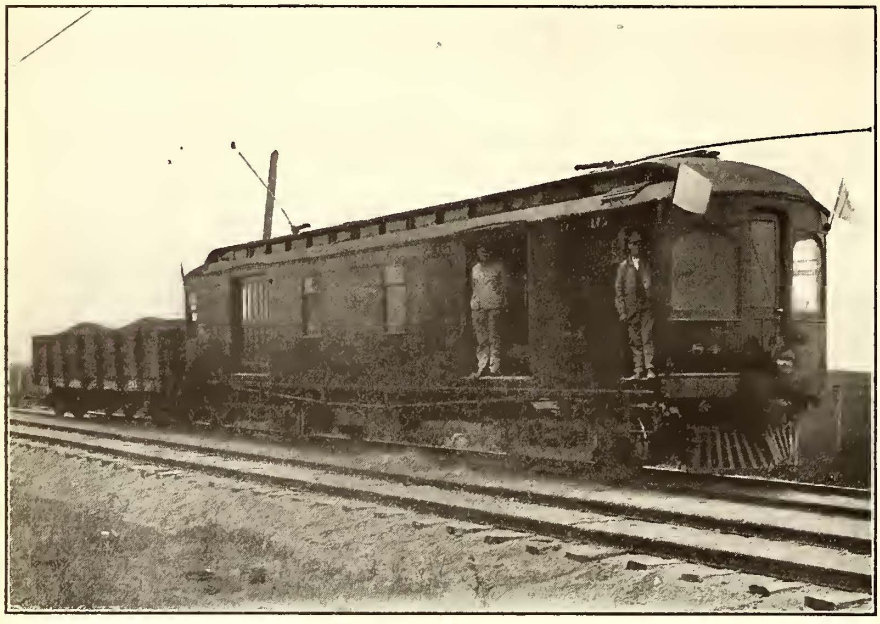


CAR HOUSES OF THE FORT DODGE, DES MOINES & SOUTHERN RAILWAY AT BOONE



BRIDGE ACROSS THE DES MOINES RIVER

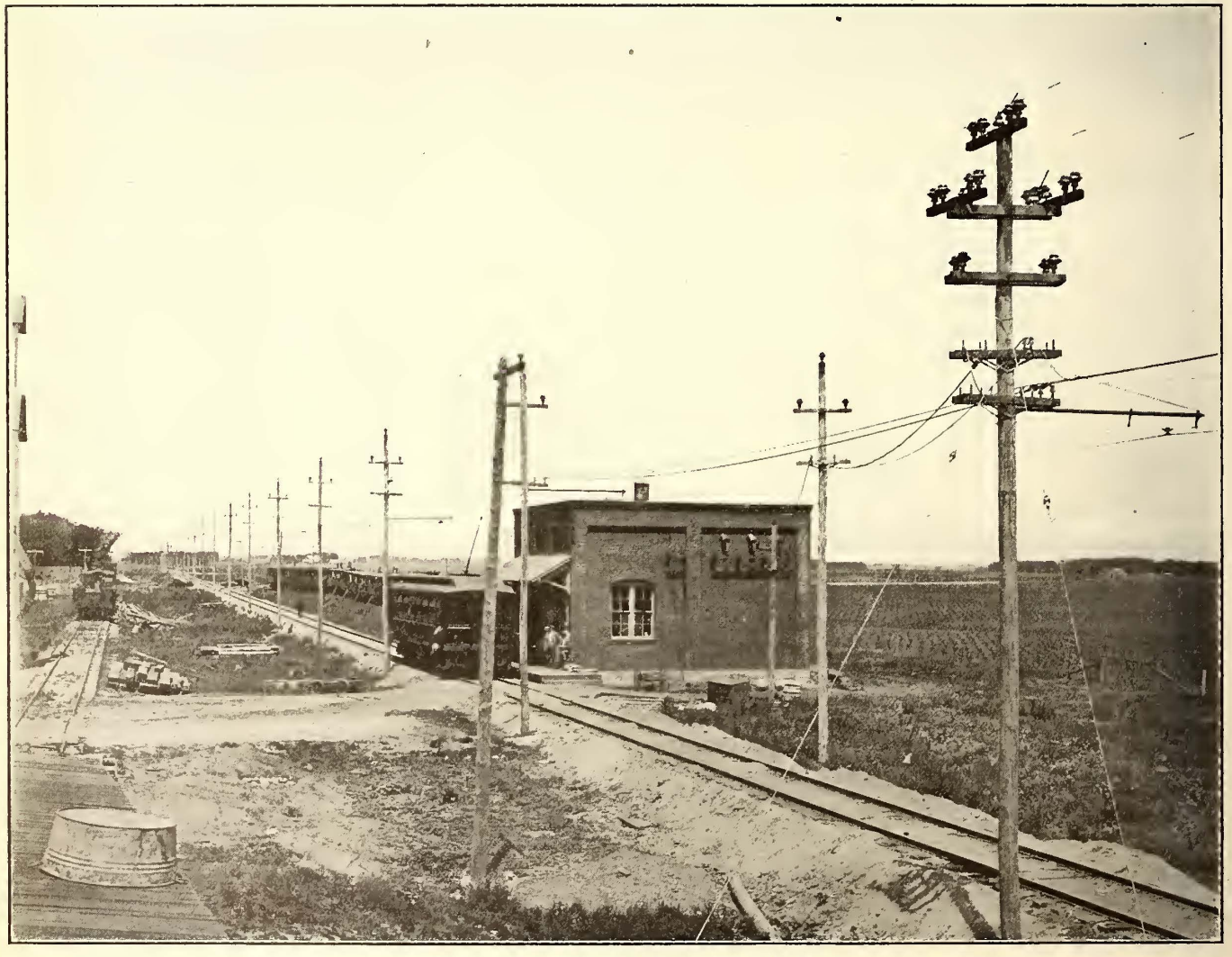
The electric passenger train service, first established between Fort Dodge and Des Moines on Nov. 4, is based on an average speed of 27½ miles per hour, including fifteen regular stops, which means that a maximum speed of nearly 60 miles per hour is frequently attained between stations by the heavy electric express and passenger cars. The total running time from terminal to terminal is three hours fifty minutes, but forty-three minutes are consumed in covering 4 miles within city limits at Des Moines and 2½ miles in Fort Dodge.



MOTOR CAR TAKING UP FREIGHT

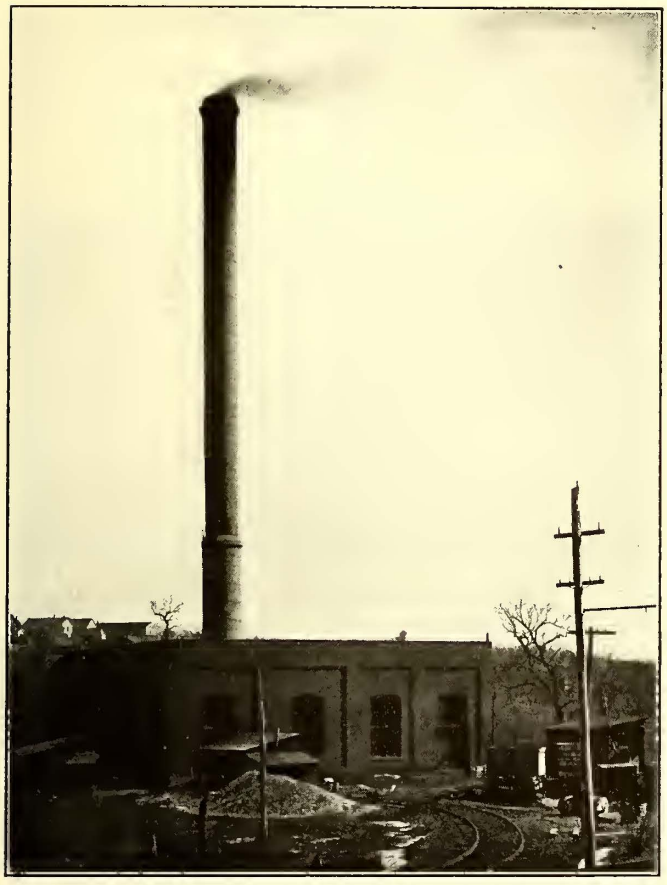
Comparison between speed of the electric and steam passenger trains on the above systems is possible only on the stretch between Buxley and Lanyon, which is used in common by Newton & Northwestern and Fort Dodge, Des Moines & Southern trains. The distance here of 42 miles is covered by the average steam trains en route between Newton and Rockwell City in about two hours and by all the electric trains in one hour thirty-six minutes, including the same regular stops.

To provide for the high maximum speed on the system it was necessary to rebuild the permanent way of the electrified section of the Newton & Northwestern Railroad. The road was reballasted with gravel and equipped with heavy rails throughout, and the extensions were constructed to the same standard. Fairly level country is

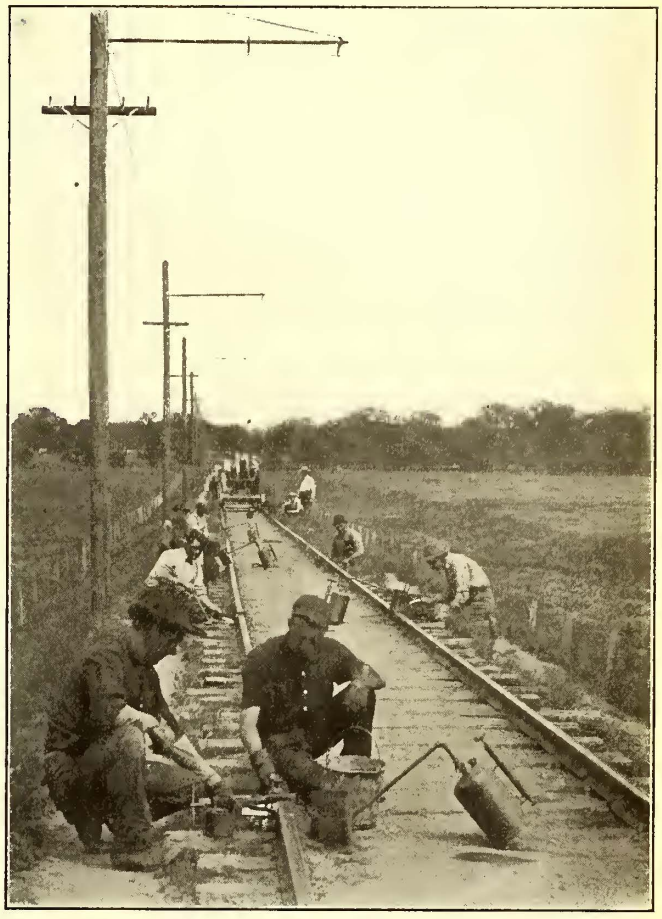


SUB-STATION ON MAIN LINE AT KELLEY

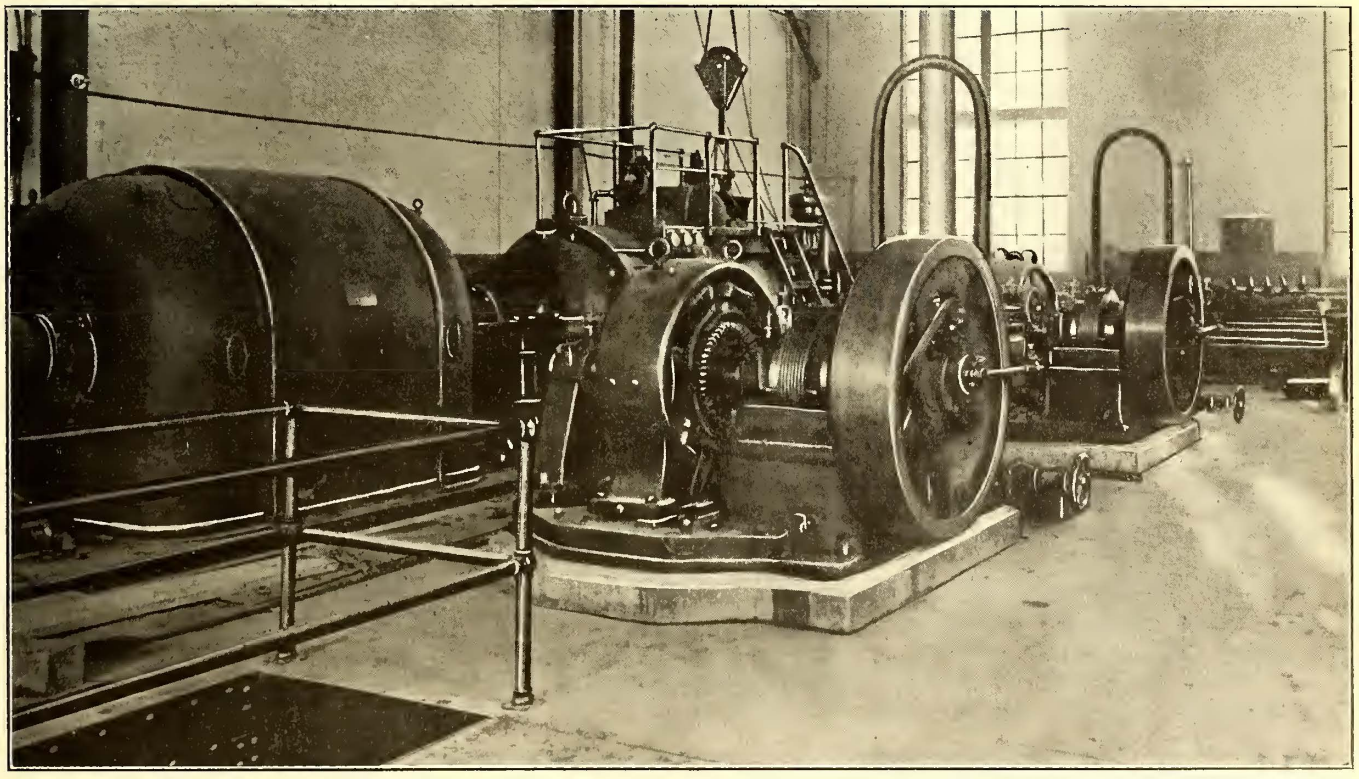
traversed permitting small gradients except near Boone, where the line crosses the Des Moines River, and the country is rugged and cleft by deep ravines. On this section a 2½ per cent grade is encountered, while still heavier grades were obviated on the original line in the Des Moines River Valley only by a series of trestles, bridging the ravines before mentioned, where they emerge into the river flats. One of these trestles just west of Boone is among the highest and longest in the country. The rugged and picturesque character of the country, which gives the Fort Dodge, Des Moines & Southern Rail-



POWER HOUSE AT FRAZER, IOWA



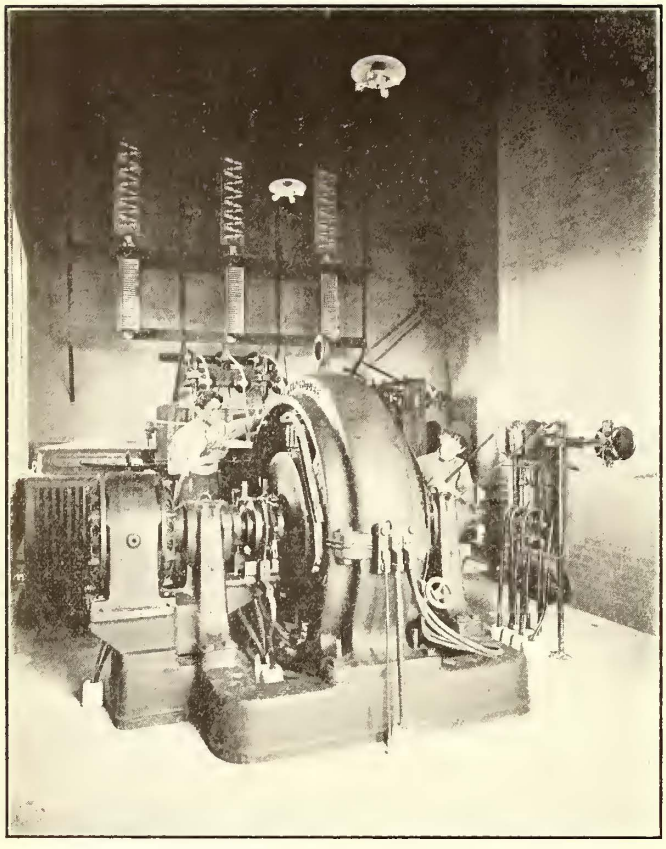
RAIL BONDING GANG AT WORK



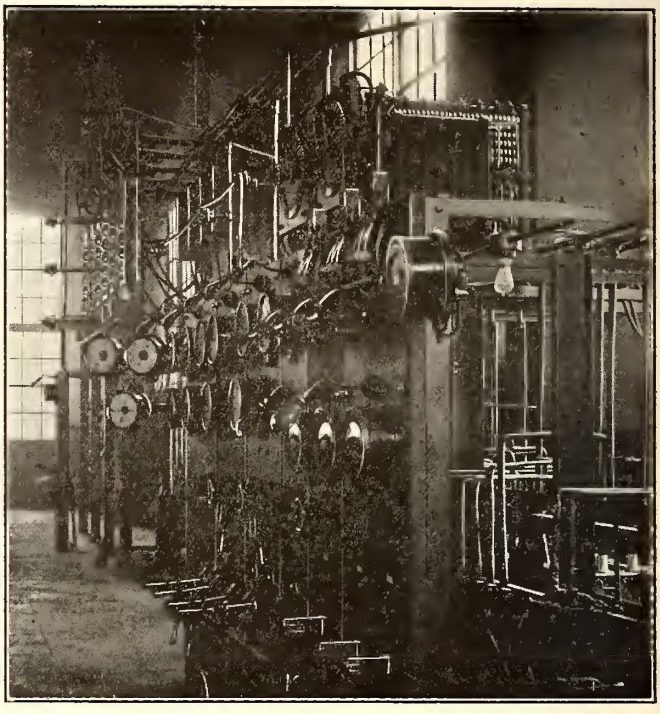
ENGINE ROOM OF THE FRAZER POWER HOUSE

way decided scenic advantages is shown by the illustrations.

The electric rolling stock is of especial interest. It consists of exceptionally commodious interurban passenger and express cars, built on liberal lines to meet the conditions of combined interurban railway and electrified steam railroad practice. In electrical, and generally in mechanical equipment, as well as in principal dimensions, the passenger and express cars are similar. They are 53 ft. long over the buffers and have a width of 9 ft. 6 ins. over the sills. The power equipment consists of four 75-hp direct-current motors, which give a maximum speed on the level of nearly 60 miles an hour. All cars are single ended and have locomotive pilots. They are equipped with standard radial draw bars and M. C. B. railway couplers to permit coupling to the steam railroad cars. Multiple unit control apparatus is installed on all electric cars for operating in trains.



ROTARY CONVERTER IN ANKENY SUB-STATION



MAIN SWITCHBOARD IN FRAZER POWER HOUSE

INTERIOR OF PASSENGER CAR

The passenger car bodies are 43 ft. long over corner posts and are very handsome, with mahogany interior finish, semi-empire ceilings, leather upholstery and plate glass windows. At the front end there is a baggage compartment 10 ft. long containing movable seats, and back of that a smoking compartment 12 ft. 6 ins. long containing seats. The heating is by hot-water apparatus. With the seats filled these cars weigh about 38 tons.

The power for electric operation is derived from a turbine-driven plant of 3000 hp capacity, located at Frazer on the Des Moines River, about equidistant from the terminals. Coal mines nearby supply cheap fuel in the form of Iowa bituminous slack coal, while the feed water comes from the river, passing through purifiers to reduce the scale-forming salts. The main power equipment consists of two 1250-kw Parsons type turbo-generators supplied with steam at 175 lbs. pressure from two batteries of water-tube boilers, the flues of which connect with a 180-ft. chimney.

The electric current is generated, alternating, three-phase, twenty-five cycles at 2300 volts and, excepting a part supplied to a sub-station within the power house, is stepped up to 20,000 volts for transmission to five sub-stations located at Ankeny, Kelley, Boone, Fort Dodge

Junction and Otho at an average distance apart of about 15 miles. The sub-station in the power house consists of three 145-kw water-cooled, oil-insulated, 2300/370-volt, single-phase, step-down transformers and one 400-kw, 600-volt rotary converter. The other sub-stations are uniform, containing each three 145-kw, single-phase, 20,000/370-volt, oil-cooled, step-down transformers and one 400-kw, 600-volt rotary converter with room for the installation of a second duplicate converter if desired. The converters are of standard Westinghouse design.

The transmission line is designed for a maximum pressure of 33,000 volts, the wires being No. 4 B. & S., spaced 48 ins., and carried on porcelain insulators 7½ ins. high and 8½ ins. in diameter. The insulators are tested to 75,000 volts. Poles of not less than 8 ins. top diameter are used and are spaced 100 ft. apart on tangents, being set in concrete were advisable.

