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Ticket Rates in Ohio and Indiana

The Ohio Interurban Railway Association, after some five or six months of consideration and reconsideration of the question of an interchangeable coupon ticket good on different Ohio interurban roads, came finally to a decision, as announced in these columns some months ago. The Indiana Electric Railway Association is now in the midst of a similar dilemma, for dilemma it can truly be called when all of the points to which attention must be given are considered. As the regular rates of interurban roads per mile vary considerably, it is utterly impractical to adopt a mileage book, because such mileage book would have to be sold at a rate per mile lower than the lowest regular rate of any company party to the agreement. The very simple and satisfactory way out of this difficulty adopted in Ohio was to issue, instead of mileage books, coupon books containing a certain number of 5-cent coupons, these coupons being accepted in place of money in payment of fare on the various roads. The books in Ohio are sold at a rate which gives the traveler a reduction of 16⅔ per cent from his regular fare. These books are proving very popular with the traveling men, and we understand that over 1000 are already in use, although they have been out but a short time.

Now comes the Indiana Association with an equal appreciation of the importance of an interchangeable ticket and a committee to investigate the matter, as noted in the report of the Lebanon meeting of that association. Although no conclusions have been reached, it is evident at this stage of the game that any ticket adopted by the Indiana roads must be of the same general character as the Ohio ticket, because the Indiana roads also vary greatly as to the rate charged for regular fare per mile. The Indiana rates are some of them so low that it is not thought the companies with the lower rates would enter an agreement which would cause a 16⅔ per cent reduction from the regular fare on coupon tickets. The sentiment in Indiana seems to be in favor of a reduction of not over 10 per cent. Now, it is highly desirable that the same form of ticket be adopted by both States. The Ohio Association realizes this so much that the officers of the Ohio Association are following the proceedings of the Indiana men with a great deal of interest. They make no secret of the fact that they think that the adoption of a different ticket in the two States would be a mistake. These tickets are intended for the regular traveler more than for anyone else, and, as a general thing, those who travel in Ohio also travel in Indiana. It will be to the benefit of the roads of both States if a ticket good in both States be adopted. There is at the present time apparently a difference of exactly 6⅔ per cent in the ideas of the associations of the two States, although the Indiana Association has been careful not to go on record as yet. In Ohio, when this ticket matter was first brought up, the conditions as to rates of fare were much the same as in Indiana—that is, there were some roads having rates as low as 1¼ cents a mile, and a reduction of 16⅔ per cent was more than these roads could stand. The difficulty has been got over in Ohio by the raising of the rates by such companies as had this low rate.

It may be necessary for the Ohio men to agree to a smaller discount on coupon tickets than is now in force if there is to be a ticket good in both States. At any rate, the Indiana Association will do well to go very slow before adopting a separate ticket from the Ohio roads. The two States have everything to gain and nothing to lose by uniting on a form of ticket acceptable to both. The matter will have to be compromised, but by giving a little here and a little there, the companies ought to get together to the advantage of all.

Free Interline Baggage in Ohio

The broad-minded spirit of the men in charge of the Ohio interurban railway properties has been well illustrated by the decision recently reached in the Ohio Interurban Railway Association to check baggage free on interline business where a passenger has a ticket over two or more connecting lines. Although many of the companies do not really desire this, the decision was unanimously in favor of checking free on interline business, because of a belief that it was for the good of all interurban traffic in general to do this and that no one company should stand in the way of what some other companies feel strongly to be necessary. As a consequence of this rule, some rather queer situations can be found among the Southern Ohio roads, where a passenger holding an interline ticket gets his baggage carried free, while next to him may be a passenger with a local ticket who is charged 25 cents for his trunk. Of course, there is more justice than at first appears in such a state of affairs, because the company, to handle the local passenger's trunk, may be put to considerable more trouble in proportion to the revenue received than in the case of the through passenger. It is probable, however, that this rule is an entering wedge which will in time result in the free checking of local baggage on all the Ohio roads.

Considerable fear has been expressed lest checking baggage free result in the abuse of the privilege so that merchandise and express matter will be carried by local passengers as baggage, where before it would go as express or freight at express or freight rates. We are inclined to think that an abuse of this kind could be prevented to a large extent by a strict interpretation of the rules regarding personal baggage. Miscellaneous merchandise cannot be checked on steam railroads as personal baggage, nor should it be so checked on electric roads. Of course, it is possible that some regular local passengers might find it worth while to pack merchandise in trunks for the sake of getting free transportation for it, but everything considered, it is not likely that these abuses would amount to much in the aggregate. One of the greatest fears seems to be that free baggage privileges will be taken advantage of by farmers who make a regular trip to town with farm products, but it ought not to be difficult to stop such abuses.

Lighting Offices from Car Houses

When the general offices of a street railway company chance to be located near a car house it is often worth while to ascertain if they cannot be lighted at less expense than by the purchase of current from the local electric light company. The matter is a simple one if an alternating-current sub-station is installed at the car house for the power supply of the local cars, and unless the local central station is in a position to quote exceedingly low rates it generally is cheaper for the street railway company to install its own transformers and supply the office and car house lights from its own circuits.

With direct-current 600-volt supply in the car house and no alternating circuits available at the offices, a frequent method of obtaining lighting current independently of the central station is to install a motor-generator set in the car house, as the insurance rules forbid the installation of either lighting or power circuits in ordinary buildings when one side of the line is the trolley wire and the other side the ground return. The motor-generator set is, of course, open to the objection of any moving mechanism in comparison with a stationary system like that furnished by a small lighting transformer and its connections; it may also occupy floor space which can ill be spared; it induces the never-ceasing charges of interest, insurance, taxes and depreciation, requires some attendance, and at loads below its normal rating sags considerably in efficiency of transformation.

These objections, however, are often far from serious in connection with car house operation. The motor-generator bears an enviable reputation for maintaining continuous service. It can easily be installed on an overhead platform if floor space is not available, particularly in the small sizes necessary for lighting service, and as for attendance, the cost of looking after the outfit by the regular car house force is insignificant. The success which has attended the motor-generator in the exacting requirements of telephone exchange operation is a good thing to remember.