The overhead work is the standard bracket construction except at turnouts, where span construction is used. Frogs are not used on the trolley wires at turnouts, the wire for the siding being run parallel to the main wire with a space of 18 ins. for a distance of 100 ft. beyond the end of turnout in either direction. The track is bonded with 300,000 circ. mil soldered bonds and cross bonded at intervals of 500 ft. with No. 4/0 B. & S. copper wire.

The engineering, construction and equipment of the system, including power house, transmission lines, sub-stations, overhead work and bonding, telephone dispatching facilities, rolling stock and car barns have been in charge of J. G. White & Company. The Northwestern Construction Company carried out the construction and reconstruction of permanent way. The entire work was carried out under the supervision of J. L. Blake, general manager of the Fort Dodge, Des Moines & Southern Railway, representing the owners. The main turbo-generators with the other principal electrical apparatus, including the car equipment, are of Westinghouse manufacture. The cars were made by the Niles Car & Manufacturing Company and the trucks by the Baldwin Electric Works. They are heated by the Peter Smith hot-water apparatus. In the power house the boilers are from the Babcock & Wilcox Company, Aultman-Taylor type. Wheeler Condenser & Engineering Company's surface condensers and Cochrane feed water heaters are used. The chimney was built of concrete and steel by the American Chimney Company under the specifications of J. G. White & Company.

STEAM LOCOMOTIVES AND BRIDGE CORROSION

The corrosive effect of steam locomotive gases has long been realized in a general way, but in the case of the Boylston Street Bridge, in Boston, over the four main tracks of the Boston & Albany lines, concrete evidence have just been uncovered which furnish in themselves a strong argument for the electrical equipment of all urban tracks carrying dense traffic.

The bridge was built in 1888. A plank floor has covered the floor beams and the bottom part of the trusses. Above this floor the members are still of the full original section; below the floor the metal has disappeared on the average for a depth of about an eighth of an inch on each exposed surface. Several of the steel eye-bar diagonals have lost 60 per cent. of their original section, and some iron floor beam angles have lost the entire outstanding leg. The mechanical effects of the blast are much less marked than the chemical effects of the gases.

RELATION BETWEEN TEMPERATURE AND POWER STATION LOADS

At a meeting of the Boston branch of the American Institute of Electrical Engineers, held in the auditorium of the new Edison Building, on Nov. 20, John W. Corning, electrical engineer of the Boston Elevated Railway Company, presented some data of unique character on the relation between atmospheric temperature and power station loads. A study of the operating conditions on the Boston Elevated System during the past few years has shown the existence of a marked parallelism between the total station output per diem, the average load between 5 and 6 p. m. and the external temperature. Curves plotted between these quantities show that the load and temperature variations follow one another closely both during the warm and cold seasons, when heaters are in use, and when only open cars are in service. The following approximate tables transcribed from the data presented by Mr. Corning at the meeting illustrate these relations.

Table I shows the variation in the total daily kilowatt-hour output of the Boston Elevated generating stations from Oct. 1, 1906, to Oct. 1, 1907, in relation to the average temperatures at which these outputs occurred:

TABLE I

DAILY KW-H.	DEGREES F.	DAILY KW-H.	DEGREES F.
340,000	84	500,000	40
360,000	76	520,000	35
380,000	69	540,000	30
400,000	62.5	560,000	27
420,000	58	580,000	21
440,000	53	600,000	18.5
460,000	49	620,000	16
480,000	44		

These values were obtained from a large number of readings and an average curve was drawn which shows a progressive relation of the inverse order between the output and temperature. The company's heaviest load occurs in the winter season, but regardless of the time of year increase of temperature lowers the station output, and decrease of temperature is associated with larger outputs. The average daily output to be expected at a temperature of about 84 deg. is 340,000 kw-hours, while at the other end of the scale a temperature of 16 deg. is associated with 82.5 per cent increase of output to 620,000 kw-hours.

Table II shows the load temperature relation for the hour of maximum traffic, 5 to 6 p. m., derived from readings taken in the year from Oct. 1, 1905, to Oct. 1, 1906:

TABLE II

AVERAGE KW.	DEGREES F.	AVERAGE KW.	DEGREES F.
26,000	93	36,000	45
28,000	80	38,000	36.5
30,000	70	40,000	29
32,000	60	42,000	20
34,000	52	44,000	14

Here the change in load is at the rate of approximately 0.6 to 0.8 per cent per degree. The peak load varies from 26,000 kw in summer to 46,000 kw in winter, but aside from traffic variations there is a definite increase of load with temperature decrease, independent of the season of the year. From the winter conditions Mr. Corning found that the following equation expresses the relation between the maximum rush-hour load and the temperature, N being the number of cars in service and t the temperature in degrees Fahrenheit:

$$\text{kw} = 2660 + N\ (24.3 - 0.134\,t)$$

In this equation 2660 represents the stationary load upon the generating plants, consisting of motors in shops and car houses, heaters in stations and other buildings, and lights in fixed structures. The number of equivalent 25-ft.

cars in service during the rush hour in the winter was about 2350 on the average, and the figure 24.3 represents the average kilowatt consumption per car at the generating plants, taken at about 30 deg. F. Knowing the number of cars and the temperature it was found that the load could be predicted within about 2.5 per cent.

At the meeting a large chart was shown giving the plots of maximum hour loads and temperature variations through the different months from October, 1905, to October, 1906. In general the outputs varied from a minimum of 30,000 kw in October through a maximum of 44,000 kw in March, to a minimum of 22,000 kw in August. The temperature average followed the load as plotted throughout practically the whole year, the corresponding temperature to the figures above quoted being 75, 80 and 85 deg. The general shape of each curve was a species of sine wave with, a period of one year per cycle.

Mr. Corning stated that bearing friction appeared to be the principal cause of the phenomena discussed, eliminating as far as possible other variable factors. Table III shows values of drifting times derived from three car coasting test curves. In this test a car was allowed to coast from standstill down a grade and then up a rise to a tangent track, the time required to negotiate given distances being measured. Three runs were made with the same car, the first being made with bearings relatively stiff and cold. As the bearings warmed up during the runs, the friction decreased, and the time required to coast a given distance grew less, gradually approaching a fixed time for each distance.

TABLE III

SECONDS.

DISTANCE FEET	RUN NO. 1	RUN NO. 2	RUN NO. 3	DISTANCE FEET	RUN NO. 1	RUN NO. 2	RUN NO. 3
100	36	30	27	600	104	89	78
200	63	52	45	700	109	95	83
300	78	65	56	800	115	100	88
400	87	75	65	900	120	105	93
500	96	82	72	1000	125	109	97

Table IV shows the results of a test made to determine the relative heating of grease and oil when used in motor bearings. The motor was tested on a stand in the shop and the temperature rise in degrees Centigrade taken above the surrounding air. Each set of figures represents an average of tests on four bearings, grease and oil being tried separately in each journal.

TABLE IV

TEMP. RISE DEGREES C

MINUTES	GREASE	OIL	MINUTES	GREASE	OIL
0	3	3	90	26.5	15
10	6	5	100	28	15.8
20	12	7.6	110	29	16.3
30	18	9	120	29.6	17
40	20	10	130	30	17.3
50	21	11	140	31	19
60	22	12	150	32	19
70	23	13	160	33	19
80	25	14			

The superiority of oil compared with grease as regards heating is clearly apparent from these tests. Mr. Corning emphasized in conclusion the importance of a closer study of the lubrication problem in relation to the best service at different seasons of the year, including the effect on the generated output as well as the cost of lubrication on the car itself.

W. K. Vanderbilt, Jr., V. W. Rossiter, Albert H. Harris and John Carstensen, of the New York Central, inspected the electrified division of the West Shore Railroad one day last week as the guests of C. Loomis Allen.

INDIANAPOLIS MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

The November meeting of the Central Electric Railway Association was held at the Claypool Hotel, Indianapolis, Thursday, Nov. 21. Two very interesting papers were presented and discussed, and there was also a general discussion on the subject, "Does It Pay Interurban Electrics to Cater to Long Distance Travel?" The papers presented were, one by Albert B. Herrick, "Analysis of the Cost and Methods of Electric Railway Maintenance," and one by Fred Heckler, master mechanic of the Lake Shore Electric Company, "Foundation Brake Arrangement for Electric Railway Cars."

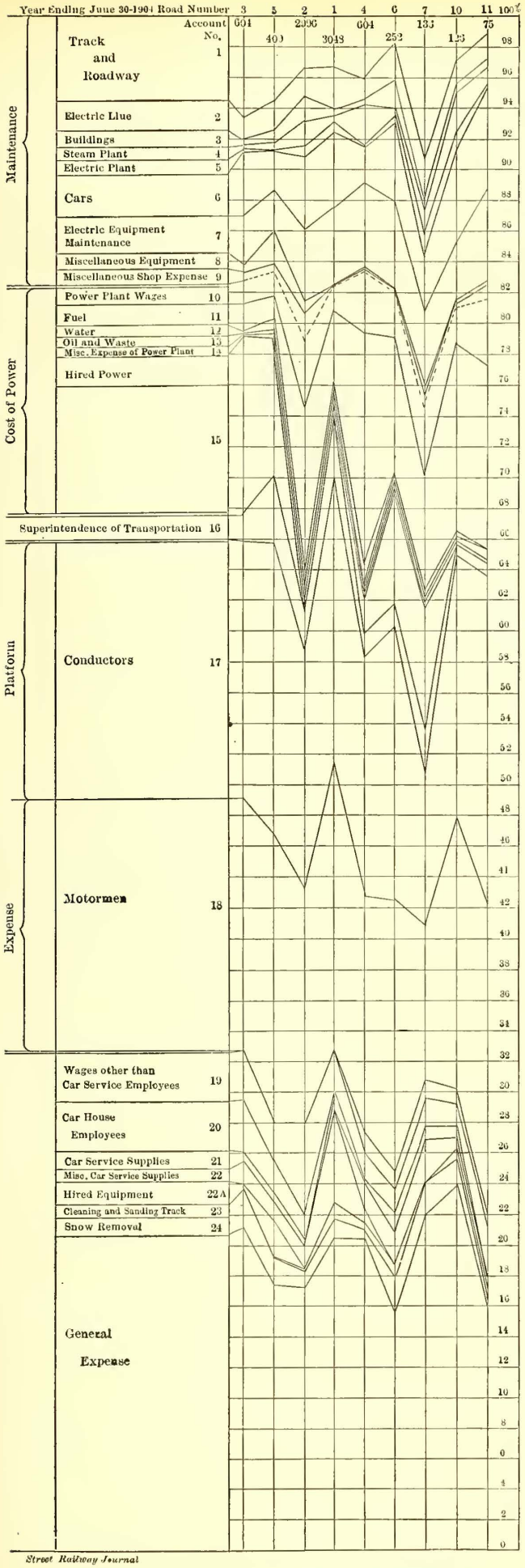
MORNING SESSION

President H. A. Nicholl opened the morning session at 10:30 a. m. He said the committee appointed by the association to meet the standardization committte of the American Association had, through the press of business, not been able to attend the Atlantic City convention. However, the chairmen of the two committees had conferred. It was probable that a meeting would be held early in 1908 between the representatives of the Central, the New York State and the New England associations to see if the three associations could not get together on standard rules. The standardization committee of the Central Association felt gratified that the report of the American Association committee had been adopted, particularly because this report was practically the same as the Central Association's recommendations.

MAINTENANCE OF ELECTRIC RAILWAYS

Under this title Albert B. Herrick presented an interesting paper on methods of making tests on feeder and return systems and the car equipment of electric railway companies. He gave particulars of his system of testing, which is described in detail in his handbook, and also in his book, "American Electric Railway Practice." He also discussed the general subject of expenditures for maintenance. To illustrate the marked difference betwen various companies in this respect he presented a diagram, Fig. 1, in which these expenditures have been reduced to a percentage basis. The roads selected for this comparison are those in which the character of the service and the conditions of transportation are fairly close. The number of cars on each system is given at the top of each vertical column and none of the expenditures was abnormal or could have been charged to capital account. A study of diagrams of this kind in individual cases, Mr. Herrick said, will indicate directions in which economy can be secured. The aggregate of the cost of maintenance above the average cost, conservatively estimated, amounts to $19,700,000 per annum in the territory enclosed by the Mississippi River on the west, a line drawn through Covington, Ky., and Washington on the south and including Canada on the north.

An abnormal loss in one department in an electric railway transportation system is not necessarily confined to the portion of the system in which it occurs, but the different parts of the system are so correlated that the secondary effects of the loss are reflected in increased cost in other parts of the system. For instance, an abnormal drop of potential in the distribution system increases the current required per car mile, raises the output of the station, decreases the percentage of useful energy to the total energy developed, increases the heating and depreciation of equipment and decreases the schedule speed that can be obtained.



Street Railway Journal

FIG. 1.—COMPARISON OF OPERATING EXPENSES.

Fig. 2 illustrates the cost of electrical and car maintenance on twenty-five roads. The upper line includes maintenance of trucks, brakes and car body. The figures show the number of equipments operated by each of the different properties analyzed. The letter "I" means that the service on these roads is interurban. At the top of Fig. 2 there are two lines. The heavy black line is the average car miles per equipment per annum. The dotted line is the average number of stops per mile per equipment per annum. It will be seen that there is no connection in cost of maintenance between the number of car miles the equipment makes per annum and the number of stops per mile. In other words, these elements which are supposed to militate against economical car operation have been neutralized by careful and intelligent maintenance of the equipment.

In referring to the test car, "Florence," operated by the speaker, Mr. Herrick said that it had made records of more than 11,000 miles of track and had tested over 3,800,000 bonds; more than a ton of paper had passed through its apparatus in making these records. During the past year this car has made records on most of the electric railways in Pennsylvania and has just completed 400 miles in Baltimore and 200 miles in Rochester.

While presenting the paper, Mr. Herrick remarked that his car for testing bonds had a weight of 30 tons on each truck. The weight moved the joint and broke any temporary connection at the joint. He also stated that tests showed that it cost twice as much to start a two-motor as a four-motor car.

DISCUSSION

F. D. Carpenter, general manager of the Western Ohio Railway, asked Mr. Herrick if he could determine the source from which current was attacking water pipes. Some of the towns along his line claimed that return current was straying from the tracks and attacking the water pipes. He considered the road well bonded and thought it might be some other electric property that was causing the trouble. Mr. Herrick replied that where there is an interconnected system not only the source of the current but the amount from each source could be determined. In getting at results a certain test point would be taken and the flow of current under normal conditions obtained. He would then ask the railway company to shut down its plant for, say, a period of five minutes for one or two times. The difference in the reading would enable him to decide definitely.

G. H. Kelsey, superintendent of power of the Indiana Union Traction Company, said about a year ago he made some measurements and computations on a feeder system which traffic had outgrown to determine whether or not it would pay the company to install additional feeders. His point was to find whether or not the total power lost in the feeder for the year would pay interest on an investment in copper which would eliminate the loss of power. He found that the loss in current would only pay an interest of 2 or 3 per cent on the copper. Mr. Kelsey asked also how the copper should be installed. On modern installations it was customary on interurban lines to install a uniform cross section of copper feeders the entire distance between sub-stations. It was sometimes a question whether or not wedge shaped feeders should not be installed, or feeders with a greater cross section near the sub-station. Mr. Herrick replied that with one equipment between sub-stations, or when cars met at a point one-half way between sub-stations, the tapered or wedge-shape

feeder would be of no advantage, but conditions were changed when there was more than one equipment between sub-stations, or when the cars did not meet at a central point. The presence of grades in between sub-stations would make the wedge-shape feeders of more advantage.

Mr. Herrick added that he had noticed in the Middle West a tendency for cars to drop their speed between feeder taps. He thought that with taps 1,200 ft. apart there was enough drop in the line to warrant two more taps. Mr. Herrick wanted to get the idea of load factor of a feeder clear in the minds of those present. The load factor did not take into consideration the ammeter readings, but the square of the readings, so that the area of the plotted curve was proportional to the loss. Mr. Kelsey thought if the saving of power alone were considered that there were many roads with more copper in their feeder systems than was warranted. He believed that the saving in power would often warrant only 2 or 3 per cent interest on the investment represented by copper installed, and to prove the necessity for the copper it would be necessary to bring in the question of external economy. To bring out the idea of external economy, Mr. Herrick said that on a 20-mile road which operated three cars, he had been able, by an investment of $7,000 in additional copper and in straightening a curve, to make it possible to operate the road with two cars to produce a saving of $1,200 a year.

F. J. J. Sloat, general manager of the Concinnati Northern Traction Company, wanted to know why, when the current density in the feeders had gotten too high, the operation of the road on higher voltage should not be considered. Mr. Herrick replied that Mr. Sloat's suggestion had been made by Mr. Sprague, and that he thought raising the potential was the only salvation for future electric railway work. Mr. Sloat added that if steam roads were going to electrify under present conditions they would have to own a copper mine.

Mr. Sloat called attention to the statement of Mr. Herrick that after the armature cores of motors had rubbed against the pole pieces the lamintions were pressed together in such a manner that currents were generated in the cores. He thought this might have something to do with the fact, as noted in his experience, that during the first year of operation new motors were subject to very few breakdowns, but after the first year of operation the motors were subject to frequent breakdowns from various causes. He asked Mr. Herrick whether ribbon-wound fields or fields wound with round wire were subject to more frequent defects. Mr. Herrick replied that a great deal of trouble occurred with rewound fields and was due to the stretching of the wire and the lessening of its cross section in rewinding. The ribbon type gave better results than the round wire type except that there was greater probability of the coils of the ribbon type fields coming loose and chafing. He believed that we were coming to the point of immersing the coils and impregnating them so they would be held absolutely rigid.

Mr. Kelsey brought up the question of the efficiency of the motormen. He made a test of two motormen on a limited run of 340 miles per day. The motormen were shifted every other day and the car ran within two or three hundred feet of the same distance daily. Wattmeters placed on the car showed that the power consumed by one man had a value of 35 cents more than that of the other. Mr. Herrick stated his method of testing the motormen by putting ammeters on insulated sections of the trolley wire would discover the characteristics of the individual motorman as to nervousness, carelessness, etc. The difference in the motormen was not only made evident by the current consumed, but also by the frequency with which the cars were sent to the repair shop. Mr. Sloat remarked that on one road there was a hilly section 18 miles long and a level section of 37 miles. On the hilly section tests showed almost identical current consumption by two or three different motormen; while on the level portion, one motorman would use considerable more power than the other. Mr. Herrick's observations were identical with those of Mr. Sloat, for he had found that on a hilly road

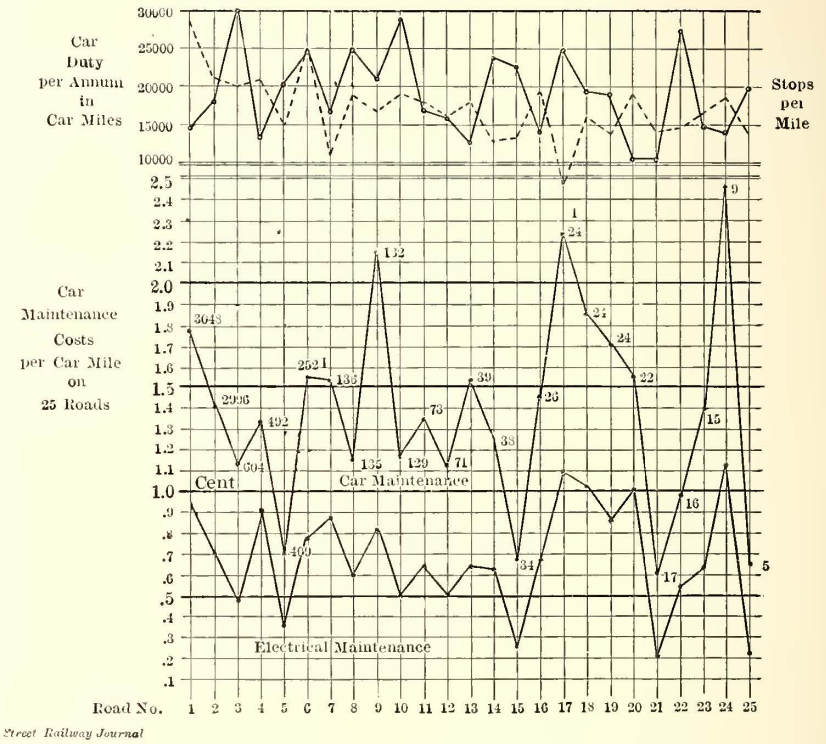


FIG. 2.—COMPARISON OF CAR MAINTENANCE COSTS

all the motormen seemed to catch the car and turn on the power or cut it off at the same time.