Each specific case, however, must be figured on its own merits, the treatment being somewhat as follows, assuming a concrete example: Given a suite of general offices adjoining a car house, with a total installation of 120 incandescent lamps of the usual 16-cp type, and local lighting rates 15 cents per kw-hour, it is interesting to compare the cost of home production with the central station bill for a year's service. Assuming that the average lighting load occurs with 60 lamps burning 1½ hours per day and 300 days per year, with a Sunday and holiday average of 10 lamps burning 1 hour each, we have an annual consumption of 2760 lamp-hours. Allowing 15 lamps per kilowatt, the bill comes to $276, or $23 per month. With a 10 per cent discount, the cost of office lighting falls to approximately $250 per annum, the energy consumption at the meter being 1,843,000 watt-hours. Assuming a flat rate of 10 cents per kw-hour, the bill amounts to about $185.

A motor-generator set rated at 6.5 kw, and consisting of a 125-volt direct-current generator, direct driven by a 600-volt motor, would be amply large for the work in hand and allow liberal provision for future extension of the lighting service. Such a machine should not cost over $500 installed, and allowing 6 per cent interest, 8 per cent depreciation and 1 per cent insurance and taxes, the fixed charges come to $75. The cost of attendance and maintenance ought not to exceed $25 per year. As for the cost of power, it should be possible in most cases to supply 600-volt direct current at a city car house trolley wire at not over 2.5 cents per kw-hour. With 1893 kw-hours demanded by the lighting circuits and an allowance of 75 per cent as the efficiency of the motor-generator set, we have a power cost of $61.50. The total cost of the lighting service, exclusive of lamp renewals, which we may assume to fall upon the street railway company in each case, amounts to about $162 per year, or a little over $13 per month.

It will be seen from these figures that unless the central station rate for commercial incandescent lamps is well down toward what is, in many localities, a low price for even power service, it is decidedly worth taking a little time and trouble to find out just what the possibilities are. In case the trolley voltage fluctuates widely at the car house, it will probably be necessary to install a differentially wound generator instead of the ordinary compound machine. When the car house sub-station includes a storage battery, however, there need be little anxiety in regard to the regulation of the lamp voltage. With alternating current at the power house and no sub-station at the car house, it is important to figure the cost of running an a. c. line for both car house and office lighting before deciding either to patronize the local central station or to install a motor-generator set. A hundred dollars a year is the equivalent of 2000 5-cent fares, and is worth saving in any event.

The Rapid Transit Problem

One of the most interesting features of opening new rapid transit lines for service in the densely populated districts of large cities is the effect of these additional facilities upon the volume and distribution of traffic within the tributary region. It has long been recognized that a permanent solution of the rapid transit problem in a growing city cannot be secured by the development of any single route of high-speed service. New facilities not only open up additional avenues of travel and thereby tend to—and often do—relieve the congestion existing upon other lines; they apparently create traffic, which sooner or later grows to a volume that requires additional means of transportation to be furnished. In other words, the new routes laid out from time to time produce a temporary alleviation, but ultimately become inadequate to handle the traffic which seeks outlets through them.

This absence of a permanent cure of congestion by any specific remedial line of transit has led to the belief in some quarters that there is little hope of solving the problem of urban transportation by increasing the internal railway facilities of great cities through the addition of subways, tunnels, elevated structures and even surface routes to the existing means of handling traffic. This contention is ably supported in a recent number of the "Forum" by Henry Harrison Suplee in his review of recent progress in applied science. Mr. Suplee's argument, in brief, is that the provision of greater facilities cannot be expected to relieve a congestion which they really aid in creating; that they actually attract more people to the business districts, increasing the number of persons daily carried between the business and the residence sections; that the strongest hope of relief at present lies in a wider dispersion of the residence sections from the business districts; that every effort should be made to discourage the provision of additional facilities reaching such portions of the city as are already well filled, while making it exceedingly convenient to reach fairly remote and partially developed suburbs; that numerous trains should be run from the heart of the business districts at maximum speed to suburbs where there is room to spread, giving no opportunity for alighting in the sections already well filled; and that a large part of the traffic could thus be directed over a far greater area, leading ultimately to the use of the entire area of the original city for business purposes, with a tributary suburban residence area outside, having reasonable population density.

In looking into problems of this character it is important to take the broadest possible view of the factors and conditions involved. Pedestrian and vehicular traffic contribute to the congestion of cities no less than does railway traffic. It is open to grave doubt whether the sum total of traffic in a large city is increased to such an extent by new rapid transit lines that the congestion of the city as a whole is made worse than before the new lines were opened for service. Rather it appears that the regular growth of great cities, increase of population, addition of new industrial establishments, extension of office building facilities and the like—phenomena set in motion by deeper economic causes than the mere creation of new internal rapid transit routes—are the true causes of urban congestion. Concentration is the great tendency of twentieth century business. The modern office building would certainly appear to be a far greater cause of congestion than the rapid transit line, which is constantly at work in the effort to relieve the condition in the territory which it serves. It must not be forgotten that every person who travels by a rapid transit line means one less pedestrian or vehicle passenger on the street itself; that the movement of large numbers of people upon railways is a far more speedy and efficient method of relieving congested streets than any other known.

It is reasonably certain that the growth of great cities continues and will continue even where new rapid transit routes are not opened. Whether we like it or not, the business of these cities gravitates to the central region every time, and there is little prospect that the trend of affairs in the future will be outward until the saturation point of the congested district is well in sight. Certain manufacturing plants, educational institutions and special organizations like music halls, art museums, etc., swing away from the heart of a metropolitan business district long before the region overflows into the less populous sections; but the vast majority of a city's workers, housed during business hours within office buildings and mercantile establishments, or else occupied in or about the streets themselves, can only be relieved from the throttling conditions of slow travel by internal rapid transit routes. It is only necessary to see the colossal inconvenience suffered by congested districts which remain unprovided with rapid transit facilities to appreciate the great usefulness of such facilities in making travel easier and quicker. If a modern large city should stop growing, the rapid transit problem could readily be solved, and solved permanently; as it is, the best that can be done is to develop such routes as nearly as possible along the consistent lines of an efficient and inter-related system. Comprehensive schemes of this character are being worked out at the present time in New York on north and south lines, not to mention the great railroad developments running from west to east.