Mr. Sloat cited a very interesting case relative to operating cars in series or in parallel on grades. Coming out of Cincinnati there was a 4½ per cent grade two miles long. Motors operated in parallel up the grade consumed 404 amperes and when running in series 202 amperes. The gain in time of multiple running over series operation was only about 3 minutes in 15 minutes. Under the circumstances, he considered it best and had issued orders to the trainmen to run in series.

Mr. Sloat wanted to know Mr. Herrick's opinion concerning the capacity of bonds. He thought the present methods might be inadequate for heavy electric service. The carrying capacity of the contact surfaces was not utilized to the full extent because of the limited carrying capacity of the central portion of the bond. He suggested a slab type of bond holding the rails rigid and expansion joints at proper intervals. Mr. Herrick stated the type of bond suggested had been tried without much success.

In connection with the subject of increased weights of cars, Mr. Herrick brought out a very interesting point regarding the distance between truck centers of heavy and high-speed interurban cars. With the present method of

putting the trucks several feet under the end, in taking a curve the car body is off the tangent some time before the truck strikes the curve. This results in an excessive stress on the trucks and rails, and increases the hazard of turning the rail. With truck centers placed farther apart, the car would be turned slower, and the stresses on the rails and flanges would be reduced.

At the close of the discussion and before adjournment for lunch, on a motion by Mr. Carpenter, a vote of thanks was tendered to Mr. Herrick for the paper presented.

AFTERNOON SESSION

At the afternoon session, in the absence of the author, Fred Heckler's paper on "Foundation Brake Arrangements for Electric Cars" was read by S. D. Hutchins, special representative for the Westinghouse Air Brake and Westinghouse Traction Brake Companies.

Mr. Hutchins said it required a long period of missionary work to bring about the present conditions regarding braking on steam roads. He thought the air brakes on these roads operated with the highest efficiency. A six-car passenger train, traveling 60 miles per hour, could be stopped in 1,000 ft. Improvements in brakes had kept pace with the increased weights of trains. Interurban traffic had increased to proportions where the same conditions regarding braking obtained as on steam roads, but he found a different condition existing on the two kinds of roads. The company supplying the brakes found different types of trucks to contend with, and it seemed that the trucks were designed almost completely without thought of applying the brake apparatus and then the levers were placed in any position possible. The leverage of the truck brake rigging seemed to depend on how it was possible to locate the levers on the already designed truck and varied from 2½ to 1 to 6 to 1.

His company's endeavor was to brake the car at 100 per cent of its light weight. With a car weighing 50,000 lbs. a brake cylinder would be furnished to provide a leverage of not over 10 to 1. A 10-in. cylinder would be required. The endeavor was to get the lowest ratio on the truck levers and carry this ratio to the body levers where there was plenty of room to get whatever total leverage was desired. Instead of low truck leverage it was frequently the case that this leverage was so high that before the shoe was one-third worn out the angle of the brake levers was so great that the shoe could be worn no further without putting the car in the barns for adjustment of the turnbuckle.

Mr. Hutchins urged the railroad companies to supply the weight of the cars in specifications for brakes. This was of great importance, yet in very few instances were the brake manufacturing companies able to obtain it. The result of installing cylinders too small in diameter on cars was that the total leverage was made too high in order to get the requisite braking power. An 8-in. cylinder on a 50,000-lb. car would require a total leverage of about 18 to 1. This meant that for every one inch wear of the shoe the piston would move 18 ins. The result of such leverage was that the car had to make very frequent trips to the shop for adjustment of the brakes. With a 12-in. cylinder on such a car the leverage could be brought down to 10 to 1. In concluding he urged the railroad companies to furnish the brake companies with a proper truck leverage. The brake company could be held responsible for the brakes as installed.

Mr. Sloat inferred from Mr. Hutchins' remarks that the proper course would be to have representatives of the brake companies meet with a committee and decide on the leverage of trucks for certain weight of cars. Mr. Hutchins, however, explained that the total light weight of the car did not enter into the question of truck leverage. All that was required was as low a truck leverage as it was possible to obtain. If a standardization committee would decide on a leverage of 3 to 1 the brake companies would take care of the total ratio.

Mr. Hutchins brought up the question of the suspension of the shoe head. He recommended that it be suspended from a point not affected by the light or loaded condition of the car. The lower the shoe was forced by the load on the car the farther it was thrown from the wheel and the greater the piston travel necessary to set the brakes. With increased load, therefore, the braking power was reduced when in fact it should be increased. He thought it was always possible to hang the shoe from some point not affected by the load on the car, although it was nearly always suspended so as to be affected.

Mr. Sloat wanted to know if putting a piston on each truck would not get away from some of the present difficulties. Mr. Hutchins replied that this scheme had been tried out a few years ago when it was desired to avoid a brake cylinder larger than 14 ins. in diameter on some heavy cars. The results, however, were unsatisfactory, as distortion of the truck resulted due to the fact that the stress could not be taken care of. On a locomotive the boiler has sufficient strength to resist the stress. An additional drawback to the installation of the cylinders on the trucks would be that they would necessarily be connected to the piping on the body through hose connections which might rupture at a critical moment.

At the conclusion of the discussion, President Nicholl read a communication from the St. Clair Air Brake Company to the effect that the company has its brake on exhibition in the basement of the Newton-Claypool Building, and extended an invitation to all interested to inspect the apparatus. President Nicholl also announced that it had been decided to hold the next meeting of the association at Dayton, Ohio, Thursday, Jan. 4, 1908. This would be the annual meeting and the customary annual banquet would be held.

The remainder of the afternoon was devoted to the discussion of the subject, "Does it Pay Interurban Electrics to Cater to Long Distance Travel." S. R. Dunbar, purchasing agent of the Indiana Union Traction Company, suggested that it might be well at the outset to agree on what mileage constituted long distance travel—whether 60 miles or 160 miles. F. D. Norveil said that a few years ago a trip of 50 miles by interurban lines was considered a long distance. Now runs of 150 miles were very frequent. He thought interurban lines should be out for all the business they could get legitimately, and as the public appreciated the interurban for long as well as short distances the companies should go after the long distance haul business from a standpoint of earnings. It was better for the long distance car to make its entire trip only half or one-third filled with passengers than for a car to start out of a terminal with all standing room taken and to discharge its pasengers two or three miles out, continuing the remainder of the trip almost empty.

Mr. Carpenter said he had been working up long distance travel on his road for some time. About 25 per cent. of the business on limited cars was made up of long hauls. For some unknown reason, people liked to ride on interurban cars both in summer and winter. The people were pushing the interurban to give better facilities for long distance travel. A few days ago a passenger who bought a ticket to Kansas City was routed over the interurban

line a portion of the distance. He mentioned this to show the increasing field of the interurban, and as evidence that the steam roads were going to help get business for the electrics.

Mr. Starkey said that while it paid to haul passengers distances such as those between Indianapolis, Fort Wayne and Dayton, the time was not ripe to attempt to get through business between Indianapolis and New York. Mr. Norveil said that with present facilities the interurban should not attempt to get business over distances of 400 or 500 miles, but with people pushing the interurban as they were now doing, the long distance travel would increase to the extent that the interurban showed its ability to take care of it.

Mr. Carpenter urged the interurbans to remove present difficulties of long distance travel. Changes of cars should be eliminated, and he suggested the use of through cars which could be coupled on to the regular cars of the different lines. It would not be advisable under present conditions to get motor cars too far from home as it might be difficult to make proper repairs.

E. C. Van Valkenburg, in calling attention to the extent that a change of cars cut down through traffic, said that in one instance when change of cars was eliminated at the point where two roads connected and through cars were put into operation, the through traffic increased about 30 per cent.

John H. Crall, district passenger and freight agent of the Terre Haute & Eastern Traction Company, and the Indiana Union Traction Company, gave an instance of what the interurbans could do in the matter of long distance travel. He had contracted to haul a party through to Zanesville, Ohio, a distance of 250 miles. The car left Indianapolis at 8 a. m., made one hour stop at Dayton, and a stop of one and one-quarter hours at Columbus, arriving at Zanesville at 7 p. m. The passengers were delighted with the trip and came back the same way.

Mr. Sloat said that before interurbans could make a regular business of long distance travel they would have to operate their trains entirely different from the manner they had been operating them in the past. He considered three-car trains necessary. These trains should be made up of a baggage, smoker and day coaches. This was the universal practice of steam roads, and people had become so accustomed to the facilities of these roads that they would demand the same from the interurbans. Such heavy trains would require a different method of current distribution, and double the present voltage would be required. Terminal and switch facilities radically different from the present ones also would be necessary.

Mr. Dunbar suggested that a good deal of energy spent in catering to long distance travel and getting the "velvet" might better be spent in taking care of local travel. J. B. Crawford, superintendent of transportation on the Fort Wayne & Wabash Valley Traction Company, thought his road, at least, took good care of local passengers. A recent report of the board of directors of the paralleling steam road stated that all of the local travel had been lost to the interurban.

Mr. Herrick, upon being called on by President Nicholl, related an incident where removing the difficulties of long distance travel had increased the traffic wonderfully. At South Norwalk, between New York and Boston, passengers were formerly compelled to change cars and walk over a bridge about 100 ft. long in doing so. Putting a track across the bridge and running through cars resulted in an increase in traffic of about 180 per cent.

President Nicholl closed the discussion by saying that its trend was to the effect that the interurban people should go after long distance travel and that they made a mistake if they did not do so.

FOUNDATION BRAKE-GEAR DESIGN FOR ELECTRIC RAILWAY CARS*

BY FRED HECKLER,
Master Mechanic, Lake Shore Electric Railway Company.

Before dealing with the mechanical consideration of a proper foundation brake gear for electric cars, it is deemed advisable to call attention to the importance of the brake as a whole. Unfortunately, the brake is usually looked upon as a safety device only, and we believe it is because of the prevalence of this idea that the installation and maintenance does not receive the consideration it merits. Considering the investment, there is no part of the railway equipment that will give greater material returns than the brake when properly installed, operated and maintained. Its importance would be more fully appreciated if we could separate to some extent the brake from the idea or impression that it is a safety device only, and show that it makes possible the hauling of heavier cars, and faster and more frequent service as much or more than the high-power motor, the signals and the good roadbed. If given the consideration it should have, it would increase the possibilities of all these things. Therefore, at least the same consideration should be given to its design and installation that is accorded to other parts of railway equipment. As a safety device, the brake is excellent, but it has other reasons for existence.

The brake is often looked upon as a mere piece of mechanical apparatus which can be designed by "rule of thumb," applied in any haphazard fashion to the vehicle it is intended to control, then operated by "go as you please" methods, whereas all these things call for the exercise of the highest intelligence if even approximate perfection is to be obtained. The magnitude of the problem can be seen when the thought is kept in mind that the brake has often to do in seconds what it has taken the motive power minutes to accomplish, and that it is far more important to be able to stop a car than to start it. From a speed of 60 miles per hour, on a level track, it is possible to stop a car in about 1000 ft.; whereas, under the same conditions, the car would run 28,000 ft. if no brakes were used. Any difference between these extremes may result according to the condition of the brake; and no matter how perfect and well maintained the apparatus may be, a great part of the brake efficiency may be lost by improper design of foundation brake gear, which condition will undoubtedly continue to exist until the brake ceases to be looked upon as a necessary evil. When it is realized that the brake equipment is not merely an auxiliary apparatus but a controlling element—not merely a necessary expenditure, but a dividend-earning asset—then sufficient pressure will be brought to bear on the car and truck designers and builders to induce them to consider the brake installation before it becomes impossible to put on one that will even merit the name of a brake in the true sense of the word.

Perhaps the reason for so many monstrosities is lack of information on the part of the designer, and to this end it might be well to give a few reasons why the brake should be so designed that there is a proper proportion between air pressure, cylinder piston area and leverage.

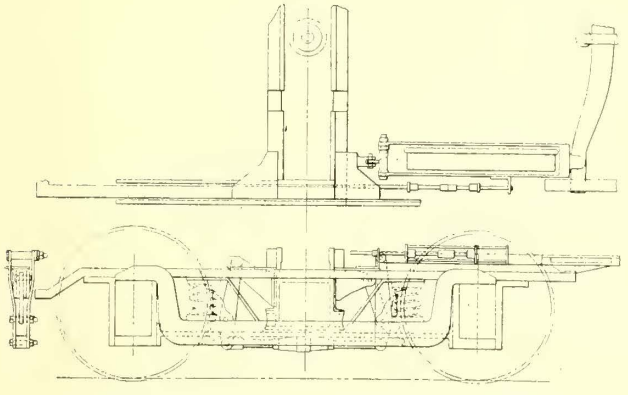
First, as to pressure: If more than 2 per cent. braking power per lb. of cylinder pressure is attempted, a very

*Paper presented at meeting of Central Electric Railway Association, Nov. 21, 1907.

high braking power power for light cylinder pressures is obtained and, therefore, the cars cannot be handled without shocks at low speeds, and either the range between maximum and minimum braking power obtainable must be very narrow or else wheel sliding will result when the maximum power is used.

Second, as to area of brake piston: If the ratio of cylinder piston area to cylinder pressure is excessive, it means either a low leverage, which means great shoe movement; or higher leverage with low pressure, which means very narrow range between maximum and minimum braking power.

Third, as to leverage: If the leverage is too low, it means excessive air consumption and too much shoe movement; if too high (that is, brake cylinder too small for weight of car, and it is here that the principles governing brake design are violated most frequently), smooth and accurate handling of the car or train becomes impossible and the shoes are constantly grinding on the wheels, consuming the current, wearing out the shoe and causing loss of time; or else piston travel must be lengthened out, thus greatly increasing the air consumption, lengthening the time of application and release, and reducing both service and emergency braking power. Besides, the high leverage makes necessary a frequent adjustment of piston travel or a constant and very rapid decrease of braking power will result. Furthermore, high leverage, if made at truck levers, necessitates low hung brake shoes, which, when suspended from a spring supported part of the truck, results in great increase of piston travel and resultant decrease of braking power with the loading of the car; this always occurs at a time when readjustment of piston travel is impracticable and when instead of a decrease of braking power an increase is greatly to be desired. In addition, the danger of the levers fouling is greatly increased, particularly where the truck leverage ratio is high, and very frequent and careful inspection is required or the total loss of the brake may result.



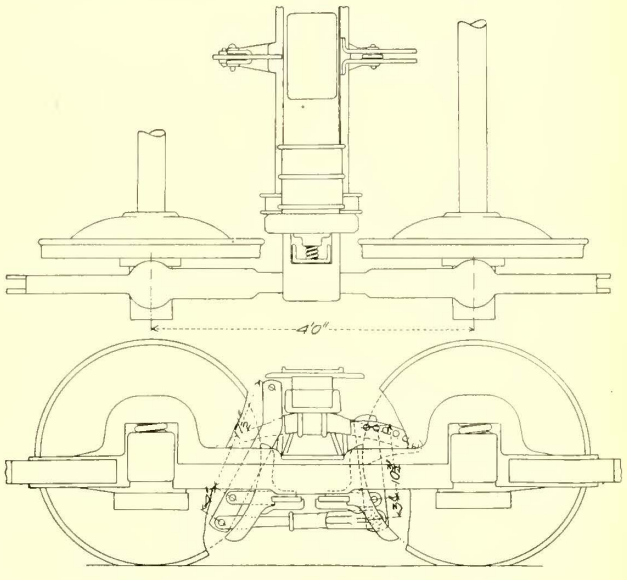
Merits of This Truck from a Brake Design Standpoint

1. Inside hung brake shoes.
2. Equalized brake leverage system.—That is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.
3. Radius bar connection to live truck levers.—In addition to its use when on a curve, the radius bar construction also eliminates the great deflection of weak brake beams, due to the truck levers acting at their center.

Demerits from a Brake Design Standpoint

1. High truck leverage ratio.—This total ratio is 7.22 to 1 (i. e.), one pound applied at the middle of radius bar gives a total of 7.22 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck levers in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on the truck, since the multiplacation can readily be made in the car-body levers where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Angle of live truck levers bad, since they are almost vertical in release position.—If lever is too near vertical in release position, it assumes a bad angle when brake shoes are set up against wheels.
3. Available movement of radius bar too limited.
4. Brake shoes hung slightly too far below the center of wheels.—This will increase after the car body placed on truck, and also in proportion to the load.
5. Dead lever dimensions not of the same proportion as those of the live truck levers.—For one pound applied at the middle of radius bar, the leverage, as now proportioned, results in 3.53 pounds pressure, distributed at the live lever brake shoes, and 3.69 pounds at the dead lever shoes. This results in unequal shoe wear, and also makes it impossible to use the best percentage of braking power, since the correct percentage on one pair of wheels, makes the percentage incorrect for the other pair, due to this discrepancy in proportion of truck levers.

Note.—Absence of the thickness and width of truck levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with consequent deflection, and often failure of the brake rigging.



Merits of This Truck from a Brake Design Standpoint

1. Inside hung brake shoes.
2. Equalized brake leverage system; that is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.

Demerits from a Brake Design Standpoint

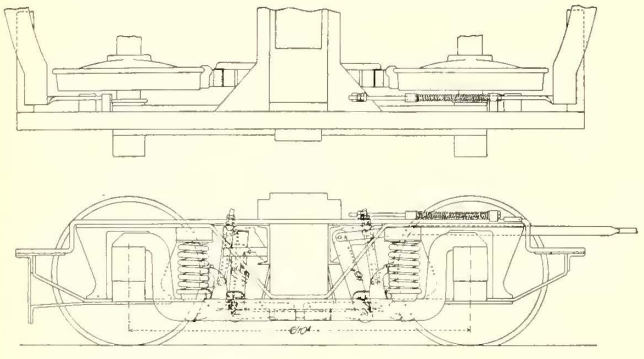
1. Very high leverage ratio.—This total ratio is 10.96 to 1 (i. e.), one pound applied at the top end of live lever gives a total of 10.96 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck lever in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on this truck, since the multiplication can be readily made in the car body levers, where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Brake shoes hung somewhat too far below center of wheels.—This will increase after the car body is placed on truck and also in proportion to the load.
3. Dead lever dimensions not of the same proportion as those of the live truck lever.—One pound applied at the top of the live lever, as now proportioned, results in 5.37 pounds pressure distributed at the live lever brake shoes and 5.59 pounds at the dead lever shoes. This results in unequal shoe wear and also makes it impossible to use the best percentage of braking power, since the correct percentage for one pair of wheels makes the percentage incorrect for the other pair, due to this discrepancy in proportion of truck levers.
4. Dead lever fulcrum should be horizontal instead of curved.
5. Dead lever is too short, thereby assuming a bad angle with the brakes set, especially with worn shoes.
6. Angle of main truck lever, as shown, too near the vertical in release position.

Note.—Absence of the thickness and width of truck levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with consequent deflection, and often failure of the brake rigging.

All of the preceding could be very much elaborated upon, but it is thought that enough has been said to show that the braking problem has much reason from a profit standpoint to warrant careful consideration being given both to the kind of brake and its proper installation. When to these reasons is added the one of safety, this part of the car equipment and its installation and care become paramount. The methods so long pursued of building the cars and trucks with little or no thought for the brakes, and then "sticking on" just what will happen to go and where it will happen to go, should be abandoned. The brakes should be given equal consideration with the other necessary points of design, for at all times much money will be made thereby, and there are times when not money, but life and limb become the measure of this value.

Coming to the mechanical requirements of the foundation

brake gear, the most desirable features in connection with this matter are a motor truck that will permit a brake design providing a lower truck leverage ratio and a clear movement of the same for the entire wearing out of the brake shoes of, say, 1½ ins. thick; also provision in motor truck construction for the best location of the brake shoes on the wheel and the suspension of the brake head or beam hangers at a proper angle and at such a point on the truck as will maintain a standard location of the shoes on the wheel regardless of whether the car is light or loaded. These recommendations should also apply to the car builders who in many cases design the car body portion of the foundation brake in which very often the harmonious working of the hand and air brakes is not taken into account. In fact, it is seldom that a car and truck design can be found upon which even a passable brake installation can be made.



Merits of This Truck from a Brake Design Standpoint

1. Inside hung brake shoes.
2. Equalized brake leverage system.—That is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.
3. Good angle of live lever in release position.
4. Radius bar connection to live truck levers. In addition to its use when on a curve, the radius bar construction also eliminates the great deflection of weak brake beams, due to the truck levers acting at their center.

Demerits from a Brake Design Standpoint

1. Very high truek lever ratio.—This total ratio is 9.85 to 1 (i. e.), one pound applied at the middle of radius bar gives a total of 9.85 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck levers in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on this truck, since the multiplication can readily be made in the car body levers, where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Dead lever dimensions not of the same proportion as those of the live truck lever.—For one pound applied at the middle of radius bar the leverage, as now proportioned, results in 5 pounds pressure distributed at the live lever brake shoes and 4.8 pounds at the dead lever shoes. This results in unequal shoe wear and also makes it impossible to use the best percentage of braking power, since the correct percentage for one pair of wheels makes the percentage incorrect for the other pair, due to this discrepancy in proportion of truck levers.
3. Brake shoes hung somewhat too far below center of wheels.—This will increase after the car body is placed on truck and also in proportion to the load.
4. Hanging of shoes not good.—The suspension, as shown, made at upper end of shoe instead of at center of same.

Note.—Absence of the thickness and width of truck levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with consequent deflection, and often failure of the brake rigging.

To the end that improvement be made in this direction, the following is suggested for your consideration.

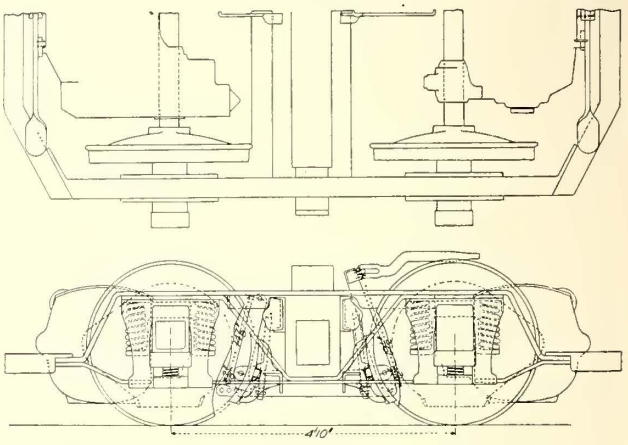
First, that the brake be considered as much an asset as are the motors, etc., and as a part of the profit-making equipment instead of an expenditure and nonproducer, classed, for instance, with the color of the paint on the car.

Second, that as safety is a prime requirement in railway operation, the brake being the most vital factor in this connection, should have consideration commensurate with its importance.

Third, that in the design of the car and truck ample space be allowed for the application of the proper brake equipment and a suitable foundation brake gear right down to the brake shoes.

Fourth, that sufficient clearance should be allowed to permit of the wearing out of the shoe and that in the event of piston travel adjustment being neglected, the piston should strike the head before the radius bar or levers foul.

Fifth, that while a total leverage of from 9 to 1 to 12 to 1 is proper, yet the total truck leverage ratio should not exceed 6 to 1, i. e., one lb. exertion on truck pull rod should not give more than 6 lbs. of force distributed at the four wheel shoes. This, of course, would mean a ratio of 3 to 1 for each truck lever but 2½ to 1 would be even more preferable; this latter would mean a total truck leverage ratio of 5 to 1. This because when it is exceeded, the travel of the top end of the lever becomes great as compared



Merits of This Truck from a Brake Design Standpoint

1. Inside hung brake shoes.
2. Equalized brake leverage system.—That is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.
3. Good angle of live leverage in release position.

Demerits from a Brake Design Standpoint

1. Very high leverage ratio.—This total ratio is 10.8 to 1 (i. e.), one pound applied at the top end of live lever gives a total of 10.8 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck lever in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on this truck, since the multiplieation can be readily made in the car body levers where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Brake shoes hung somewhat too far below eenter of wheels. This will increase after the car body is placed on truck and also in proportion to the load.
3. Dead lever dimensions not of the same proportion as those of the live truck lever. One pound applied at the top of the live lever, as now proportioned, results in 5.33 pounds pressure distributed at the live lever brake shoes and 5.46 pounds at the dead lever shoes. This results in unequal shoe wear and also makes it impossible to use the best pereentage of braking power, sincc the correct percentage for one pair of wheels makes the pereentage incorrect for the other pair, due to this discrepancy in proportion of truck levers.
4. Shoe hangers so straight as to preelude proper release by gravity action when pressure is removed.

Note.—Absence of the thickness and width of truek levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with eonsequent defleetion, and often failure of the brake rigging.

with shoe wear; also, the shoe has to be placed very low on the wheel, besides the danger of the lever fouling on the shoe; also the lower the ratio the less change of angle for a given shoe wear.

Sixth, that proper provision be made for maintaining as near a uniform piston travel as practicable, that (1) the air consumption may be kept low; (2) that uniform braking power may always be had and (3) a brake of full power assured at all times.

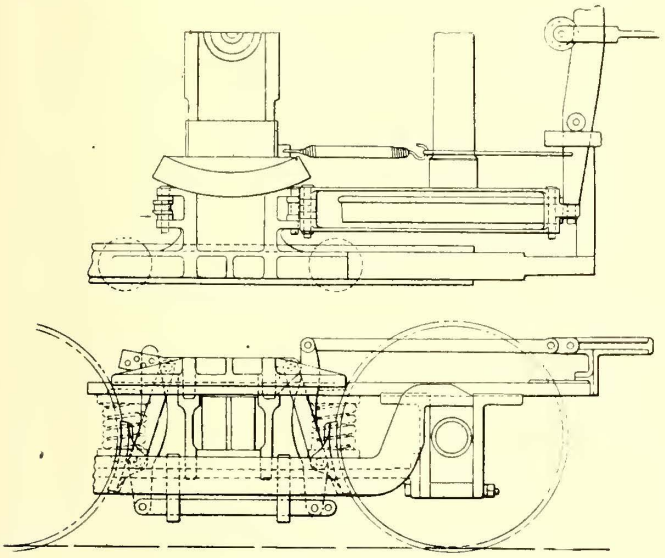
Seventh, that all truck levers, brake beams, clevises, pins and rods for truck should be made strong enough to withstand safely the stresses produced with a total braking power on the shoes equal in lbs. to the maximum weight of car for which the truck is suitable. This also applies to car body pins, rods and levers.

Eighth, the following points should also be considered: Release springs of proper strength; brake shoes as to thickness, area and friction; live and dead truck levers be of the same proportion when motor is used on each truck axle,

otherwise proportion to allow for motor and idle axles, ample provision for take up of shoe wear, slack, etc.; elimination as far as possible of lost motion in journal boxes, pin holes, center plates, etc.; that car should have reasonably large truck centers to admit of proper connection of body levers to truck levers by means of pull rods, and that the hand brake be equalized and that the multiplication made mostly in the cab by gears, i. e., so that a large force can be applied to the hand brake chain with consequent small amount of chain to be wrapped up.

Attached are drawings showing designs for truck with brake rigging. These are intended to give some idea of what should be considered in the design as well as to show that many things have not been considered, and for easy references the defects and merits have been printed thereon. Some of them show that the efficiency of even a good brake may be reduced to a minimum and in many cases become a source of trouble, and, as far as ordinary service operations are concerned, of loss. Others show that what the brake is expected to do is more nearly approximated, care and maintenance reduced to a minimum, and troubles eliminated.

It is to be regretted that we do not have for your consideration more designs showing both desired and undesirable truck designs, but the former are so scarce as to be practically unobtainable, while the latter can be seen under any car you may care to examine. As these problems are physical, mathematical and mechanical, it is certainly not beyond the range of possibility that they may be solved in a way that will be satisfactory to the car and truck builders, profitable to the railway companies and certainly more conductive to the comfort and safety of the public. It is hoped that these recommendations may meet with your approval and receive favorable action.



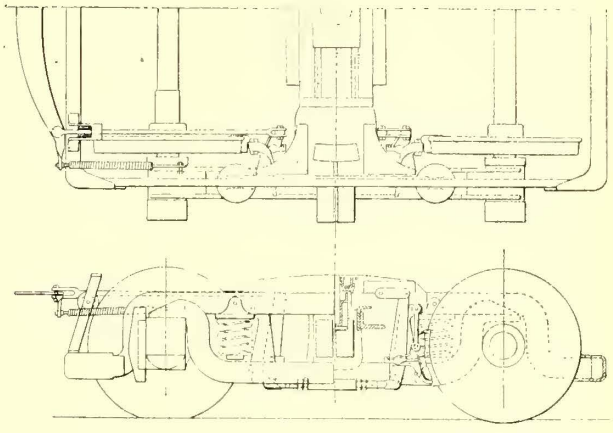
Merits of This Truck from a Brake Design Standpoint

1. Inside hung brake shoes.
2. Equalized brake leverage system.—That is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.
3. Radius bar connection to live truck levers.—In addition to its use when on a curve, the radius bar construction also eliminates the great deflection of weak brake beams, due to the truck levers acting at their center.

Demerits from a Brake Design Standpoint

1. High truck leverage ratio.—This total ratio is 7.5 to 1 (i. e.), one pound applied at the middle of radius bar gives a total of 7.5 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck levers in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on the truck, since the multiplication can readily be made in the car body levers, where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Angle of live truck levers too near the vertical in release position.—If lever is too near vertical in release position, it assumes a bad angle when brake shoes are set up to wheels.
3. Available movement of radius bar in guide too limited.
4. Brake shoes hung slightly too far below the center of wheels. This will increase after the car body is placed on truck, and also in proportion to the load.
5. Dead lever dimensions not of the same proportion as those of the live truck levers. For one pound applied at the middle of radius bar, the leverage as now proportioned, results in 3.7 pounds pressure, distributed at the live lever brake shoes, and 3.8 pounds at the dead lever shoes. This results in unequal shoe wear and also makes it impossible to use the best percentage of braking power, since the correct percentage on one pair of wheels makes the percentage incorrect for the other pair, due to this discrepancy in proportion of truck levers.

NOTE.—Absence of the thickness and width of truck levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with consequent deflection, and often failure of the brake rigging.



Merits of This Truck from a Brake Design Standpoint

1. Brake shoes hung the proper amount below center of wheels.
2. Brake shoe hanger bracket supported by the equalizer bars.—With this construction the distance of brake shoes below center of wheel remains constant, whether the truck is supporting the car body and its varying load, or not.
3. Inside hung brake shoes.
4. Equalized brake leverage system.—That is to say, it is arranged so that unequal shoe clearance will not throw all the pressure on one pair of wheels.
5. Live and dead levers of same proportion, thus giving same shoe pressure on each pair of wheels.
6. Radius bar connection to live truck levers.—In addition to its use when on a curve, the radius bar construction also eliminates the great deflection of weak brake beams, due to the truck levers acting at their center.

Demerits from a Brake Design Standpoint

1. High truck leverage ratio.—This total ratio is 7.48 to 1 (i. e.), one pound applied at the middle of radius bar gives a total of 7.48 pounds distributed at the four-wheel shoes, and therefore necessitates a large movement of the live truck levers in setting the brake shoes, with consequent bad angles and danger of striking an obstruction, since the room for movement is generally limited on an electric railway truck. A high leverage ratio is altogether unnecessary on the truck, since the multiplication can readily be made in the car body levers where there is greater clearance room. The total truck lever ratio should not exceed 6 to 1.
2. Angles of live truck levers too near the vertical in release position.—If the lever is too near vertical in release position it assumes a bad angle when brake shoes are set up to wheels.
3. Shoe hanger connected above instead of at center of shoe.

NOTE.—Absence of the thickness and width of truck levers, rods, etc., makes it impossible to figure the strength of the brake rigging, but on electric railway trucks, generally, it is almost invariably too weak, with consequent deflection, and often failure of the brake rigging.

One of the latest petitions for approval of electric railway freight rights to reach the Massachusetts Railroad Commission is from the Springfield & Eastern Street Railway Company, covering its line through the town of Brimfield. This marks the intention of the New Haven interests to put through the project of freight service on the electric railways between Springfield and Worcester. The New England Investment & Securities Company controls the street railway systems of both cities and, while it has barely secured local rights in Worcester, it has begun the operation of two lines of cars in Springfield. The Brimfield petition would pave the way for an extension of the service now in operation out of Springfield as far as Palmer.

The strike of the employes of the Louisville Railway Company, referred to elsewhere in this issue as having been broken, was formally declared off Wednesday, Nov. 27.

HEARING ON CLASSIFICATION OF ACCOUNTS BY THE INTERSTATE COMMERCE COMMISSION

The hearing on the proposed classification of accounts of electric railway companies by the Interstate Commerce Commission, as announced last week, was held at the rooms of the Commission in Washington, D. C., on Friday, Nov. 22, at 11 a. m. The meeting was called by Prof. Henry C. Adams, statistician of the Commission, who called attention to the tentative classification of electric railway accounts, suggested by the Commission, and printed in this paper last week.

The following, among others, were present at the hearing:

Milo R. Maltbie, member of the Public Service Commission of the First District of New York.

Martin S. Decker, member of the Public Service Commission of the Second District of New York.

Wm. J. Meyers, statistician of the Public Service Commission of the Second District of New York.

T. W. Wilson, president of the Street Railway Association of the State of New York and general manager of the International Traction Company of Buffalo.

A. L. Linn, Jr., chairman of the committee on a standard classification of accounts of the Street Railway Association of the State of New York and auditor of the Mohawk Valley Company.

E. S. Fassett, general manager of the United Traction Company, of Buffalo.

H. M. Beardsley, secretary and treasurer of the Elmira Water, Light & Railway Company, Elmira, N. Y.

J. C. Collins, secretary and auditor of the Rochester Railway Company, Rochester, N. Y.

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

Mr. Swenson stated that the American Street & Interurban Railway Association and the American Street & Interurban Railway Accountants' Association were very much interested in the subject of the proposed classification of operating expenses, and that the officers of the association were anxious to co-operate with the Interstate Commerce Commission in the preparation of any classification which should be adopted. He said, however, that the notification of the meeting and copies of the suggested classification of accounts had been received by the associations so short a time prior to the meeting—only two days—that it had been impossible for the officers to examine carefully the proposed classification or to be in attendance at the meeting. He therefore suggested that the actual decision on the classification should be postponed until there was time to make a study of the matter when the association would be pleased to send representatives to take up the subject with the Commission. Messrs. Wilson and Linn also referred to the shortness of the time with which the Street Railway Association of the State of New York had been informed of the meeting, but presented a comparison of the different accounts which had been prepared in the interim, and which is reproduced herewith. This comparison shows the tentative classification of the American Street & Interurban Railway Association as adopted at Atlantic City, and as somewhat modified by the New York State Association, the tentative classification of the Interstate Commerce Commission, as published last week, and the steam railroad classification. Messrs. Wilson and Linn argued that the tentative classification of the Commission was not adapted to electric railway work, as many of the subjects were insufficiently covered, as for instance, "operating power plants," which had only one account, whereas many others were almost superfluous.

After an extended discussion it was decided to hold another conference on Dec. 10 at the rooms of the Interstate Commerce Commission, at Washington. As a preliminary to this hearing, it was decided to appoint a committee to make a report on the subject, this committee to consist of six members. Three of these members are to be appointed by the Interstate Commerce Commission, one by the American Street and Interurban Railway Association, one by the American Street and Interurban Railway Accountants' Association, and one by the Street Railway Association of the State of New York.

TENTATIVE ELECTRIC RAILWAY.	TENTATIVE I. C. C. ELECTRIC.	STANDARD I. C. C. STEAM.
I. Way and Structures.	I. Way and Structures.	I. Way and Structures.
II. Equipment.	II. Equipment.	II. Equipment.
III. Transportation (Power Plants).	IV. Transportation.	IV. Transportation.
IV. " (Operation Cars).		
V. " (Misc.).		
VI. Traffic.	III. Traffic.	III. Traffic.
VII. General.	V. General.	V. General.
	PRIMARY ACCOUNTS.	
I. Maint. Way and Structures.		
A. Engineers' Sal. and Exp.	1 Superintendence.	1 Superintendence.
B. Roadway & Track Labor.	7 Roadway and Track.	6 Roadway and Track.
C. Ties (Material).	4 Ties.	3 Ties.
D. Rails (Material).	5 Rails.	4 Rails.
E. Rail Fastenings & Joints (Mat.).	6 Other Track Material.	5 Other Track Material.
F. Special Work (Material).	6 Other Track Material.	5 Other Track Material.
G. Ballast (Material).	2 Ballast.	2 Ballast.
H. Paving (Material).	3 Paving.	(None.)
I. Bridges, Trestles and Culverts (Material).	10 Bridges, Trestles and Culverts.	9 Bridges, Trestles and Culverts.
J. Fences, Road Crossings, Cattle Guards and Signs (Material).	12 Grade Crossings, Fences, Cattle Guards and Signs.	11 Grade Crossings, Fences, Cattle Guards and Signs.
K. Signals and Interlocking Systems (Material).	14 Signals and Interlocking Plants.	13 Signals and Interlocking Plants.
L. Miscellaneous Roadway and Track Expenses.	23 Injuries to Persons.	22 Injuries to Persons.
(Acct. 34) Removal of Snow and Ice.	24 Stationery and Printing.	23 Stationery and Printing.
(None.)	26 Other Expenses.	25 Other Expenses.
J. Fences, Road Crossings, Cattle Guards and Signs (Material).	8 Removal of Snow, Sand and Ice.	7 Removal of Snow, Sand and Ice.
(Acct. 34) Removal of Snow and Ice.	9 Tunnels.	8 Tunnels.
	11 Over and Under Grade Crossings.	10 Over and Under Grade Crossings.
	13 Snow and Sand Fences and Snow Sheds.	12 Snow and Sand Fences and Snow Sheds.

TENTATIVE ELECTRIC RAILWAY.	TENTATIVE I. C. C. ELECTRIC.	STANDARD I. C. C. STEAM.
II. Maint. Electric Line.		
A. Engineers' Sal. and Exp.	15 Telegraph and Telephone Lines. 16 Electric Power Transmission.	14 Telegraph and Telephone Lines. 15 Electric Power Transmission.
B. Electric Line Labor.	15 Telegraph and Telephone Lines. 16 Electric Power Transmission.	14 Telegraph and Telephone Lines. 15 Electric Power Transmission.
C. High-Tension Transmission Lines (Material).	16A Low-Tension Transmission Lines.	15 Elec. Power Transmission.
D. Low-Tension Transmission Lines (Material).	16A Low-Tension Transmission Lines.	15 Elec. Power Transmission.
E. Track Bonding (Material).	15 Telegraph and Telephone Lines.	14 Telegraph and Telephone Lines. 15 Elec. Power Transmission.
F. Telephone and Telegraph System (Material).	15 Telegraph and Telephone Lines.	14 Telegraph and Telephone Lines.
G. Miscellaneous Electric Line Expenses.	15 Telegraph and Telephone Lines. 16 Elec. Power Transmission. 23 Injuries to Persons. 24 Stationery and Printing. 26 Other Expenses.	14 Telegraph and Telephone Lines. 15 Elec. Power Transmission. 22 Injuries to Persons. 23 Stationery and Printing. 25 Other Expenses.
III. Buildings, Fixtures and Grounds.		16 Buildings, Fixtures and Grounds.
A. Eng. Salaries and Exp.	17 Buildings, Fixtures and Grounds.	16 Bldgs., Fixtures and Grounds.
B. Bldgs., Fixtures & Grounds Labor.	17 Bldgs., Fixtures and Grounds.	16 do
C. Power Plants (Mat.).	17 do	16 do
D. Sub-stations (Material).	17 do	16 do
E. Car Houses and Yards (Mat.).	17 do	16 do
F. Shops and Yards (Mat.).	17 do	16 do
G. General Offices (Mat.).	17 do	
H. Stations, Waiting Rooms and Platforms (Mat.).	17 do	16 do
I. Docks and Wharves (Mat.).	18 Docks and Wharves.	17 Docks and Wharves. 71 Coal and Ore Docks.
J. Miscellaneous Bldgs. (Material).	17 Buildings, Fixtures and Grounds.	16 Buildings, Fixtures and Grounds.
K. Miscellaneous Supplies and Expenses.	19 Roadway Tools and Supplies. 23 Injuries to Persons. 24 Stationery and Printing. 26 Other Expenses.	18 Roadway Tools and Supplies. 22 Injuries to Persons. 23 Stationery and Printing. 25 Other Expenses.
IV. Maint. Power Plant Equipment.		
A. Engineers' Salaries and Expenses.	30 Superintendence.	28 Superintendence.
B. Power Plant Labor.	44 Power Plant Equipment. A Steam and Water Plant. B Electric Plant. C Sub-station Equipment.	48 Power Plant Equipment. A Steam and Water Plant. B Electric Plant.
C. Boiler Plant (Mat.).	44 A Steam and Water Plant.	48 A Steam and Water Plant.
D. Steam Engine Plant (Mat.).	44 A Steam and Water Plant.	48 A Steam and Water Plant.
E. Hydraulic Plant (Mat.).	44 A Steam and Water Plant.	48 A Steam and Water Plant.
F. Gas Engine Plant (Mat.).	44 A Steam and Water Plant.	48 A Steam and Water Plant.
G. Electric Plant (Mat.).	44 B Electric Plant.	48 B Electric Plant.
H. Miscellaneous Equip.	49 Other Expenses.	52 Other Expenses.
I. Misc. Power Plant Exp.	23 Injuries to Persons. 24 Stationery and Printing. 26 Other Expenses. 45 Injuries to Persons. 46 Stationery and Printing.	22 Injuries to Persons. 23 Stationery and Printing. 25 Other Expenses. 49 Injuries to Persons. 50 Stationery and Printing.
V. Maint. Sub-station Equipment.		
A. Engineering Salaries and Expenses.	30 Superintendence.	28 Superintendence.
B. Sub-station Labor.	44 C Sub-station Equipment.	48 B Electric Plant.
C. Sub-station Material.	44 C do	48 B do
	44 C do	48 B do
VI. Maint. of Revenue Cars.		
A Passenger Cars (Mat.).	34 Passenger Train Cars Repairs.	35 Passenger Train Cars Repairs.
A1 do (Labor).	34 do	35 do
B Combination Cars (Mat.).	34 do	35 do
B1 do (Labor).	34 do	35 do
C Express Cars (Mat.).	(None.)	35 do
C1 do (Labor).	(None.)	35 do
D Freight Cars (Mat.).	37 Freight Train Cars Repairs.	38 Freight Train Cars Repairs.
D1 do (Labor).	37 do	38 do
E Mail Cars (Mat.).	34 Passenger Train Cars Repairs.	35 Passenger Train Cars Repairs.
E1 do (Labor).	34 do	35 do
F Locomotives (Mat.).	31 Electric Locomotives Repairs.	32 Electric Locomotives Repairs.
F1 do (Labor).	31 do	32 do
G Foreign Equipment (Mat.).	31 do	32 do
	34 Passenger Train Cars Repairs.	35 Passenger Train Cars Repairs.
	37 Freight Train Cars Repairs.	38 Freight Train Cars Repairs.
G1 Foreign Equipment (Labor).	31 Electric Locomotives Repairs.	32 Electric Locomotives Repairs.
	34 Passenger Train Cars Repairs.	35 Passenger Train Cars Repairs.
	37 Freight Train Car Repairs.	38 Freight Train Cars Repairs.