Enough has been said, we believe, to show that internal rapid transit routes relieve congestion as a whole instead of increase it; that they do not of themselves notably increase the population of our great cities, since by their inception they enable urban workers to travel more speedily and easily within the congested districts, and also to live further away from their places of business; and finally, that the office building—specifically the high-speed passenger elevator—is one of the prime causes of urban congestion, and is likely to remain so. Hence the unwisdom of trying to stem the tide of city travel by overburdening the existing facilities for its handling, and the far-sighted sagacity of providing new routes in a comprehensive transportation scheme within the city limits.

As for the suburban problem, the electrical equipment of steam railway local service offers the best solution at the present time. The running of numerous express trains without stops from the business district to sparsely settled suburbs is an operating scheme of doubtful financial expediency. Frequent and limited service of this character can seldom be profitably given without an adequate volume of supporting traffic. The rapid acceleration of the electric motor in comparison with the steam locomotive means a great deal to the distant suburbanite in the way of shortened time of transit. The elimination of stops is a serious question outside the city proper, and particularly is this true within the zone of 5-cent fares on the trolley lines. It is safe to say that suburban development must be from within the city outward, and that artificial restrictions of suburban population density based upon reduced service are bound to be of doubtful value from the standpoint of both the traveling public and the transportation companies.

POWER HOUSE OF THE INDIANAPOLIS & CINCINNATI TRACTION COMPANY

A description was published in the Street Railway Journal for Feb. 18 of the single-phase system of the Indianapolis & Cincinnati Traction Company. Single-phase operation is, however, not the only interesting feature of the installation, the general engineering involved, and especially the equipment of the power house, being worthy of careful attention. The selection of

STANDARD CAR, RUSHVILLE LINE

Sargent & Lundy as the consulting engineers made it certain that the whole work of equipment and installation would be along the most skilful lines of modern practice. Their latest work fully sustains the high reputation of this firm. Some particulars of the power station were published in the previous issue referred to, but in view of the interest which attaches to this line, further information, which was not available at the time of the previous description, is now published.

Current for the operation of 120 miles of railway is supplied from a single power station. This is located in Rushville, Ind., about 40 miles from Indianapolis and about 80 miles from the other end of the completed line. The site is adjacent to the Cincinnati, Hamilton & Dayton Railway, with a connecting track from that road to the company's side track alongside the power station, which track in turn is connected to the main track of the operating company. This arrangement is convenient for ordinary business, and will be especially useful whenever it becomes necessary to burn coal under the boilers. Natural gas is now being used. The side track along the power station is built at a proper level for the dumping and crushing of coal, so that it can be handled by carrier and elevator and fed under the boilers on chain grates without manual handling of any kind. A mill race from the stream known as "Flat Rock" runs along the east side of the power station. The company has a perpetual contract for the use of this water for condensing and other purposes.

BUILDING

The station building is 113 ft. x 128 ft. 10 ins., and is of very heavy and substantial construction. The foundations are of concrete and the upper walls are of brick laid with cement mortar. The floors and other frame work and roof structure are of steel. Floors are of concrete, and a gravel asphalt roof is laid upon a concrete base with expanded metal, leaving nothing about the building that can burn except the doors and windows. The building is designed and constructed with a view to the installation of coal-crushing and automatic coal-handling machinery, with overhead bunkers feeding direct to the boiler grates. As natural gas is being used as fuel at the present time, the coal bunkers and carriers have not yet been put in, but everything is prepared for their installation, even to the punching of holes in the steel structure from which the coal bunkers will be suspended.

Foundations for the engines, boilers, pumps and other machinery are all of solid concrete. Stairways are made of either steel or concrete. The cellars and chambers for electric wires, cables, switches, transformers, protective apparatus, etc., are built according to the most modern practice and in the most substantial manner. The structural and architectural features of the building were designed by Sargent & Lundy, the consulting engineers, and constructed under their supervision. The John A. Schumacker Company, of Indianapolis, was the general contractor, and the American Bridge Company furnished the larger part of the steel work.

WATER TUNNELS

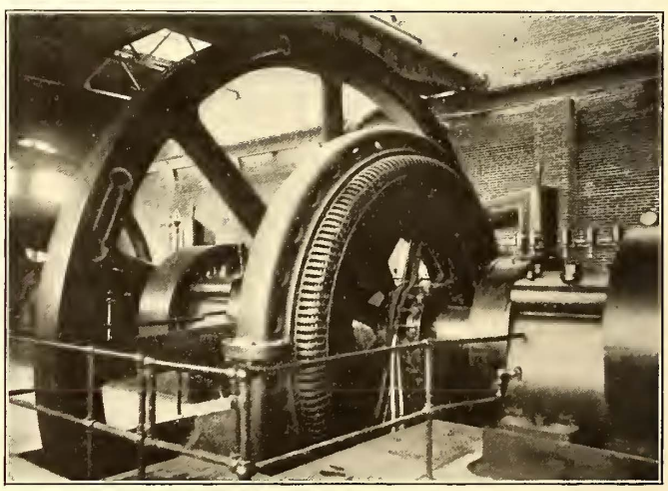
A concrete tunnel or pipe 3 ft. 6 ins. in diameter, running under the basement floor, conveys the water from the mill race to the condensers, and a similarly constructed tunnel is provided to carry the water back again to the mill race, connecting at a point some 300 ft. below the intake. The supply tunnel is provided with an intake crib which is equipped with an iron grill and removable screens.

SMOKESTACK

At the east end of the power station erected upon a heavy concrete base is a well proportioned, self-supporting steel stack 180 ft. high, lined its entire length with fire brick. The inside measurement of the stack is 11 ft. It is of sufficient size to take care of eight 350-hp boilers, space for which is provided in the present building. The stack was constructed by the S. Freeman & Sons Manufacturing Company, of Racine, Wis.

FUTURE EXTENSIONS

The power house is so framed and constructed that the west wall can be taken out without disturbing the other walls or the present steel frame work, and the building extended to the

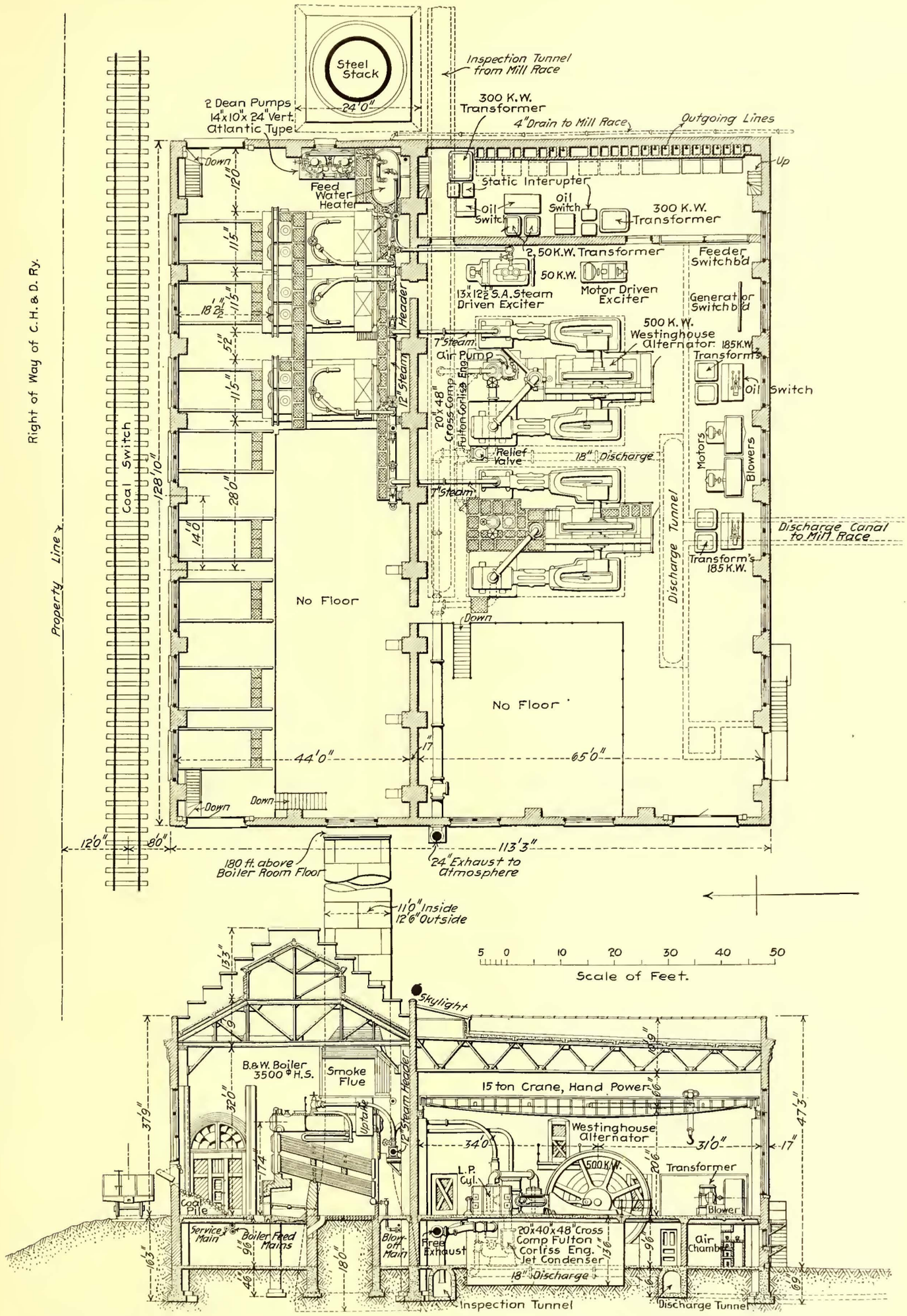


VIEW OF ONE OF THE GENERATING UNITS

west. For this purpose a space of over 200 ft. has been reserved for extensions to accommodate the future needs of the company.

EQUIPMENT

The present equipment includes three Babcock & Wilcox water-tube boilers of 350-hp nominal capacity each. Each boiler contains in the setting a Babcock & Wilcox superheater proportioned for about 100 degs. of superheat. Space is provided in the building for five additional boilers of the same capacity, which will be installed as rapidly as additional power is required. Natural gas is being burned under the boilers,

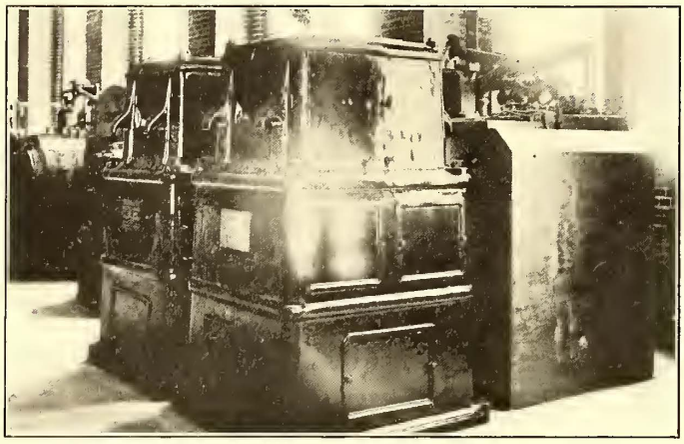


PLAN AND ELEVATION OF POWER HOUSE, SHOWING ARRANGEMENT OF GENERATING APPARATUS, STEAM PIPING, AUXILIARIES, ETC.

but, as has already been said, provision is made for the use of coal if at any time the supply of natural gas becomes exhausted. The boilers are now equipped with flat grates set in an extension furnace, but the setting is arranged so that chain grate stokers can be easily installed when the coal-handling apparatus is put in.