TENTATIVE ELECTRIC RAILWAY.	TENTATIVE I. C. C. ELECTRIC.	STANDARD I. C. C. STEAM.
VII. Maint. of Electrical Car Equipment of Revenue Cars.		
A Passenger Cars (Mat.).	40 Electric Equipment of Cars Repairs.	41 Electric Equipment of Cars Repairs.
A1 do (Labor).	40 do	41 do
B Combination Cars (Mat.).	40 do	41 do
B1 do (Labor).	40 do	41 do
C Express Cars (Mat.).	40 do	41 do
C1 do (Labor).	40 do	41 do
D Freight Cars (Mat.).	40 do	41 do
D1 do (Labor).	40 do	41 do
E Mail Cars (Mat.).	40 do	41 do
E1 do (Labor).	40 do	41 do
F Locomotives (Mat.).	31 Electric Locomotives Repairs.	32 Electric Locomotives Repairs.
F1 do (Labor).	31 do	32 do
G Foreign Equipment (Mat.).	31 do	32 do
	40 Electric Equipment of Cars Repairs.	41 Electric Equipment of Cars Repairs.
G1 do (Labor).	31 Electric Locomotives Repairs.	32 Electric Locomotives Repairs.
	40 Electric Equipment of Cars Repairs.	40 Electric Equipment of Cars Repairs.
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A. Work Car Equip. (Mat.).	20 Work Equipment Repairs.	19 Work Equipment Repairs.
A.1 do (Labor).	20 do	19 do
B. Snow Equip. (Mat.).	20 do	19 do
B.1 do (Labor).	20 do	19 do
C. Elec. Locomotives (Mat.).	31 Elec. Locomotives Repairs.	32 Elec. Locomotives Repairs.
C.1 do (Labor).	31 do	32 do
D. Horses, Harness and Vehicle Equip. (Mat.).	49 Other Expenses.	52 Other Expenses.
D1. do (Labor).	49 do	52 do
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F. Miscel. Equip. (Mat.).	49 do	52 do
F.1 do (Labor).	49 do	52 do
G. Foreign Misc. Equip. (Mat.).	49 do	52 do
G.1 do (Labor).	49 do	52 do
IX. Misc. Shop Expenses.	30 Superintendence.	28 Superintendence.
	43 Shop Machinery & Tools.	47 Shop Machinery and Tools.
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B. Train Dispatchers, Telegraph and Telep. Operators.	61 Superintendence.	66 Superintendence.
	66 Dispatching Trains.	67 Dispatching Trains.
	82 Teleg. & Telep. Operation.	100 Teleg. & Telep. Operation.
C. Road Officers.	61 Superintendence.	66 Superintendence.
	66 Dispatching Trains.	67 Dispatching Trains.
XVIII. Wages Passenger Motormen.	67 A Passenger Motormen.	85 Motormen.
XIX. Wages of Passenger Conductors and Trainmen.	68 A Passenger Conductors.	94 Road Trainmen.
	68 B Other Passenger Trainmen.	
XX. Wages of Express and Freight Motormen.	67 B Freight Motormen.	85 Motormen.
	67 C Other Motormen.	

TENTATIVE ELECTRIC RAILWAY.	TENTATIVE I. C. C. ELECTRIC.	STANDARD I. C. C. STEAM.
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D. Miscellaneous Supplies.	69 Train Supplies and Expenses. 71 Other Supplies for Electric Loco. 72 Car House Expenses. 77 Yard Supplies and Expenses.	95 Train Supplies and Expenses. 76 Yard Supplies and Expenses.
E. Miscellaneous Expenses.	69 Train Supplies and Expenses. 71 Other Supplies for Electric Loco. 72 Car House Expenses. 77 Yard Supplies and Expenses.	95 Train Supplies and Expenses. 76 Yard Supplies and Expenses. 78 Enginehouse Expenses—Yard. 87 Enginehouse Expenses—Road.
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TENTATIVE ELECTRIC RAILWAY.	TENTATIVE I. C. C. ELECTRIC.	STANDARD I. C. C. STEAM.
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HINTS FROM A CONDUCTOR

CONTROL OF THE BELL STRAP

A thing simple in itself yet of utmost importance to a street car company is for a conductor to keep his car bell strap under control until the car gets under headway. A company should positively insist upon this being done. Thus a conductor may be inside the car, collecting fares, and cannot get a good view of the rear platforms, when three women are about to board the car. After two of them mount the platform the conductor gives the motorman two bells, leaving one woman on the car step. The passengers on the rear platform call out and the conductor gropes for the strap, but probably by the time he has found it the woman has been dragged some distance, necessitating a suit against the company. If the conductor had retained control of his bell he could at once have given the motorman the third bell, and the car would have stopped. Retaining control of the bell gives a conductor more confidence and enables him to get his car over the line more quickly.

MEALS AT TIMES OF EXTRA RUNS

When a crew of a car is unexpectedly ordered out they should be allowed money for meals. Thus, if a special car is ordered out and a crew just finishing a run is ordered to take command, it is no more than right that they should be allowed meal money, if they have not time to reach their homes. This practice prevails among trucking companies and should be followed among street railway companies.

DISTRIBUTION OF LAMPS

We frequently hear discussions regarding the distribution of lights in street cars, yet the two most important requirements of a proper distribution of illumination seem to be entirely overlooked, namely, that that the register can be read from any part of the car, and that a passenger can see the locality at night. Regarding the first, if a register has a glazed surface, it cannot be read unless the observer is within 5 or 6 feet, yet it is the exception rather than the rule, to place a lamp near the register. As to the ability of a passenger to see the particular point at which he wants to get off, in some elaborately furnished box cars in which the writer has ridden lately, the lights are placed in the roof of the cars in such a manner that they throw a reflection on the windows, so that it is impossible at night time to see out of them. This should not be, for on the old-time cars anyone could always see the street and landmarks and did not have to bother the conductor by asking him questions.

EXTRA CHANGE

An excellent way for a conductor to prevent himself from running short of change is to keep $2 in change on reserve in an unused pocket, and only open this pocket pocketbook when he runs out of change. This gives him more confidence in running his car.

COPYING REPORTS OF ACCIDENTS

A good idea, not original with the writer, is to keep in every depot a copy book for accidents. At one street railway depot with which the writer is acquainted a copy book is kept, and when a conductor writes out an accident report it is at once copied. This is a much better practice than that which prevails in other places of copying the main features of the report in a book. Naturally, division superintendents like to see accident reports, and as the original report goes as soon as possible to the claim department, other means should be taken by superintendents to have a copy for their own use. Some use a letter press and have the reports copied by this means, others require a clerk to copy the reports in a book. As good a way as either of the above, and one which is just as desirable for the claim department, would be to have all accident reports written with an indelible pencil, and a carbon copy taken of them. Many large concerns, such as shipping departments of stores, express companies and docks use indelible pencils, and find them very satisfactory.

AN EFFECTIVE REMEDY

On nearly all street car systems there are along the route "safety stops," such as firehouses, schools, etc., where the electric cars are required to come to a full stop. At times some motormen will get lax about stopping at these points and have to be disciplined by being laid off for a day or in some other way. A division superintendent of a certain electric railway has adopted an effectual device for making the men remember this rule. In the depot there is a large blackboard to mark up the runs of extra men. One day a motorman was reported for running by a "safety stop," and he was ordered to write the word "stop" 100 times on this blackboard. The lesson was effectual. It is noticed that all motormen now observe this stop.

A SMALL TALK ON TRANSFERS

The best method of preventing a. m. and p. m. transfers from getting mixed by conductors is a problem that has given many street railway companies an endless amount of study. The writer suggests a simple remedy to overcome the difficulty cheaply and effectively and one that will kill two birds with one stone as it helps in another direction. Make it a rule that when a conductor starts out on his run he carry two sets of transfers, a. m. and p. m. Have in the car, in an out-of-the-way place, a little box, 8 ins. by 3 ins., and require the conductor to place in this box the transfers of the kind that he is not going to distribute. Have a small alarm clock in the front part of the car near the motorman and set this clock 11 p. m. or 11 a. m. At 11 p. m. or a. m. this alarm will ring, and the motorman can at once notify the conductor to change his transfers, avoiding all confusion, and possible lawsuits, which have frequently taken place from conductors getting their transfers mixed in the crowded cars.

CLOCKS

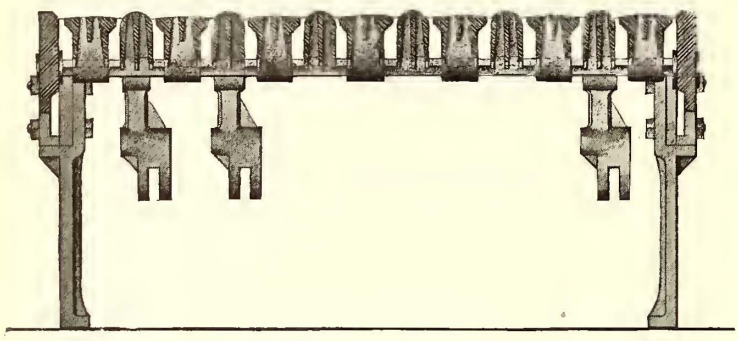
In connection with the previous suggestion I consider that every motor car should have at the front end a clock for the use of the motorman. Time is an important matter in the operation of an electric railway. All companies require their motormen and conductors to carry watches, but it frequently happens that these watches are not good time pieces. A clock will stand the racking incidental to electric railway service better than a watch, and, if hung on the dash in front of the motorman, offers a distinct advantage, especially in cold weather when the motorman is bundled up. It would also be a good idea to put a clock in the front part of the car, as it would be an accommodation to the public and would also induce passengers to move forward in the car.

A LARGE ORDER FOR THERMIT JOINTS IN AUSTRALIA

The Goldschmidt Thermit Company announces the closing through its Australian office of an order for welding portions for 10,000 joints on the new tramway system being constructed at Adelaide. Thermit joints have been used to a considerable extent already in Sydney and other systems in Australia, and this order comes as the result of the satisfaction given at those places.

NOTES ON GRATE PRACTICE

The Boston Elevated Railway Company and the Boston & Northern and Old Colony Street Railway companies are giving especial attention to the problem of securing efficient combustion. In this connection each road has installed a number of Reagan grates in its various power stations, and the performance is being quite closely watched. This grate is familiar to steam users in general as a chopping grate, built of special quality iron of unusual weight; it can be operated whether hot or cold, and obviates



END VIEW OF GRATE

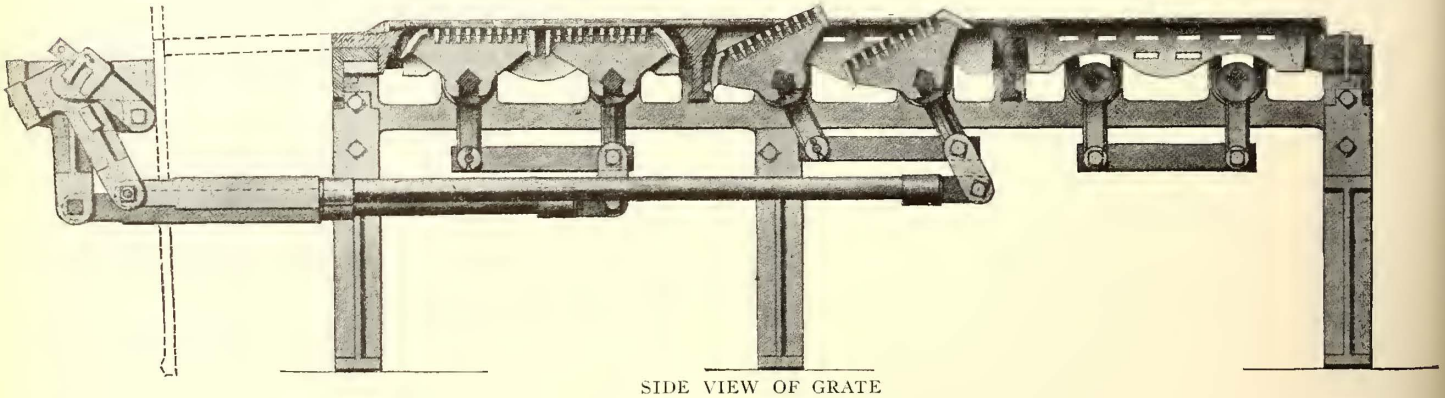
any necessity of running with the fire doors open unless handling a badly clinking coal.

About seventy-five or eighty of these grates have been in use for from two to four years on the Boston & Northern and Old Colony systems. They are installed in thirteen power stations under boilers ranging in capacity from 100 to 575 hp. Very few repairs have thus far been necessary and no trouble has been experienced from burning out. The draft over the fire ranges from 0.24 in. to 0.94 in. in these plants, with an average of about 0.75 in., the chimney heights varying from 75 ft. to 200 ft. The thickness of the fires is ordinarily from 12 to 14 ins. Standard New River or George's Creek coal of 14,000 to 14,500 B. T. U. per pound, particularly the latter fuel, is burned in these grates. Some of the plants contain economizers, and for this and other reasons flue gas temperatures and CO_2 analyses are not included in these notes. A marked increase in boiler capacity has resulted from the introduction of these grates. The grates are shaken hourly or more frequently, according to the character of the coal used.

The Boston Elevated Railway Company has been using the Reagan grate to some extent for about two years. Thirty boilers are now equipped, and fifteen more are being fitted up with these grates. When this installation is completed, about 47 per cent of the boilers in the company's steam power plants will be so equipped. The sizes range from an 8½ ft. x 7 ft. grate under a 350-hp boiler to a 12 ft. x 7 ft. grate in a 500-hp furnace. Repairs have been very slight, and during one year's service it was necessary to replace but four pieces in eight grates. The draft over the fire in the Boston Elevated plants ranges from 0.1 to 0.5 in. The company endeavors to run with a fire thickness of about 7 ins., but the average is probably nearer 12 ins.

The rate of combustion averages from 22 to 25 lbs. of coal per sq. ft. of grate surface per hour at times of peak-load. The Reagan Grate Company claims that this rate of combustion can be increased to 40 or 45 lbs. if necessary, according to draft, even with the damper practically closed. During the lighter hours the rate falls to an average of about 16 lbs. In the Boston Elevated plants the flue temperatures average about 600 degs. F., and the percentage of CO_2 is about 9, without figuring the hours from 1 to 5 a. m., when the system is very lightly loaded. Many grades of bituminous coal are burned, and the analyses vary from 13,300 B. T. U. or lower to 14,000, with the per cent of ash varying from 5 to 12.6. A fair average for the per cent of ash is 8. The company has found that the number of heat units per pound is not an accurate index of the combustion adaptability of the coal, and neither is the ash percentage.

In firing at the Boston Elevated plants the effort is made to have the men cover the fire lightly and frequently. The grates are shaken hourly, and during the rush hours probably three times an hour. One man at Central power station during peak-loads devotes his entire time to shaking the grates. These grates have been found to extend the time through which the maximum boiler capacity can be carried without cleaning; in fact, the fires have been satisfactorily maintained for days at a time without any cleaning being necessary further than the shaking above referred to, with the boilers actually doing work beyond the rated capacity. The rugged design of the grate parts undoubtedly is a contributory cause of the excellent maintenance records thus far obtained. One of the chief claims made for this grate is that boilers can be held in suspense while the load is light and can be thrown into service again almost instantly by simply shaking the grate and opening the damper, thus doing away with delay in getting into condition to take care of the increased load.

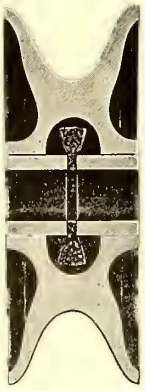


SIDE VIEW OF GRATE

The Louisville Railway Company has refused to consider the proposal of its former employes to submit the alleged differences to arbitration. President Minary says he will receive the applications of the old employes as individuals.

A MODIFIED TROLLEY WHEEL.

The Recording Fare Register Company, of New Haven, Conn., announces a new type of trolley wheel, provided with an oil chamber and with bushings made in two sections, between which is placed a felt washer of the proper thickness. The felt presenting a wiping surface to the spindle, oil is drawn from the chamber by capillary attraction, thus insuring perfect lubrication without excessive oiling. The graphite, which is a non-conductor, offers great resistance to the current, and the necessary grooves required to hold the graphite leave just so much less metal for bearing surface. At the same time, the bushings being perfectly smooth, without grooves or channels, give double the bearing surface. Containing no graphite they offer no resistance to the current. As a result longer life is claimed for the wheel, with no expense for extra bushings and no labor of rebushing, as the original bushing will outwear the wheel. Further, the oil bill is said to be entirely eliminated, as the wheels are shipped from the factory filled with oil which it is said will last until the wheel is worn out. The self-lubricating wheels are made in three sizes: No. 400, standard 4-in. wheel; No. 430, standard wheel, 4⅜ ins. in diameter, and the No. 530 wheel, which is 5¾ ins. in diameter. They are composed entirely of new metal, 88 per cent copper and are guaranteed to contain no lead. The company also furnishes, when desired, the standard sizes of trolley wheels with regular graphite bushings.



NEW WHEEL WITH OIL CHAMBER

NEW YORK ASSOCIATION ISSUES PROCEEDINGS.

The Street Railway Association of the State of New York has just published its printed proceedings of the Lake Champlain meeting. The pamphlet is uniform in size with the reports of other meetings of the association, and on account of the importance of the papers presented at that meeting constitutes a valuable volume for reference. The association, in connection with the Empire State Gas & Electric Association, has also reprinted in pamphlet form the addresses at the joint meeting of the associations at Madison Square Garden, Oct. 1. The addresses were by Hon. Frank W. Stevens, chairman of the Public Service Commission for the Second District, New York; Henry J. Pierce, president of the International Railway Company, Buffalo, N. Y.; Alexander C. Humphreys, president of Stevens Institute of Technology, Hoboken, N. J., and Everett W. Burdett, of Boston, Mass. An abstract of these addresses appeared in the STREET RAILWAY JOURNAL for Oct. 5, but as they all relate to the present-day problem of the relations between State authorities and public utility corporations, they will well bear rereading.

A TRANSFER WHICH DESIGNATES THE STARTING POINT

A year or more ago H. M. Sloan, general manager of the Calumet Electric Street Railway, of Chicago, adopted a double stub transfer to prevent a continuous circuit with one fare. Mr. Sloan has recently had added to this transfer a feature which designates by means of one extra punch approximately where the passenger boards the car, so that if the direction of the car he transfers to is incorrect, or if he changes his mind, the conductor on the car receiving the transfer will know from its origin whether or not the pasenger is entitled to ride. The heavy or light lines through the body of the transfer are punched for a. m. or p. m.. The arrow marks indicate the direction the car is traveling, and the streets designated across the arrow lines are the transfer points on this particular line.