The boiler room is equipped with a large open exhaust feed-water heater of the Stillwell-Bierce make, and with two vertical "Atlantic type" feed-pumps, built by the Dean Brothers Steam Pump Works, of Indianapolis.

The engine room is provided with a traveling crane, built by the Northern Engineering Works, of Milwaukee, of sufficient



250-KW AIR-BLAST TRANSFORMERS AND OIL SWITCHES

capacity to handle all the machinery, and which greatly simplifies the work of installation. The present generating equipment, as stated in the previous issue, includes two 700-hp Corliss type, cross-compound, condensing engines, built by the Fulton Iron Works, of St. Louis, Mo. Each engine is equipped with an independent steam drive jet condenser, made by the Dean Brothers Steam Pump Works. The condensers are set in the basement, but are arranged for operation from the main floor level.

Each engine is direct connected to a 500-kw, 2300-volt, three-phase, 25-cycle, Westinghouse revolving-field, alternating-current generator running at a speed of 94 r. p. m. The engines are operated at a steam pressure of 140 lbs. per square inch, and are guaranteed to deliver the maximum capacity necessary to drive the generators.

The generators are of standard Westinghouse construction. The frames of the stationary armatures are of cast iron and surround inner cores of laminated steel, which are built up with overlapping joints so as to form a circular ring, slotted to receive the coils. The slots are of the partially closed type, and the coils are connected to give the three-phase relation. The field core is formed of laminated punchings, dove-tailed to a cast-iron spider. It has thirty-two poles, each of which is wound on a machine-formed coil. The field is separately excited. The generators will develop full load continuously under normal conditions with a temperature rise not exceeding 35 degs. C. above the surrounding air, and immediately following such a full load run will carry 50 per cent overload for a limited period with a temperature rise not exceeding 55 degs. C. The generators have a close inherent regulation, but arrangement has been made further to control the voltage by means of Tirrill regulators mounted on the switchboard. The present engine room provides sufficient space for the installation of two additional generating units.

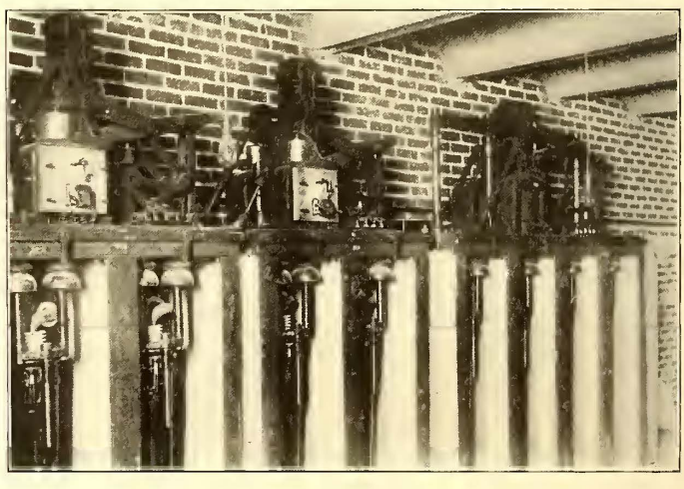
Two exciter sets have been installed, one of which is driven by a Westinghouse compound steam engine, the other by a type C induction motor, which in turn is driven from the main generators through transformers.

The generators are connected directly to two pairs of 250-kw air-blast transformers, which are connected according to the Scott three-phase, two-phase system, to transform the current from 2300 volts three-phase to 33,000 volts two-phase, at which higher potential it is delivered to the transformer stations along the line of the railway, and to the lowering transformers in the power house which supply the portions of the trolley located in and near the city of Rushville. Air to cool these step-up transformers is furnished by a pair of 90-in. fans made by the Sturtevant Company, and driven by Westinghouse type C induction motors.

The air-blast transformers are connected in pairs, and each pair is connected in turn with its own generating unit. The high-tension coils of the transformers are divided so that they may be connected for either 16,500 volts or 33,000 volts. The low-tension winding is designed for 2300 volts, the potential of the generators. The insulation between the high-tension coils and core was submitted to a test of 66,000 volts alternating current for one minute, and for the same length of time a potential of 4600 volts was applied between the low-tension coils and core. These transformers are designed to carry full load for twenty-four hours with a temperature rise of 25 degs. C. above the temperature of the surrounding air, and after a full load run under these conditions each will carry an overload of 40 per cent for two hours with a final temperature rise not exceeding 55 degs. C. Their efficiencies are approximately as follows:

	Per Cent		Per Cent
Full load	97.4	Half load	96.1
Three-quarter load	97	One-quarter load	92.8

Between the high-tension coils of the step-up transformers and the main bus-bars, 33,000-volt, oil-insulated, electrically-operated, two-phase, non-automatic switches have been installed. On each outgoing feeder leading to the transformer stations a double-pole automatic switch of similar type has been inserted, and each outgoing feeder is also protected by disconnecting switches, which were made by the Westinghouse



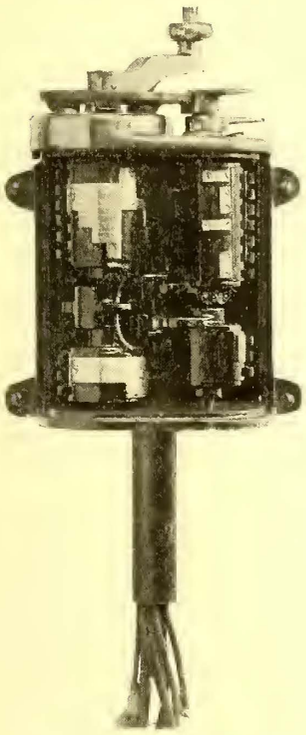
ARRANGEMENT OF ELECTRICALLY OPERATED OIL CIRCUIT BREAKERS

Company in accordance with designs specially prepared by Sargent & Lundy, the consulting engineers.

SWITCHBOARD

The generators are connected in parallel. The operating panels are located in the main engine room, forming two switchboards of blue Vermont marble. The first board is composed of five panels and provided with apparatus for the control of the two exciter sets, the motors which drive the ventilating fans for the step-up transformers, and the ammeters, voltmeters, wattmeters, Tirrill regulators, synchroscopes and switch control mechanism for the two 500-kw main generators. As has been stated, all the switches are electrically operated, current for this purpose being supplied by the exciter set. As, however, the generators are governed by Tirrill regulators, it

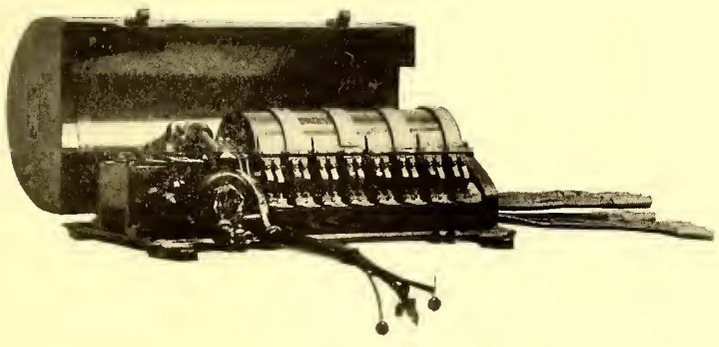
has been thought wise to install a specially designed booster set in the switch operating circuit, in order that the electromotive force of the exciters may not be so reduced by the action of the Tirrill regulators that the switch mechanism may fail to act, and in this way all possibility of failure has been overcome. The second switchboard is composed of twelve blue Vermont marble panels, designed to control the outgoing feeder circuits. Five of these panels are now blank, but will be equipped with the necessary apparatus when the operations of the road are more extended. The main bus-bars occupy a portion of the basement. They are mounted upon heavy insulators, which are supported upon a masonry structure which is very heavy and substantial. Provision has been made so that the air from the transformer fans is carried through the bus-bar chamber. The bus-bars are arranged in a double set, each of which is protected by a disconnecting switch.



MASTER CONTROLLER

The east end of the building constitutes what is called the high-tension chamber, and is divided into four floors. The basement contains the bus-bars, which are mounted similarly to those leading from the generators, together with the instrument transformers. On the main floor are installed the oil-insulated, electrically-operated, high-potential switches which are controlled from the panels in the engine room, the lowering transformers from which the 550-volt alternating-current trolley line in the city of Rushville is operated, the lowering transformers —33,000 volts to 3300 volts— which feed the sections of the trolley immediately next to Rushville on either side, the lowering transformers for the operation of the motors which drive one exciter and the ventilating fans in the engine room, and the static interrupters for the protection of the lowering transformers.

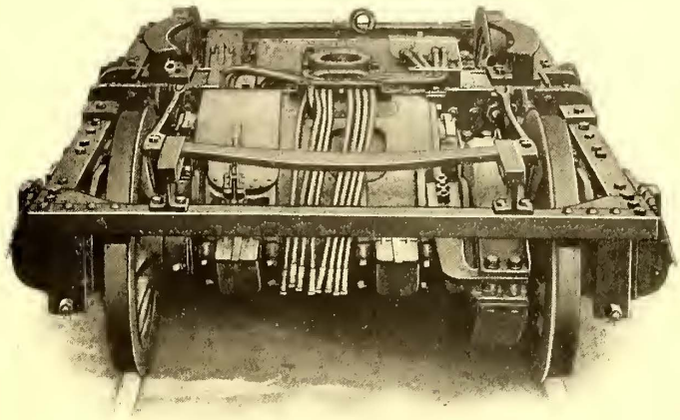
On the third floor have been installed the static interrupters which are connected to the main outgoing feeder lines, while



REVERSER

the low-equivalent lightning arresters are mounted upon the fourth floor of the high-tension chamber. It will be noted that all switching is done on the high-tension side.

The general plan of operation is the transmission of alternating current over single-phase circuits at 33,000 volts to transformer stations, which are located every 10 miles or 12 miles along the road, where the potential is reduced to 3300 volts and connected direct to the trolley. The transformer stations require no attention, as the feeder lines are all controlled from the main power house and no moving apparatus is installed in the transformer houses. Because of the high potential at which the current is transmitted and fed to the trolley, no auxiliary feeders are necessary, and the total expenditure in copper is exceedingly low. The possibility of this saving



MOTORS AND TRUCK

constitutes one of the most important advantages of the alternating-current single-phase railway system.

ROLLING STOCK

The cars of the Indianapolis & Cincinnati Traction Company were described in the Street Railway Journal for Jan. 28 and Feb. 18, but some further particulars of the electrical equipments which were not available at the time of publishing the previous articles may be of interest.

As the cars must be operated over the tracks of the local railway companies in the city of Indianapolis, which are all supplied with direct current, it was necessary in their equipment to make provision for operation on either direct or alternating current. Furthermore, as it was not considered advisable to use a high potential trolley within the limits of the town of Rushville, it became necessary to provide for the use of two alternating-current trolley voltages. The main portion of the trolley circuit will be fed with 3300-volt, single-phase, alternating current. The total arrangement therefore includes operation at 550 volts direct current within the city limits of Indianapolis and 550 volts alternating current in Rushville, and 3300-volt alternating current on the other sections of the line. Because of this complicated service, it seemed advisable to pass by the attractive and economical features of control by induction regulators and to adopt the rheostatic system on account of its simplicity and adaptability to both alternating and direct-current operation.