NEW CARS FOR GALESBURG, ILL.

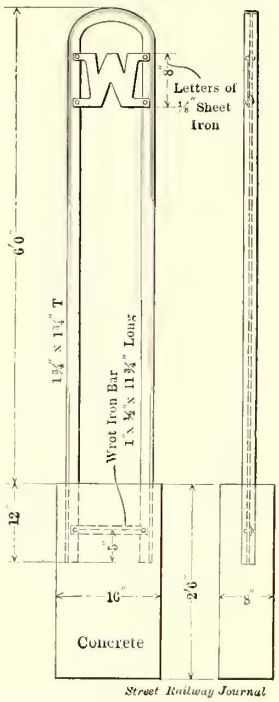
The accompanying illustration shows one of several semi-steel semi-convertible cars built by the Danville Car Company, of Danville, Ill., for the Galesburg Railway Company. The outside panels of the cars are composed of a series of steel plates with metal moulding covering the joints. The inside finish is with mahogany. There are polished bronze trimmings throughout. The seats are of the walkover type, upholstered in rattan, manufactured by the Hale & Kilburn Manufacturing Company, of Philadelphia. Electric heaters of the Consolidated type are distributed under each seat, and electric lamps, liberally distributed, give illumination.

Bodies are mounted on trucks manufactured by the J. G. Brill Company. Four G. E. motors are used per car. Westinghouse air brakes and hand brakes are used.

NEW CAR FOR SERVICE IN GALESBURG

A STEEL WHISTLING POST

It is now possible to replace the familiar white stones and wooden posts with their black "W" that appear along steam and electric railways at crossings, bridges and elsewhere, by a durable, cheap and attractive steel whistling post. The Continental post has been designed especially to reduce the high cost of maintenance, to give longer life to the post and to keep the first cost as near that of the wooden post as possible. A light "T" iron is bent in an arch shape, the long ends of the "T" forming the legs of the post. The letters are stamped from sheet iron and riveted or bolted to the stems of the "T" near the top of the post. A bar riveted between the legs at the bottom of the post acts as an anchor when the post is set in concrete or in the ground.



PLAN OF STEEL WHISTLING POST

The claims for this post are that being made of structural steel, it will outlive the wooden post by many years; it will reduce the amount of paint used to maintain the posts by at least 75 per cent; it will reduce the amount of time necessary properly to maintain the posts by at least 75 per cent; the letters will be silhouetted against any background in winter or summer; snow cannot drift against it; the letters can be held in stock and new ones attached to a post at any time. The device is the invention of E. D. Hillman, mechanical engineer of the U. S. Metal & Manufacturing Company, New York, which company will shortly place the post on the market.

FUNERAL OVER THE BOSTON & WORCESTER.

On Wednesday, Nov. 20, the Boston & Worcester Street Railway Company ran a funeral car from Brookline to Worcester, a distance of 40 miles. The company used one of its regular closed cars, taking out one of the side seats on the end and one of the large windows on the side to allow the casket to be placed in the car. The funeral party used the balance of the seats in the car which were not removed. The running time from Brookline to Worcester between the points which the funeral party was carried was about 2 hours 20 minutes, the party being given the right of way. This is a new departure for New England, but probably will not be a novelty as the party was extremely well satisfied with the service on this trip. The expense was not so great as it would have been by the steam railroad, and the trip was not subjected to delays as would have been the case by steam. General satisfaction was expressed by relatives and friends of the deceased at the conduct of the funeral.

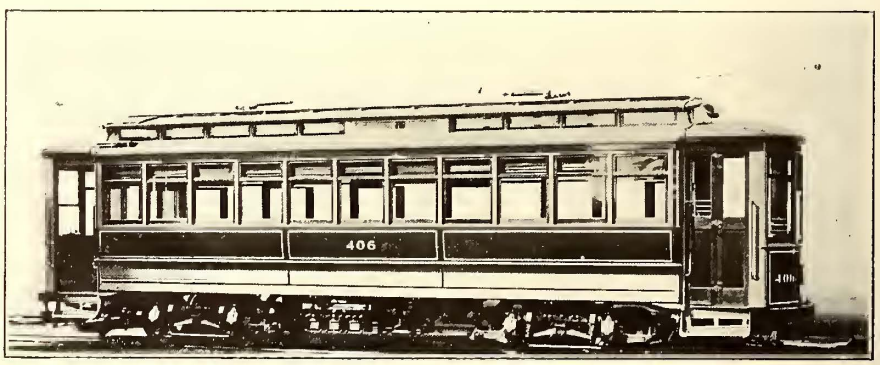
STATISTICS ON PRUSSIAN EMPLOYES

A recent inquiry by the Prussian Ministry of Public Works brought to light some interesting data on the number of men employed in street railway service in Prussia, the percentage for each class of work, hours of labor, etc. In May, 1906, 135 street railways in Prussia had 33,869 employes divided as follows: Executive and managerial departments, 3.6 per cent; operating department, 29 per cent, of whom 61.2 per cent were in actual car service; shops, 14 per cent; track and overhead maintenance, 9.5 per cent; power plant and sub-stations, 1.7 per cent; mixed service, 2.2 per cent. The shop apprentices numbered only 1 per cent of the shop employes.

The great difference in the operation of small and large systems is shown by the fact that while the town of Aurich requires only fifteen men in all for its line of 3.74 km., or four men per km. (.62 mile), Berlin averages 29.4 employes per km., or 11,098 men for 377.2 km.; Stettin averages 16.2 employes per km.; Posen, 20.8; Wiesbaden and Cologne, 19.1 per km. each. Of the 20,725 employed in the transportation department, 19,048 were employed under written agreements, and 18,876 were subject to discharge upon notice. Of the car men, 81.1 per cent worked less than eleven hours daily on the schedule, and, in fact, 59.6 per cent less than ten hours. Regular working time exceeding thirteen hours constituted 3.9 per cent of the total, while only 7 per cent ever had to work more than fourteen hours a day, including overtime. During May, over 82 per cent of the men were allowed three or more days' absence from duty, a day being understood as twenty-four consecutive hours' absence.

FIFTEEN CLOSED CARS FOR WORCESTER CONSOLIDATED

Fifteen cars like the one illustrated were delivered last month to the Worcester Consolidated Street Railway Company, by the John Stephenson Company, and follow closely on the ten Brill "Narragansetes" described recently in the Street Railway Journal and furnished by the same builder. The chief dimensions of the closed cars are as follows: Length over the end panels, 30 ft.; over the crown pieces, 39 ft. 5 ins.; over the sills, including the sheathing, 7 ft. 3 ins.; height from the floor to the ceiling, 8 ft. ¾ in.; from the underside of the sills over the trolley board, 9 ft. ½ in.; size of the side sills, 4¾ ins. x 7¾ ins.; end sills, 5 ins. x 8⅞ ins.; sill plates (outside), 6 ins. x ½ in. Like the "Narragansett" cars mentioned, these were mounted on the Brill No. 27-G1 truck with 4 ft. 6 ins. wheel base. The seats are of the longitudinal variety, upholstered in plush. The lower sashes of the windows raise in the ordinary manner, the top sashes remaining stationary. The weight of the car completely equipped is 43,000 lbs.



TYPE OF CLOSED CAR FOR SERVICE IN WORCESTER

FINANCIAL INTELLIGENCE

Wall Street, Nov. 27, 1907.

The Money Market

Monetary conditions have improved materially during the past week, and the situation at the close may be said to be clearer than at any previous time for a month or more. The demand from all of the leading interior points has been almost as heavy as in the two preceding weeks, but the loss from those sources has been largely offset by the arrivals of gold from Europe. Since the beginning of the gold import movement upward of $95,000,000 gold has been contracted for abroad, of which considerably more than half has been received, and despite the action of the foreign bankers in advancing the official discount rates, and the employment of other methods to keep their gold supplies intact, our bankers continue to report new engagements of the yellow metal, and indications now are that much more than $100,000,000 will be brought here on the present movement. A feature has been the decision of the Bank of France to send gold to the United States against commercial bills. Several million dollars of gold were secured in Paris near the close of the week, the first since the beginning of the movement, for shipment to this side. One of the most encouraging features of the week was the falling off in the demand for currency which was attended with a sharp decline in premiums. Quite an active business has been done in this branch of the market during the past fortnight and premiums at times have reached 3½ and 3¾ per cent; but at the close of the present week, the premium declined to below 1¼ per cent, and dealers generally were of the opinion that the money market would soon become normal. Much relief will result from the carrying out of the plans of the Secretary of the Treasury by issuing $50,000,000 2 per cent Panama Canal bonds and the $100,000,000 one-year 3 per cent certificates of indebtedness. These issues will be the basis for new circulation by the banks throughout the country. The foreign exchange market has ruled firm, owing to the light supply of commercial bills, shipments of cotton and grain being somewhat retarded by the existing money stringency.

Money on call on the Stock Exchange has been in freer supply at rates ranging from 15 per cent to 3 per cent, the average rate for the week being about 10 per cent. Business in the time loan branch has been practically at a standstill, the banks and trust companies showing no disposition to re-enter the market at this time. Some transactions, however, were reported at 14@15 per cent for 60 days, but such transactions were subject to special agreements. Mercantile paper was extremely quiet and rates were quoted nominal at 7@7½ per cent for the best double names.

The bank statement published last Saturday was somewhat better than expected. There were substantial decreases in both loans and deposits, the decline in the former item amounting to $4,012,000, while the decrease in the latter was $9,485,000. The reserve required, however, was $2,371,250 larger than in the preceding weeks, and the loss in cash amounted to $2,807,900. Deducting the reserve required from the loss in cash shows an increase in the deficit in the clearing house banks of only $436,650. The total deficit now stands at $54,103,600, as compared with a deficit of $53,666,950 last week and a surplus of $2,371,675 in the corresponding week of last year. A feature of the bank statement was the large increase in circulation, amounting to $3,423,000.

The Stock Market

Dealings on the Stock Exchange were upon an extremely small scale, and were accompanied by a decidedly irregular price movement. The sharp advance in prices which resulted from the decision of the Government to relieve the money stringency by the issuance of $50,000,000 Panama Canal bonds and of $100,000,000 certificates of indebtedness was followed by a sharp reaction in prices, which carried values for many issues to the lowest of the year. The uncertainty regarding the success of the issue of the certificates of indebtedness was in a measure responsible for the downward trend in prices, but perhaps the greatest influence in bringing about the lower levels was the forced liquidation which was in evidence in many of the standard stocks and bond issues. Sentiment was also chilled by reports of further contraction of business throughout the country, and by the persistent demand for and the high premium paid for currency. It was generally expected that the heroic efforts making by the Government and leading bankers in this city to restore confidence would result in an absolute disappearance of the premiums on currency. Contrary to general expectations, however, quite an active business was transacted in that branch of the money market, and at times the rate paid for bills of small denominations and gold reached 3½ per cent. The liquidation in stocks was confined to certain quarters of the market. The weakness in United States Steel stocks was due almost entirely to the continued heavy selling of the U. S. Steel 5 per cent bonds by parties who took the bonds in payment when the transfer of the Tennessee Coal & Iron stocks was made several weeks ago. Chicago, Rock Island & Pacific 4 per cent bonds also exhibited pronounced weakness, the price for that issue falling sharply. Atchison issues were also under pressure and declined sharply, and weakness was also displayed by many of the Southern railway issues. At the close of the week, however, the market recovered sharply and in many issues the earlier declines were partly or wholly regained. The chief influences in bringing about the recovery at the end of the week included the sharp break in the rates for currency, and in some quarters it was believed that the premiums would soon disappear entirely. The conference between President Roosevelt and members of his cabinet and several leading financiers had a very beneficial effect upon sentiment, although the matters discussed were not made public. Considerable amounts of gold continue to be secured in the European markets by our bankers, perhaps the most important development in this connection being the engagement of several million dollars at the Bank of France and the reported willingness on the part of that institution to furnish further considerable amounts if necessary. The bank statement was also a helpful influence, inasmuch as it showed only a nominal increase in the deficit of the clearing house banks, and also an increase in note circulation of nearly $3,500,000, showing that the banks are taking advantage of the relief measures put into effect by the Secretary of the Treasury.

Philadelphia

Dealings in the Philadelphia traction stocks were considerably larger than in the preceding week, and while prices moved with more or less irregularity the general trend of values was toward a higher level. During the first part of the week practically all of the active issues were under pressure, and in some instances new low records for the movement were established. Philadelphia Rapid Transit was forced down to 12, but at the low level very heavy buying developed which carried the price up to 13½, a gain of 1½ points. About 15,000 shares were dealt in. Union Traction was also under pressure, the price receding to 42½, a loss of 2¾ from the previous week's close, but later on there was an advance to 44. Philadelphia Traction sold at 82½. Consolidated Traction of New Jersey held steady at 55, but United Companies of New Jersey lost a point to 215. American Railways was firm at 45.

Baltimore

Trading in the local traction issues was comparatively quiet during the week, but nevertheless prices held decidedly firm. United Railway issues were especially firm upon a reduced volume of business, the 4 per cent bonds selling at 80¼@80, while the income bonds brought 42¼@42. The refunding 5s sold at 69¼@69. Baltimore City Passenger 5s sold at 99, and transactions in Washington City & Suburban were recorded at 97½.

Other Traction Securities

The Boston traction shares were extremely quiet and without especial feature. Boston Elevated after an early decline to 117¾ recovered to 118. Massachusetts Electric common sold at 9½, and Boston & Worcester preferred sold at 55. West End common advanced to 81 and the preferred at 95.

A few sales of Cleveland Electric were made on the Cleveland Stock Exchange the past week at 33. Since the election this security has gained little strength and perhaps not much change will be shown until some definite action is taken toward a settlement of the franchise question. Northern Ohio Traction & Light showed a little strength because of the declaration of a dividend, but the sales were small at that. Fifty shares of Western Ohio preferred changed hands Thursday at 51½. Little trading was done in any of the other traction stocks, and in fact business on the exchange in all securities was very quiet.

Security Quotations

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

	Nov. 20.	Nov. 27.
American Railways	44½	44
Boston Elevated	117½	117½
Brooklyn Rapid Transit	30½	31½
Chicago City	a150	a150
Cleveland Electric	30	32
Consolidated Traction of New Jersey	56	54½
Detroit United	31	30
Interborough-Metropolitan	5	5⅝
Interborough-Metropolitan (preferred)	15	15¾
International Traction (common)	40	a40
International Traction (preferred) 4s	57¼	57¼
Manhattan Railway	110	110
Massachusetts Elec. Cos. (common)	9¼	9¼
Massachusetts Elec. Cos. (preferred)	38	—
Metropolitan Elevated, Chicago (common)	a19	a19
Metropolitan Elevated, Chicago (preferred)	45	45
Metropolitan Street	23	21
North American	39½	40
North Jersey Street Railway	40	40
Philadelphia Company (common)	33	32½
Philadelphia Rapid Transit	12½	13
Philadelphia Traction	83	79½
Public Service Corporation certificates	54	54
Public Service Corporation 5 per cent notes	89	89
South Side Elevated (Chicago)	67	60
Third Avenue	18	16
Twin City, Minneapolis (common)	74¼	73
Union Traction (Philadelphia)	44½	42

a Asked.

Metals.

The copper market was somewhat firmer, prices for the leading grades advancing ¼ @ ⅝ cents. Domestic consumers are buying moderately, while foreign consumers have bought freely. Indications are that the exports for the month of November will be the largest on record. Lake is quoted at 15¼ @ 13¾c.; Electrolytic at 15 @ 15½, and Castings at 12¾ @ 13¼.

OPENING OF THE TUNNEL TO BROOKLYN

On Nov. 27 the Interborough Rapid Transit Company ran a trial train from Wall Street Station through to Borough Hall Station, Brooklyn, via its East River Tunnel. The train was sent through the north tube and carried a special party of officials, engineers and others. Among those present were Messrs. Bassett and Maltbie, of the Public Service Commission; Belmont and Shonts, of the Interborough-Metropolitan Company; Bryan, Hedley, Stott, Doyle, of the Interborough Rapid Transit Company; Vreeland, Quackenbush and Robinson, of the New York City Railway Company, L. B. Stillwell, John Van Vleck, J. B. McDonald, F. R. Fuller, Alfred Skitt, Wm. G. McAdoo and W. B. Parsons. The train consisted of two motor cars and one trail car and about 15 minutes was taken for the trip from Bowling Green to Borough Hall, but much quicker time was made on the return trip. A luncheon was served the guests at the Borough Hall station.

The distance between this station and Bowling Green is 1.6 miles and the length of each of the two tubes is 1.2 miles. The inside diameter is 15 ft. 6 ins. The lowest part of the tubes is 95 ft. below mean high water and 40 ft. below the bottom of the river. The grade on each side is 3.1 per cent. Ventilating shafts are provided at each terminal. There are three sumps, one at the middle of each grade and one at the foot of the grades, equipped with pumps sufficient to handle a very large volume of water. The tunnel is equipped with a separate lighting system, independent of the main source of supply, and a separate telephone system.

THE PAY-AS-YOU-ENTER CARS IN SERVICE IN CHICAGO

The new pay-as-you-enter cars were put in service in Chicago for the first time Sunday, Nov. 22. On the Cottage Grove Avenue line of the Chicago City Railway all of the old cars were replaced by 131 of the new type. The results were very gratifying to the company. Passengers had been prepared for the new cars by frequent press notices and instructions sent out by the company, and there was less misunderstanding regarding the operation than had been expected. The most severe test of the new method of loading was made at Congress Street on the dismissal of church at the Auditorium Theater. The crowd was handled in a very satisfactory manner. President T. E. Mitten, of the railway company, who is responsible for the introduction of the cars, spent most of the day observing their operation. His observations resulted in the following statements:

"In my judgment the 'pay-as-you-enter' system of fare collection will prove a signal success in Chicago. I was much pleased with results as they came under my personal observation and as reported to me by representatives of the transportation department.

"I am pleased to note that crowds were handled easily and quickly, and we have every reason to believe the system will produce even more than was expected of it. Some of the counts made showed that 75 persons per minute were loaded under the 'pay-as-you-enter' rule.

"The main purpose of the 'pay-as-you-enter' plan, which is in force in Montreal, and which is introduced for the first time in Chicago and for the first time in any American city, are to reduce the number of accidents, prevent overcrowding, regulate ventilation, and to increase the comforts of patrons and trainmen. The responsive attitude of the public and of employees of the company is especially encouraging."

On Monday the newspapers all contained spread stories about the success of the cars, congratulating both the company and the riding public. In fact, the story of the working of the cars telegraphed East resulted in details being published in a number of cities. In New York, the *Evening World,* in anticipation, as it were, of the introduction of the cars for service in that city, went so far as to publish pictures of the Chicago cars, duplicates of the ones shown recently in the Street Railway Journal.

ORDINANCE PASSED TO PERMIT INTERURBANS TO ENTER MILWAUKEE OVER CITY LINES

The committee on railroads of the Common Council of Milwaukee considered the proposed franchise ordinances for a number of connecting lines on the south side last week, but finally postponed further consideration of the measure to give the committee opportunity to view the premises. An amendment was proposed to provide that any interurban line which shall apply for admission to the city in the future shall have the use of the tracks of the Milwaukee Electric Railway & Light Company. President Beggs, of the Milwaukee Company, stated that more concessions had been secured for the city by the railroad commission and by City Attorney Kelly from the street railway company in the past year than had been secured by the Aldermen in ten years. He praised the fairness of the commission and the city attorney. City Attorney Kelly tried to explain to the Aldermen the theory upon which he had been acting and urged them to get into their minds the idea that if they are to insist upon a low rate of fare, they ought to regard the company as agents for the city and allow it to conduct its business as economically as possible in order that the company may give as low rates of fare as possible. He said that he differed with Mr. Beggs in the prospects of winning for the city a 3-cent fare, but that it could not be won if the city continued to harass and annoy the company by placing additional burdens upon it which would increase its operating expenses. Mr. Beggs stated positively that he would not accept an ordinance which contained burdens not contained in the franchise of 1900 as he did not care to establish a precedent. The amendment to compel the company to pay for the pavement inside its tracks was killed by a vote of six to three. The amendment to compel the company to strengthen Clinton Street bridge was adopted. The amendment to limit the franchise to the time the new Kinnickinnic Bridge is being built was killed. The amendment to allow future interurban lines to use the tracks was adopted unanimously.

CONTINUING THE B. R. T. INQUIRY—TRACTION MATTERS IN GENERAL IN NEW YORK

The inquiry by the Public Service Commission of the First District of New York into the affairs of the Brooklyn Rapid Transit Company, which was continued last Thursday, had to do with the company's finances, more especially the capitalization of the constituent companies. It was continued on Friday along the same lines, and an adjournment was then had until Tuesday. As a result of what transpired at the hearing, the commission's special counsel and one of the commissioners took occasion publicly to commend the Brooklyn Rapid Transit management for expending large amounts for maintenance and charging such expenditures to operating expenses, thereby keeping down the cost of road and equipment. The commission has also let it be known in other ways that its examination of the books of the company under the present management as so far made reveals nothing to cause any apprehension. The commission does not regard so favorably, however, the methods followed by the company in the first few years of its history, and furthermore takes exceptions to the way in which some of the subsidiaries of the Brooklyn Rapid Transit were reorganized. Before the hearing ends an investigation of the Transit Development Company and the American Railway Traffic Company no doubt will be made. The Brooklyn Rapid Transit owns practically all of the stock of both companies. The Transit Development Company operates all of the system's power houses, buys all equipment and keeps all of the rolling stock, equipment and tracks and elevated structures in repair. The American Railway Traffic Company has the ash removal contract in Brooklyn. With the ashes and garbage it has removed it has filled up lowlands along the seashore. The attempt probably will be made to find out who has profited from the filling up of this land.

The hand that Mayor Tom L. Johnson of Cleveland played in the affairs of the Nassau Electric Railroad, now one of the constituents of the Brooklyn Rapid Transit Company, was brought out at the hearing on Tuesday, Nov. 26. It seems that the Brooklyn Rapid Transit Company, in taking over the Nassau, assumed a charge of $167,500, which Mr. Ivins, as counsel for the commission, desired to know more about than was contained in the mere entrance of the sum under construction account. Col. Williams, for the Brooklyn Rapid Transit Company, said that it was a charge assumed by his company and as such had to be paid. The money, Col. Williams said, was largely used for legal expenses in connection with the securing of certain franchises by the Nassau Company, but he did not know its division. Mr. Williams is quoted as saying: "It was a case of politicians on the one hand and reformers, headed by Tom L. Johnson, on the other, and they made an alliance for accomplishing certain results. The motives which animated them and the methods they followed I have no way of knowing about."

The Appellate Division of the Supreme Court handed down a decision Nov. 22 upholding the injunction issued by Judge Giegerich in the Supreme Court more than a year ago which forbade John H. O'Brien, then fire commissioner, and other city officials from interfering with the construction of the Steinway or Belmont tunnel under the East River. The decision is unanimous. The opinion of the court was written by Justice John Proctor Clarke. The opinion, which is a long one, recites the legal history of the Steinway enterprise and of the legislation under which it has been carried out. The judge holds that the old tunnel act of 1880, under which the Steinway tube was projected, was constitutional, and that within the provisions of this act underground tubes might be built in the City of New York as well as elsewhere in the state. The opinion declares that the various proceedings by which the company changed its route are valid and that the Cantor act, requiring the sale of franchises at public auction, was not applicable to the franchises granted by the city to the tunnel company. The court also holds that the company has the right to construct its tunnel under land immediaely adjacent to the shore. This refers to the fact that the company did not obtain the consent of the Dock Department to its tunneling under submerged land lying technically within Dock Department jurisdiction.

On behalf of Solomon H. Kohn the law firm of Wollman & Wollman filed a bill in the United States Circuit Court Monday, Nov. 25, asking to have receivers appointed for the Metropolitan Street Railway other than Douglas Robinson and Adrian H. Joline, who were first appointed receivers for the New York City Railway by Judge Lacombe. Papers were formally served from the United States Supreme Court on Judge Lacombe of the United States Circuit Court Nov. 22, directing him to show cause why the receivership of the New York City Railway Company and the Metropolitan Street Railway Company should not be vacated. The service is the result of an appeal to the Supreme Court by Lawyer Roger Foster, who on behalf of several judgment creditors sought at first to have the receivership vacated and then for intervention by his clients in the suit brought by the Pennsylvania Steel Company and the Degnon Contracting Company, against the street railway company. Both motions were denied by Judge Lacombe and Mr. Foster carried the matter to Washington. The papers are returnable on Dec. 2. They require no other action on the part of Judge Lacombe than forwarding to Washington the papers in the case here. The Supreme Court will then hear arguments pro and con. The case will be argued in opposition by the lawyers who opposed Mr. Foster's motions here.

Forty-seven persons were killed last month in street-car accidents in New York according to the reports made to the Public Service Commission. This is a decrease from the number killed during September. The total number of accidents recorded for the month was 4866 as against 5202 for September, and 5500 for the last 26 days of August. The total number of serious injuries inflicted, including the fatal cases, is given as 191 for the month as against 216 for September and 189 for August. The table compiled by the commission is as follows:

Nature of Accident.	No. In October.
Car collision	221
Collisions with vehicles	791
Persons struck by car	354
Injured boarding	510
Injured alighting	593
Employees injured	603
Other accidents	1794
Total	4866

The specific cases of serious injury are given as follows:

Nature of Accident.	No.
Killed	47
Fractured skulls	15
Amputated limbs	9
Broken limbs	40
Other serious	80
Total	191

The commission has issued a final order against the Union Railway Company of the Bronx, which operates nearly all the surface lines in that borough. The order, in effect, calls for a general increase of a little over 25 per cent in the service at present being furnished by the company.

DENIALS IN THE CHICAGO SUIT

The United States Circuit Court of Appeals, in denying the petition of Charles H. Aldrich and Henry Crawford, representing minority stockholders of the West Chicago Street Railway Company, for a review of Judge Grosscup's opinion of the Union Traction reorganization plan, held that they had no legal standing; that their interests had been properly and well looked after. The Fidelity Trust Company, of Philadelphia, trustee for $3,171,000 bonds of the North Chicago Street Railway Company, has joined the other trust companies in application for foreclosure of the mortgages on the various Union Traction properties, preparatory to sale at auction, the understanding being that the Chicago Railways Company will be the only bidder. The next step will be an application to Judge Grosscup to enter an order of possession so that the new ordinance can be accepted. This will be an order on the receivers to lease the properties to the Chicago Railways Company, pending the sale under foreclosure. There may arise some new legal complication, but the Aldrich-Crawford intervention being swept away the course is left clear for the present.

FINANCIAL MEETING OF THE AMERICAN TRADE PRESS ASSOCIATION

A special meeting of the American Trade Press Association was held at the Hardware Club, New York City, on Nov. 21, in response to a call from President E. C. Brown, which said: "The meeting is called for the purpose of considering the conditions now prevailing in commercial and financial affairs and to determine what action should be pursued by this association and its members in assisting to restore public confidence, so ruthlessly shocked by the recent troubles among our local banking institutions and which is powerfully argmented by the 'currency' disturbances now prevailing throughout the length and breadth of the land. As exponents of the financial, commercial and manufacturing interests of the United States, the trade press must assume its natural position and at this critical juncture offer substantial evidence of its ability to lend material aid in stemming the tide now so strongly set against normal business operations."

Mr. Brown in calling the meeting to order emphasized the points made in the call, and stated that the subscribers and advertisers of the publications looked to them for all the assistance in their power. Their editorial columns should show independence of spirit in considering these weighty affairs, especially in dealing with the attitude of the banking community in regard to the merchant, the manufacturer and business people in general.

T. C. Martin then introduced Henry L. Doherty, past president of the National Electric Light Association, and who, he said, was now prominent in a score of public utility corporations and had made economic questions a close study. In administering these large interests Mr. Doherty, as an economist and analyst, had been led to diagnose closely the conditions noted by Mr. Brown and had addressed himself to an examination of the present state of affairs with a care more than ordinary, with results and data that would be very interesting at this juncture.

Mr. Doherty said: "If the present situation is not relieved it threatens to produce a long period of business depression. Regardless of conditions which have led up to this situation, the real condition which confronts and threatens us is the fact that the people who want money and are entitled to it, cannot get it, while a large portion of the people who have money are hoarding it through no other desire to do so than their inability to see any other means of protecting their savings. A vast sum of money has been withdrawn from circulation and has been hidden in safety deposit boxes and other less safe hiding places. A few days ago everybody was deploring the lack of confidence shown by depositors and was ridiculing their conduct as foolish and prejudicial to the country's welfare. To-day we are threatened with something even worse than an ordinary bank run —and from the very class of people who only a few days ago were criticizing others for what they are now doing themselves. Many of the banks throughout the country for their own individual protection—just as in the case of the bank depositor—are now attempting to bring up their reserves, thus removing money from circulation as effectively as though it were locked up in a safety deposit box or otherwise hidden. Many industries, threatened by their temporary inability to get money, are making wholesale retrenchments in purchases of goods and employment of labor. These retrenchments are largely advised by the bankers, in spite of the fact that every retrenchment on the part of one enterprise brings about an enforced retrenchment on the part of others.

"Retrenchment is not the cure for the condition which now confronts us, but is the result of such a condition. The correction of this condition can be summed up in a few words: Find some way, or ways, to bring the hidden money back into circulation before retrenchments have taken place to a point which will not permit re-extension to normal conditions. The main thing now is to convince the men who are leaders in industrial business affairs, first, that it is possible for them to continue, in most instances, without retrenchment with the assurance that an abundance of money will be available in the near future, and, second, to interest them in coaxing this hidden money into circulation.

"It is proposed, for example, to organize a bureau in New York in which every responsible business interest, that is willing to do so, can recommend the purchase of securities, provided it is willing to make this recommendation to its employees and friends as well, and make the communication so read. It is proposed to notify all people seeking investments that this bureau is at their disposal. It is also proposed to give out this information to the other cities throughout the country and invite their co-operation with the New York bureau."

At the close of Mr. Doherty's remarks addresses were made by John A. Hill, John R. Dunlap, James H. McGraw and C. T. Root. Upon motion, President Brown appointed a committee to act in behalf of the association, to be known as the "Committee on Public Relations" and consisting of Messrs. McGraw, Root, Hill and Williams with the president ex-officio.

At a full meeting of the special committee on Nov. 22 the following resolutions were adopted:

Resolved, That the so-called business depression now paralyzing the industries of this country is due principally to a want of confidence which is unwarranted by agricultural and industrial conditions, and that one of the worst results of the panicky feeling that prevails is the hoarding of money, in which many banks are principal offenders—many holding much more cash than the reserves called for by the banking laws, and setting a most hurtful example to individuals.

Resolved, That bank reserves are for just such emergencies as now exist and should be used rather than increased.

Resolved, That it is the duty of the trade press and the business men of this country to make every honest endeavor to find such hoarded money and bring pressure to bear upon its holders to put it back into circulation.

Resolved, That any bank holding more currency than its legal reserve is doing great harm to every business interest and merits no consideration whatever at the hands of merchants, manufacturers or labor.

Resolved, That the trade press be urged to organize business men's meetings in every city to present to the small hoarder of money a means of investing it in safe securities paying good interest, guaranteed if need be by such associations themselves.

Resolved, That money thus released be deposited only in banks that agree to put it back into legitimate channels of trade forthwith, and that manufacturing and mercantile interests be asked to do business with such banks and with them only.

Resolved, That the countermanding of orders, the closing of factories and the laying-off of thousands of wage-earners is uncalled for by any underlying condition of business itself, and that immediate steps to check the senseless scare is demanded of every conservative and politic American.

AWARDS TO EXHIBITORS AT JAMESTOWN EXPOSITION

The report of the Jury of Awards of the Jamestown Exposition to the governor of the Exposition has just been presented. This jury consisted of sixty-four gentlemen, all of whom were prominent authorities upon the apparatus in industries included in the Exposition at Jamestown. Albert Shaw, editor of the *Review of Reviews,* was president. Some other members were: R. Clinton Carpenter, M.S., LL.D., professor of experimental engineering, Cornell University, Ithaca, N. Y.; James Mapes Dodge, chairman Link Belt Company, Philadelphia, Pa.; Carl Hering, B.S., M.E., professor of electrical engineering, Franklin Institute, Philadelphia, Pa.; Gaetano Lanza, C.E., M.E., professor applied mathematics and mechanical engineering, Massachusetts Institute of Technology, Boston, Mass.; Thomas Commerford Martin, editor *Electrical World,* New York City; Joseph Struthers, Ph.D., assistant secretary American Institute Mining Engineers, New York City, and B. V. Swenson, secretary American Street and Interurban Railway Association, New York City.

The following were some of the awards to manufacturers whose apparatus is particularly identified with electric railway work:

DEPARTMENT OF MANUFACTURE AND LIBERAL ARTS

Gold Medals

Carborundum Company, Niagara Falls.—Metallic silicon.

General Electric Company, Schenectady, N. Y.—Arc and incandescent lamps and electric cooking appliances.

Silver Medals

The Bristol Company, Waterbury, Conn.—Bristol's recording voltmeters.

Walworth Manufacturing Company, Boston, Mass.—Steam, gas fitters' and water users' tools and supplies.

In Georgia Collective Exhibit

Acme White Lead Company, Detroit, Mich.—Paints and pigments.

Berry Brothers, Detroit, Mich.—Paints.

Bronze Medals

A. Buch's Sons Company, Elizabethtown, Pa.—Eagle steel lawn swing.

Benjamin Electric Manufacturing Company, Chicago, Ill.—Wireless clusters for incandescent lamps.

DEPARTMENT OF MACHINERY

Gold Medals

Alis-Chalmers Company, Milwaukee, Wis.—Electric generators and motors.

The Goulds Manufacturing Company, New York City.—Power pumps.
General Electric Company, Schenectady, N. Y.—Motors.
General Compressed Air & Vacuum Machinery Company, St. Louis, Mo.—Compressed air and vacuum house-cleaning machinery.
The Pittsburg Automatic Vise & Tool Company, Pittsburg, Pa.—Vises.
Richardson Scale Company, New York.—Automatic weighing scales.
Shelby Steel Tube Company, Pittsburg, Pa.—Seamless steel tubing.
S. A. Woods Machine Company, Boston, Mass.—Woodworking machinery
Babcock & Wilcox Company, Bayonne, N. J.—Water tube boiler, semi-marine type.
S. F. Bowser, Ft. Wayne, Ind.—Measuring pumps and storage tanks.
De Laval Steam Turbine Company, Trenton, N. J.—Steam turbines.
Heine Boiler Company, St. Louis, Mo.—Water tube boilers.
Robbins Belt Conveyor Company, New York.—Belt conveyor.
Westinghouse Machine Company, Pittsburg, Pa.—Gas producer engines and stoker.
R. D. Wood & Company, Philadelphia, Pa.—Gas producers.

Silver Medals

Advance Pump & Compressor Company, Battle Creek, Mich.—Duplex steam pump.
Atlas Engine Works, Indianapolis, Ind.—Gasoline engines.
Bullard Automatic Wrench Co., Providence, R. I.—Automatic wrenches.
Gibson Iron Works Company, Jersey City, N. J.—Dumping grates.
Jordon Brothers, New York City.—Jordon commutator truing device.
Kelly-Springfield Road Roller Company, Springfield, Ohio.—Road rollers used on Exposition grounds.
Moran Flexible Steam Joint Company, Louisville, Ky.—Flexible joints.
New York Leather Belting Company, New York City.—Leather belting.
Wagner Electric Manufacturing Company, St. Louis, Mo.—Single-phase generator set.
Under Feed Stoker Company of America, Chicago, Ill.—Under feed stoker.

DEPARTMENT OF TRANSPORTATION

Gold Medals

American Locomotive Company, New York City.—Locomotives.
Atlantic Equipment Company, New York City.—Atlantic steam shovel.
Baldwin Locomotive Works, Philadelphia, Pa.—Locomotives.
The J. C. Brill Company, Philadelphia, Pa.—Semi-convertible and full convertible cars and equipment.
Dayton Motor Car Company, Dayton, Ohio.—Stoddard-Dayton automobiles.
Pennsylvania Railroad System, Philadelphia, Pa.—Full section of tunnel under Hudson River and models and maps and drawings.
The Standard Steel Works, Philadelphia, Pa.—Steel tires and steel-tired wheels, solid-forged and rolled-steel wheels, open-hearth steel springs of various types.
Studebaker Brothers Manufacturing Company, South Bend, Ind.—Automobiles, street sprinklers, garbage and dump wagons, contractors' wagons and trucks.

Silver Medals

Chesapeake & Ohio Railway Company, Richmond, Va.—Complete vestibuled, steam-heated and electric-lighted F. F. V. train.

In Norfolk & Western Railway Collective Exhibit

Norfolk & Western Railway Company, Roanoke, Va.—Collective exhibit of transportation appliances manufactured along line of railway.

Bronze Medals

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—Steel wheel barrows, wheel scrapers, drag scrapers and four-wheel baggage truck.
Taylor Iron & Steel Company, High Bridge, N. J.—Panama dipper tooth.

DEPARTMENT OF FORESTRY

Gold Medals

Yellow Pine Manufacturers' Association, St. Louis, Mo.—Interior finish of yellow pine.

In Norfolk & Western Railway Collective Exhibit

The Central Manufacturing Company, Roanoke, Va.—Quartered oak stairway.

DEPARTMENT OF MINES AND METALLURGY

Gold Medals

Aluminum Company of America, Pittsburg, Pa.—Manufactured products of bauxite and alumina.
Carborundum Company, Niagara Falls, N. Y.—Carborundum and manufactured products.
Ingersoll & Rand Drill Company, New York City.—Ingersoll-Temple electric air rock drill.
Norton Company, Worcester, Mass.—Alumdum.
Standard Oil Company, Baltimore, Md.—Capital cylinder oil and renowned engine oil.

Silver Medal

In Norfolk & Western Railway Collective Exhibit

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—Steel and wood mining cars.

Bronze Medals

General Electric Company, Schenectady, N. Y.—Special motor used with rock drill.
Oil Well Supply Company, Pittsburg, Pa.—Model oil derrick.

COMPLETING THE BOSTON & WORCESTER DOUBLE TRACK

A location for the stretch of second track through the central part of the town of Framingham, Mass., just granted by the Massachusetts Railroad Commission to the Boston & Worcester Street Railway under the so-called "missing link" law, will give the company a chance to close the final stretch of about 2 miles where the road is still obliged to depend on a single track. Completion of the double-tracking, in the opinion of President James F. Shaw, will mean a considerable increase in the volume of through travel and will increase the safety and frequency of the service. The company has been making other improvements in conjunction with the work of double tracking. It has done a good deal toward removing some of the sharp curves between Framingham and Worcester. At one point an extensive cut and fill has been made to broaden the roadbed and straighten the line where it skirts one of the lakes in the reservoir district through which it passes, and the result will be to give the company a chance to cut the running time from Boston to Worcester by several minutes. It is now about two hours and ten minutes, slightly more than twice the schedule time by steam railroad. The double-tracking will be completed next spring. It will count in the working out of trolley express plans for this road, although the company still awaits a right to get express cars in and out of its terminal cities. The grant of trolley express privileges to the Worcester Consolidated Street Railway by the Worcester City Council recently has been vetoed by the mayor, and is thereby nullified. Regarding the prospect President Shaw, of the Boston & Worcester, says in his annual report:

"I am much disappointed that we have been unable as yet to establish the freight and express service which we have been trying to install, but the Boston Elevated Railway up to this time has been unable to obtain the necessary rights to allow it to take our cars from Chestnut Hill to the center of Boston. We are sure to receive a very handsome net revenue from this business as soon as it can be put into operation. The company is supplied with ample power and equipment to handle the increased business which will come with the completion of the property."

BOSTON & NORTHERN SECURES ALL BUT ONE FREIGHT GRANT

Negotiations for trolley freight and express rights for the Boston & Northern Street Railway lines north from Boston have been carried on so successfully that the company has now secured its local grants in all the separate communities needed to reach from the end of the Boston Elevated Railway Company tracks in Malden, as far as Lowell, excepting in Wakefield. As Wakefield thereby constitutes a missing link, under the Massachusetts law the company may apply for a grant there over the heads of the local officials to the Railroad Commissioners, if the petition remains ungranted for sixty days. The grants already secured are for the company's tracks in Melrose, Reading, North Reading, Wilmington, Tewksbury, Lowell, Dracut, Methuen, North Andover, Middleton and Lynnfield. Some of these are on the line to Lawrence from Reading, but Lawrence itself has not yet been secured. A few other towns are pending. While no through service between Boston and Lowell can be projected until the Boston Elevated Railway Company gets trolley express rights, there is some indication in the grants now obtained that the Boston & Northern Company may consider the advisability of starting an inter-city service in the district north of Boston without waiting for the rights to enter Boston itself. The original Lynn & Boston Railroad was chartered as a railroad and had many privileges not ordinarily accorded to street railways nowadays; and as the Boston & Northern now operates in Lynn and Salem, and a few of the small places west of there under the old Lynn & Boston rights, it is possible that a service might be established out of Lynn or Salem, westward and northward, entering the district where rights have just been secured locally by way of Lynnfield or Middleton, and running thence by way of Reading to Lowell. Such a route would be less valuable to the company and to its patrons, no doubt, than a direct route into Boston, but the line suggested is a busy one, and the express traffic between a mill city like Lowell and a shoe center like Lynn might prove considerable, especially as Lynn has harbor facilities and connection with Boston by water.