The car equipment includes four No. 106-A alternating-current, commutator type, series-wound railway motors, rated at 75-hp each; one main auto-transformer wound for a primary potential of 550 volts, 1650 volts and 3300 volts, and for a secondary potential of approximately 250 volts; reversing switch; motor cut-out switch; commutator or change-over switch, to throw the equipment from alternating current to direct current, and vice versa; a complete unit switch system of multiple control, with two operating controllers arranged for the operation of the cars either singly or in trains; rheostats for use on either alternating or direct-current circuits; air compressors direct connected to both an alternating-current and direct-current series-wound motor; air reservoirs; two sets of storage batteries, consisting of seven cells each; complete Westinghouse air-brake equipment, with control valve on either platform; complete hand-brake equipment, with controlling lever on one platform; one wheel trolley for low-potential service, and one bow type trolley for high-potential service.

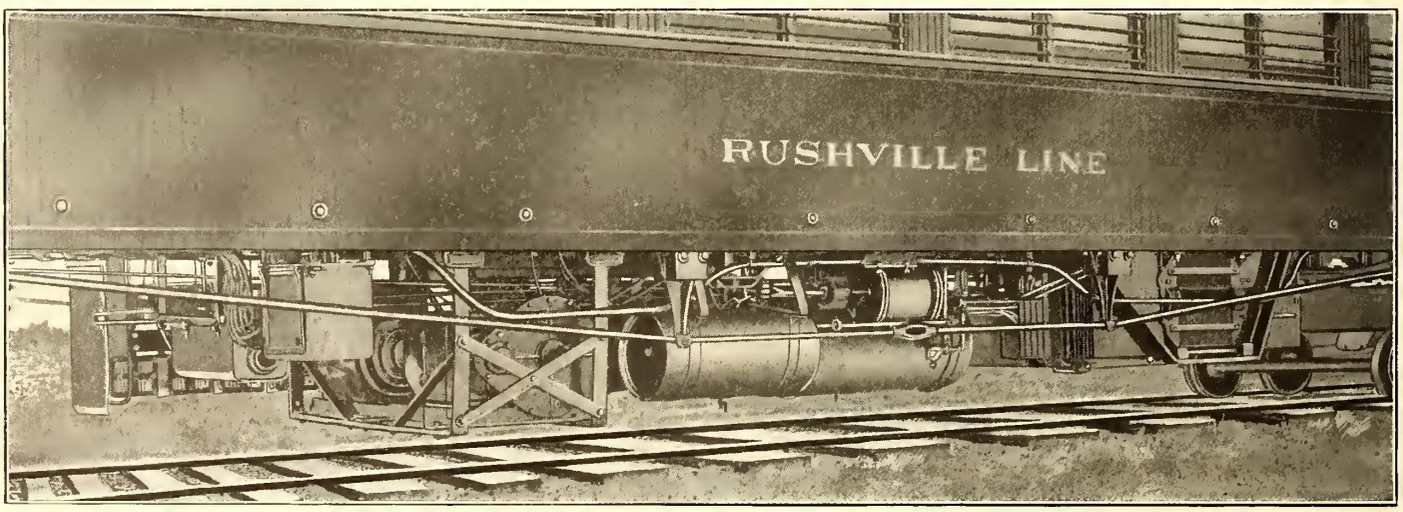
MULTIPLE CONTROL

The unit-switch system of multiple control as adopted is the standard Westinghouse equipment modified to suit the double operation by alternating and direct current. The unit switches are arranged in groups, one of 8 units and one of 4 units, which are mounted under the floor of the car. They are operated by compressed air, which, in turn, is controlled by magnet valves actuated by current from the storage batteries. The operating controllers are mounted one upon each platform, and are very small and compact, as may be seen from the accompanying illustration. The reverser, which is also illustrated, is of the reciprocating type, generally used with the Westinghouse system of multiple control.

The circuits of the controlling equipment and the four driving motors of a single car are shown in diagram on page 507. The controlling is done entirely by the unit-switch system, for which purpose there is used a cable containing eleven conductors running the full length of the train. The main operating circuits may receive power from any one of three sources, entirely distinct as to voltage or character of current. Thus the supply may be at 3000 volts alternating, 500 volts alternating or at 500 volts direct current. For direct-current operation, the four propelling motors are connected in series and subjected to a plain rheostatic control for acceleration. For alternating-current work there is installed a main auto-transformer having two primary feeding taps, at points corresponding to 3000 volts or 500 volts for normal magnetization of the core. When the supply voltage is 3000, the former of these is used, while for 500-volt supply the latter is employed.

Two distinct taps from the auto-transformer are used for current for the motors. The voltage impressed upon the motors is given one or the other of a lower or higher value, according to the speed desired. Thus without series-paralleling