NEW PUBLICATIONS

Electrical Traction, by Ernest Wilson and Francis Lydall. Vol. I., 475 pages. Vol. II., 328 pages. New York, Longmans, Green & Company. Price, $4 per vol.

It requires considerable courage in these days to publish a book on electric railway engineering, because the industry is constantly developing, and any publication of this kind is likely to become antiquated, in some parts at least, before it can reach the readers. Nevertheless, there is a demand for a book of this kind, and the authors have been very successful in their treatment of the subject. The latter might be said to be considered from the standpoint of the construction in distinction from the recent treatise of Messrs. Parshall and Hobart in which matters of design have been made more prominent. Both books are written for the engineer and not for the operator.

Volume I. is devoted to direct-current traction and the first part is given up to tramways, the latter part to heavier traction. In neither case is the subject carried further back in the system of distribution than the switchboard. The tramway portion is perhaps the least interesting part to the American reader, although it is thoroughly well done. It is this portion of the subject that British practice differs most from our own. It is necessarily larger than would be a corresponding section in an American book, on account of the variety of practice in Great Britain. This is exemplified by the discussion on types of pole standards, the large number of brakes considered and the space given to surface-contact systems, regenerative control and Board of Trade regulations with their return boosters and other requisites. These are not catalogue descriptions, but the difficulties as well as the benefits are mentioned. This is illustrated in the case of the chapter on surface contact systems, which, although possessing theoretical interest only to an American reader, is interesting from the fact that particulars are given of the actual working of the systems, including short circuiting, wear of she skates and other data. Following the tramway section, which occupies the first twelve chapters in Vol. I., the authors consider heavier work where the practice corresponds more closely to that in America.

Vol. II. is devoted entirely to alternating-current traction, an indication of the extent to which this system is considered favorably in Europe. The first four chapters, or somewhat over 100 pages, are taken up by a treatment of the polyphase motor and include the theory of the motor and a discussion with examples of its practical design and chapters on control and overhead construction. The single-phase motor is discussed in the following 200 pages of the volume. It is treated in the same general way as the polyphase motor, that is, by a discussion of the general theory, followed by chapters on design and calculations for specific sizes of motors of various types. The different methods of control and the practical application of these methods are described in detail for the compensated repulsion and the compensated series motors, with combinations of the two methods of interlocking the various apparatus, etc. In the chapter on overhead construction the authors give a reference to the first printed suggestion in favor of the catenary as having appeared in this paper during 1901, in the form of some reminiscences of the proposed Wellington Adams high-speed road between Chicago and St. Louis. This chapter itself will be found particularly interesting to American readers, owing to the attention which has been given abroad to special problems of overhead catenary construction, such as apparatus for low bridges and tunnels, with bifurcated conductors, to avoid the action of locomotive gases and protective shields to avoid short circuiting of the high-tension conductors. Both volumes have valuable chapters on feeder systems and methods for their computation.

"Städtische Verkehrsfragen" (City Traffic Questions), by Dr. Eng. Wilhelm Mattersdorff. Berlin, Julius Springer, 42 pages, bound in paper with four insets containing thirty-four curves. Price M2.40.

This book is based on the author's endeavor to find the comparative value of the influences that determine city traffic and in its treatment is an elaboration of the article contributed by Mr. Mattersdorff in the Street Railway Journal of June 2, 1906. The writer evidently has made an exhaustive study of traffic conditions in German cities of all classes to find what definite relations, if any, exist between the population of a community and its trackage, car-miles, passenger-miles, seat-use and other units of comparison. Similar data are presented with reference to the principal systems of England and the United States. While the points brought out by Mr. Mattersdorff may be of little practical value toward the solution of the numerous special problems that arise in urban transportation, his methods of comparing results in different cities to find the highest possible limit of various factors should prove of value to those desiring to compare their own traffic possibilities with other cities similarly conditioned.

ANNUAL REPORT OF THE BOSTON & WORCESTER STREET RAILWAY

The annual report of the Boston & Worcester Street Railway Company, for the year ended Sept. 30, 1907, has been issued. The income account compares as follows:

	1907	1906
Gross Receipts	$531,560	$514,464
Operating Expenses	273,365	269,391
Net	$258,195	$245,073
Charges and Taxes	151,661	132,675
Balance	*$106,534	$112.398
Dividends	103,500	103,500
Surplus	$3,034	$8,898
Previous Surplus	25,238	20,679
Total Surplus	$28,272	$29,577
Old Accounts Charged Off	13,321	4,339
Profit and Loss Surplus	$14,951	$25,238

*Equal to 4.81 per cent on the $2,200,000 capital stock.

The balance sheet as of Oct. 1, 1907, compares with the two previous years as follows:

ASSETS.

	1907	1906
Traction and Construction	$2,897,908	$2,568,826
Power Stations	634,092	632,083
Car Houses, Lands	244,401	206,788
Rolling Stock, Etc.	655,989	612,092
Suspense Account	.....	.....
Bond Discount	.....	.....
Cash and Miscellaneous Assets	183,592	112,637
Total	$4,615,984	$4,132,426

LIABILITIES.

	1907	1906
Capital Stock	$1,725,000	$1,725,000
Funded Debt	1,716,000	1,717,000
Notes Payable Held By Boston & Worcester Electric Company	600,000	600,000
Notes Payable	462,204	5,070
Interest Accrued	16,577	13,412
Taxes Accrued	37,796	37,643
Sinking Fund	.....	888
Profit and Loss	14,951	25,238
Accounts Payable	43,453	8,172
Total	$4,615,984	$4,132,426

President James F. Shaw, in the annual report, says in part:

"Notwithstanding that the past year has been a very poor one for street railways all over New England, the business of the Boston & Worcester Company has shown a healthy increase in its local traffic. The through business from Boston to Worcester has not increased during the year, and I do not look for any increase of importance until our through line is completely double tracked, which will permit of a reduction in the running time between Boston and Worcester. There are now less than two miles of double tracking to be completed and we hope to finish this work by early spring.

"I am much disappointed that we have been unable as yet to establish the freight and express service which we have been trying to install, but the Boston Elevated Railway Company up to this time has failed to obtain the necessary rights to allow it to take our cars from Chestnut Hill to the center of Boston. We are sure to receive a very handsome net revenue from this business as soon as it can be put into operation.

"A total of 10,571,065 fares were collected during the year as compared with 10,279,303 fares the preceding year, and these were received on a car mileage of 1,820,905 miles, as compared with 1,862,136 miles last year. A table of earnings per car-hour and per car-mile follows:

Route	Earn. per car-hour 1907	Earn. per car-hour 1906	Earn. per car-mile 1907	Earn. per car-mile 1906
Boston & Worcester	$7.08	$6.56	$.342	$.316
Boston & So. Framingham.	4.23	3.97	.226	.210
Local Lines	2.31	2.32	.225	.229

"The company is supplied with ample power and equipment to handle the increased business which will come with the completion of the property.

"The population of both Boston and Worcester, our terminals, is increasing rapidly, and the territory between these two cities is showing a remarkable growth."

CHANGES IN THE PERSONNEL OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY

Formal announcement has been made by the Public Service Corporation that two of its vice-presidents, A. B. Carleton and Col. Charles A. Sterling, have resigned and that their places will be taken by officers of the United Electric Company, one of the subsidiary concerns. Fred Evans, secretary of the corporation, also resigns, and his place will be taken by Col. E. W. Hine, assistant to the president.

REROUTING CARS IN CLEVELAND

J. J. Stanley, general manager of the Cleveland Electric Railway, has completed plans for rerouting cars permanently to avoid congestion at the Public Square during the rush hours of the day. It will be some time, however, before this can be put into effect, as quite a little special work will be required for the new loops that will be necessary. All through lines with the exception of Broadway and St. Clair will continue as such. The Euclid Avenue line will be the only one to operate through to the Union Station. However, the cars on other lines which have been going to that point and turning will be turned at the square. The new plan includes loops about the northwest quarter of the square which has not been used in the past for railway purposes. Euclid and Wade Park cars will turn on the loop around the southeast section of the square, while Woodland, Scoville, Broadway, Union and West Fourteenth Street cars will turn about the southwest section, passing the Forest City House. All West Side cars will turn about the northwest section. Cars coming down Ontario Street from the south will turn on a new loop around East Fourth, Prospect, East Second and High Street. Payne and Superior Avenue cars will turn on a loop around Superior, East Fifth, Rockwell Street and Ontario, which will be a new loop. St. Clair Avenue cars will turn on another new loop around East Ninth Street, Rockwell Street, Ontario and St. Clair Avenues. Through cars on the Woodland and Lorain and on Scovill and Clark lines will pass from Ontario Street to Champlain to West Third and Superior, instead of passing through the Public Square.

The fact that the Public Square is divided into four sections by Ontario Street and Superior Avenue makes it possible to make the new routings without much trouble, with the exception that pedestrians will probably find a little more trouble in crossing it than at the present, since an additional section is to be used. Cars will also cross other streets in forming the new loops where there are no lines at present. Fewer cars will reach the Union Station and the transfers will therefore be much heavier in order to accommodate the traveling public. With the addition of the cars of the Forest City Railway Company all reaching the square, the possibility of operating cars over the old route had become very small and something had to be done to avoid the delays that occurred several times a day through blockades.

Meetings of the directors of the Cleveland Electric were held both Wednesday and Thursday afternoons, President Andrews having hurried back from a trip to New York and Rochester to be present. Nothing, however, was given out as to the proceedings and the officers would not even intimate what the subject was of their deliberations in advance of a possible meeting with the City Council, which had delayed further low-fare proceedings pending a reply to the semi-arbitration proposition made to the board. Some of the directors have proposed to fight the matter out along the original lines, it is said, but the more conservative element of the board has been willing to wait until there was a tendency on the part of the administration toward a more reasonable settlement than it has yet been willing to consider.

OPERATING CHANGES AT MANSFIELD, OHIO

On Dec. 1 the operating departments of the Mansfield Railway, Light & Power Company's city lines and the interurban road between Mansfield and Shelby and Bucyrus will be consolidated. Sidney A. Foltz, general manager of the city lines, will become division superintendent of the interurban lines forming the Ohio Central division of the Cleveland, Southwestern & Columbus Railway Company. Mr. Foltz succeeds D. H. Lavenberg, of Galion, who resigned his position because of ill health. This change adds 30 miles of road to this division, making 50 miles in all. J. K. Gray, who has resigned as superintendent of the Western Ohio, will be assistant superintendent of this division and the headquarters will be moved from Galion to Mansfield. The Cleveland, Southwestern & Columbus is getting its operating departments centralized and in shape to take care of the extensive lines that it has acquired and is building at the present time. When the Cleveland, Ashland & Mansfield line is completed the system will be a large one. There are still prospects for a Columbus extension which will place it in a still more commanding position.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED NOV. 12, 1907.

870,564. Third-Rail Electric Railway System; Charles Kozesnik, New York, N. Y. App. filed June 16, 1904. Relates to that class of third-rails composed of separate sections which are in circuit only when the contact shoes of the cars are bearing thereon.

870,590. Dust Preventer; Baldwin F. Schirmer, Indianapolis, Ind. App. filed Nov. 4, 1905. A shield mounted under a car or other vehicle slightly above the roadbed to prevent the dust rising.

870,591. Street Railway Curve Sweeper and Lubricator; David P. Small, Mount Oliver Borough, Pa. App. filed Sept. 6, 1907. Relates to a device for sweeping and lubricating the groove rails at curves, crossing and intersections on street railway tracks.

870,618. Underground Railway System; Jacob H. Farrar, Chicago, Ill. App. filed March 18, 1907. An underground railway system utilizing space underneath sidewalks instead of under the streets.

870,621. Electric Railway Signaling System; Norman P. Fraser and William Gribben, Carsonville, Mich. App. filed May 17, 1907. Means whereby trains may receive warning when they approach within a danger limit. Make use of special section third-rails.

870,622. Electric Signaling System; Willard H. Gilman, Medford, Mass. App. filed Oct. 31, 1906. A railway signal system of the type in which communication is had to various points along the roadway over a signal wire. A particular station of the line is responsive by mechanism acting with current pulsations of a certain character.

870,755. Trolley-Pole Guide; Lewis A. Allen, Passaic, N. J. App. filed Aug. 14, 1907. A roller of hour-glass shape is impelled into position to guide the trolley wheel on the wire by tension on the operation cord.

870,802. Vehicle Control System; Norman W. Storer, Pittsburg, Pa. App. filed Jan. 3, 1906. Means for maintaining an equal distribution of weight upon the several pairs of vehicle truck wheels during the starting period.

870,806. Fluid Pressure Brake; Walter V. Turner, Edgewood, Pa. App. filed April 12, 1907. A double check valve device comprising a casing containing a double head valve piston and having an inlet port intermediate the piston heads, and an outlet port communicating with each check valve and controlled by the respective piston heads.

870,816. Vehicle Motor Control System; William Cooper, Wilkinsburg, Pa. App. filed Jan. 3, 1906. Provides means for regulating the torque applied to the several pairs of wheels that a maximum accelerating force is insured.

870,842. Anti-Rail-Spreading Device and Gage; Zachariah L. Pierce, Hanna City, Ill. App. filed Oct. 29, 1906. A pair of thrust-plates engage the opposite ends of two ties and have rail-engaging bars adjustably attached thereto.

870,889. Paving Block; Alexander Kelley, Wilmington, Del. App. filed Jan. 23, 1907. A paving block having a tongue adapted to fit between the base and head of a street-railway rail. The block is reversible so that when one surface has worn away, it may be reversed and relaid.

870,992. Railway Switch; Joseph F. Reese and Court L. Miner, Lucerne, Ind. App. filed March 6, 1907. Details of construction of a switch adapted to be tripped from a moving car.

870,999. Trolley Harp; Samuel T. Simmons, Columbus, Ohio. App. filed April 16, 1906. The trolley wheel swings on an axis in vertical alignment with that of its pivoted support through a limited angle.

871,065. Metallic Railway Tie; Albert L. Moorhead, Telluride, Col. App. filed March 23, 1907. Comprises a cast metal body having large end blocks united by a reduced connecting portion, said end blocks having seats in their upper faces for the reception of track rails and upon their lower or bottom faces longitudinally extending depending ribs to prevent them from slipping or creeping.

PERSONAL MENTION

MR. R. MEIGHEN was elected a director of the Montreal Street Railway Company at the annual meeting of the shareholders, which was held last week.

MR. ROBERT E. WATSON has resigned the presidency of the Columbus Railway, Light & Power Company, of Columbus, Miss., to take effect immediately, and Mr. C. F. Sherrod, a local business man, has been elected in his stead.

MR. J. W. McFARLAND has been appointed general superintendent of the Macon Railway & Light Company, Macon, Ga. Mr. McFarland is well known in electric railway circles, having formerly been general superintendent of the Chattanooga Electric Railway Company, of Chattanooga, Tenn., for ten years. Previous to that he was general superintendent of the Savannah Electric Company for eight years.

MR. G. C. KILLEEN has resigned as master mechanic of the New Jersey & Pennsylvania Traction Company, of Trenton, N. J. Mr. Killeen has had extended mechanical experience in both city and interurban service, having previously spent six years with the Public Service Corporation of New Jersey, during three years of which he was employed as foreman of the armature and controller department and one year as superintendent of rolling equipment in District No. 4, covering some of the most important territory operated by the company. Mr. Killeen has not yet made any definite plans for the future.

MR. BERNARD CORRIGAN, JR., son of Mr. Bernard Corrigan, president of the Kansas City Railway & Light Company, of Kansas City, Mo., is dead, aged 26 years. Mr. Corrigan, Jr., succumbed to typhoid fever, and the father is nearly prostrated at his loss. The young man graduated about four years ago in law at Michigan University, but had never practiced. Instead he turned his attention to purely business affairs, becoming connected with the Midland Mining Company, with coal properties at Novinger, Mo. Quite recently he had been elected president of the company. Mr. Corrigan is survived by a widow, who was formerly Miss Gladys M. Jones, to whom he had only been married about five months.

MR. WM. J. SMITH, general manager of the Titusville Electric Traction Company, of Titusville, Pa., was elected president and a director of the company at a meeting held Nov. 22, 1907. Mr. Smith is also president and a director of the Federal Gas Company and of the Titusville Gas & Power Company, of Titusville. In 1884, as a boy of twelve, he entered the service of what is now known as the Public Service Corporation of New Jersey, acting in various capacities until 1894 when he became connected with the Staten Island Electric Railroad. Later, Mr. Smith became superintendent of the Staten Island Midland Railroad, and in 1903 was appointed general manager of the Titusville Electric Traction Company.

MR. WARREN S. HALL, vice-president and general manager of the Lehigh Valley Transit Company, of Allentown, Pa., has resigned, the resignation to take effect Dec. 1. Mr. Hall has also resigned as director of the Allentown Electric Light & Power Company, the resignation to become effective at the convenience of the board of directors. The duties of vice-president and general manager of the Lehigh Valley Transit Company will be assumed by President R. P. Stevens. Mr. Hall became general manager of the Lehigh Valley Transit Company May 10, 1904, when the company was still under the control of the Lehigh Valey Traction Company. When still a young man Mr. Hall assumed control, as general manager, of the street railway lines in Hudson County, N. J. This was in 1892. In New Jersey he served under Mr. David Young, a director of the Lehigh Valley, and was appointed to the latter company from the North Jersey Street Railway.

MR. WILLIAM WHARTON, JR., president of William Wharton, Jr., & Company, of Philadelphia, died at his home in Germantown, Nov. 26, at the age of 78 years. He had been ill for some eight months and the immediate cause of his death was heart trouble. Mr. Wharton has long been prominently associated with the street railway business and has contributed greatly to its success by his inventions connected with track construction, many of which date back to horse car days. During the period of cable development William Wharton, Jr., & Company built, as contractors, a number of the important roads in the East. Mr. Wharton was one of the first to recognize the value in this country of manganese steel for points subject to great wear, and a considerable part of his later business life was devoted to improvements in maganese steel rails and special work. He belonged to an old Philadelphia family and was a brother of Mr. Joseph Wharton, who has also been prominent in the iron and steel industry in Pennsylvania and is president of the board of managers of Swarthmore College. Mr. William Wharton has attended a great many meetings of the American Street and Interurban Railway Association, and has been a member of the executive committee of the Manufacturers' Association since its organization.

SIR J. CLIFTON ROBINSON, accompanied by Lady Robinson, was a passenger on the steamer Mauretania, which arrived in New York last week. Sir Clifton is managing director of the London United Electric Tramways Company and is on a trip around the world. He expects to be away five or six months on the trip. This is not his first visit to the United States as during the eighties he was engineer for The Los Angeles cable railway and presented a comprehensive paper on cable railways at a meeting of the American Street Railway Association, at Pittsburg, in 1891. During an earlier visit he built a number of horse railways and for some time was connected with the Broadway & Seventh Avenue Railway Company. His work in England commenced in 1860, when he became associated with the late Mr. Charles Francis Train in the construction of the first tramway in Europe, at Birkenhead. Later Sir Clifton came to America with Mr. Train and remained here for five years engaged in street railway construction. In 1871 he returned to Europe, where he became associated with the Cork tramways; in 1875 he was appointed general manager of the Bristol tramways, and later manager and secretary of the Edinburgh tramways. In 1884 he built the first cable line in England, the Highgate Cable Tramway of London. Later he spent several years again in America in connection with cable construction, as mentioned above, but in 1891 returned to England to instal the electrical equipment of the Bristol tramways, the first line in Great Britain to be so equipped. Other lines of which he has been engineer and manager are the Dublin Southern, Stockton, Middlesbrough and London United. He is now managing director for London United Electric Tramways Company and Imperial Tramways Company, a director and engineer of the Bristol Electric Tramways Company and a director of the Metropolitan District Railway Company, the Underground Electric Railways Company, Ltd., of London, and the Corris Railway. He is a member of the Institution of Electrical Engineers, an associate member of the Institute of Civil Engineers and was knighted in 1905 by King Edward for his public services in tramway construction. Sir Clifton is also chairman of the transportation section of the coming Franco-British Exposition, which is to be opened at Shepherd's Bush, London, next May.

SIR CLIFTON ROBINSON.

In an interview on the subject of municipal ownership of street railways during the present trip, Sir Clifton said: "Municipal ownership is a good thing if the transportation systems, while owned by the city, are operated by a private concern. If the operation of the system is left in the hands of the city there is danger of political influence and social pull. It is the facility with which municipalities can get money, and their utter lack of responsibility in spending it, that causes them to carry passengers in England at 1-cent fares without regard as to whether the year's work results in a loss or a profit."