BOW TROLLEY CONNECTED TO BASE MOUNTED ON INSULATORS



VIEW OF PART OF CAR, SHOWING DETAILS OF THE APPARATUS MOUNTED UNDERNEATH

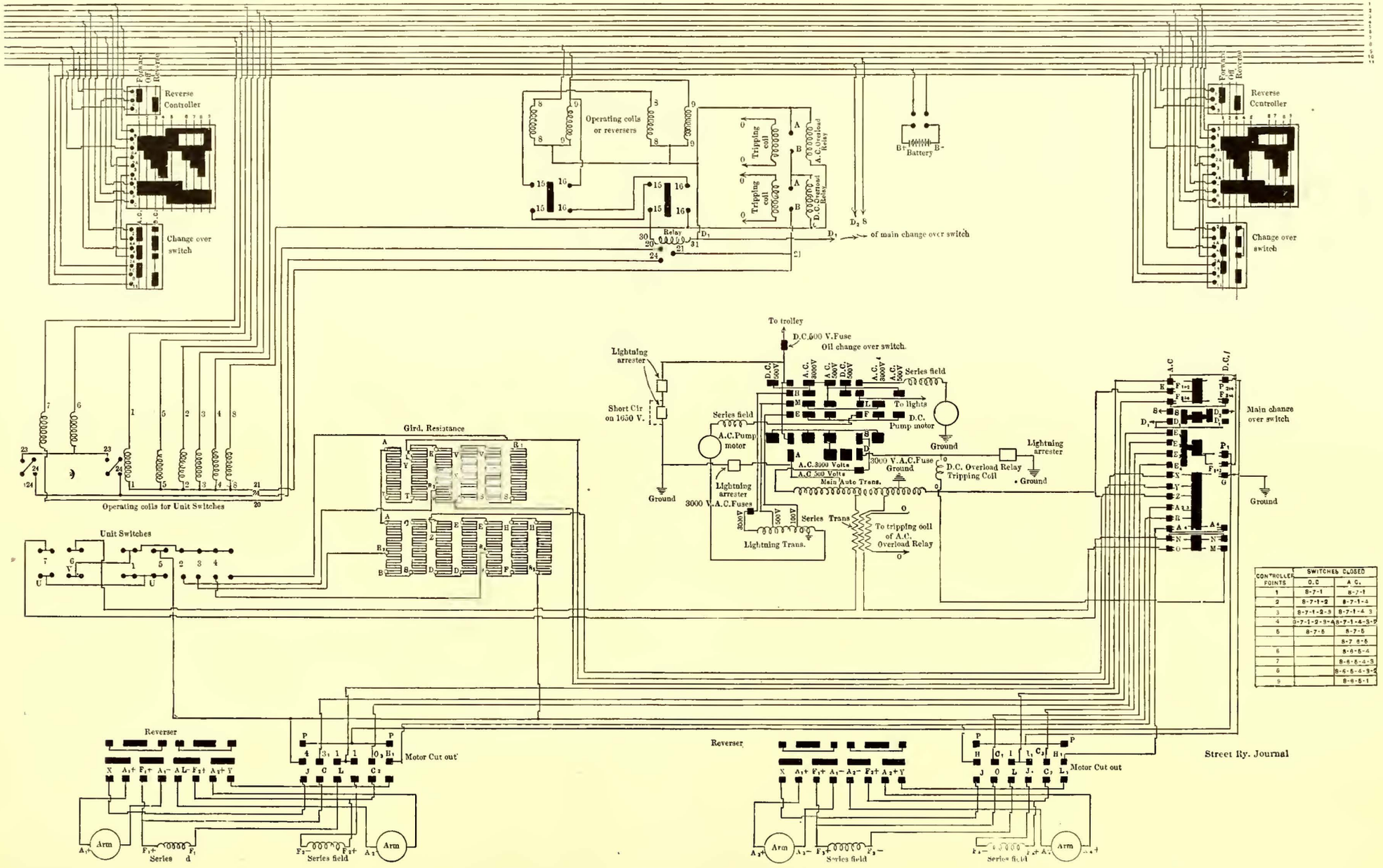
the motors, the same effect is produced by merely varying the active electromotive force at the motor terminals. Under all conditions of alternating-current operation, all of the motors of each car are connected in parallel, and for each of the two values of voltage impressed thereon, simple rheostatic control is used.

For both direct and alternating-current operation, the lighting circuit is supplied with current at 500 volts, either directly from the continuous-current circuits or through a special auto-transformer from the alternating-current circuits. As is the case with the main power transformer, the lighting transformer has taps at 3000 volts and 500 volts, respectively. The lamps are supplied from the 500-volt tap. At the 100-volt point there is placed an additional tap for supplying current to a compensated alternating-current series motor for operating the air pumps. It will be observed that the grounding point of the lighting transformer is at the neutral electromotive force point of the alternating-current motor. An entirely distinct pumping equipment is operated by a small series-wound, 500-volt direct-current motor which is controlled automatically by the air pressure. The diagram on page 508 shows the connections in simple form.

The motors, which are of the standard Westinghouse single-phase type, are rated at 75-hp each, and are geared for a maximum speed of 45 m.p.h. for local service.

AUTO-TRANSFORMER

The main auto-transformer is of the shell form, air-cooled type. Before shipment it was subjected to a test of 10,000 volts between winding and iron, and was operated at double potential for ten minutes. It is designed for operation at 25 cycles, a frequency which has been adopted as standard for single-phase railway service.



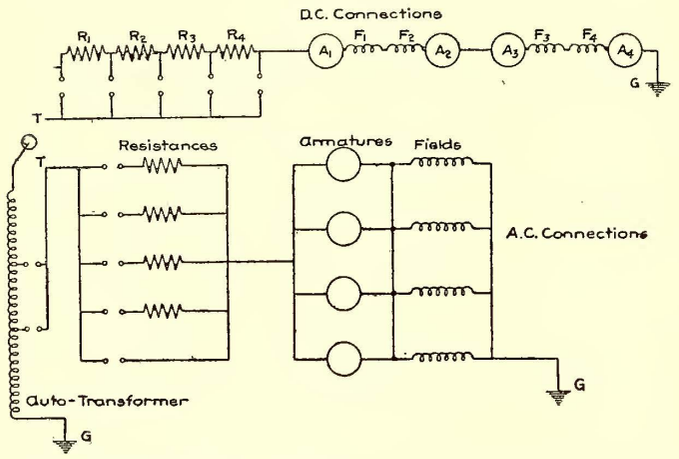
CONTROLLER POINTS	SWITCHES CLOSED	
	D.C.	A.C.
1	8-7-1	8-7-1
2	8-7-1-2	8-7-1-4
3	8-7-1-2-3	8-7-1-4-3
4	8-7-1-2-3-4	8-7-1-4-3-2
5	8-7-5	8-7-5
		8-7-5-6
6		8-6-5-4
7		8-6-5-4-3
8		8-6-5-4-3-2
9		8-6-5-1

GENERAL DIAGRAM OF CONNECTIONS

TROLLEYS

The illustration of the bow trolley given on page 506 shows the standard form of collector designed for high-potential alternating-current circuits. The trolley is mounted upon a thoroughly insulated platform, and is raised, lowered and controlled by the motorman by means of compressed air. There is therefore no danger at any time of contact with live parts of the trolley. The bow carries a large, flat aluminum shoe, which makes contact with the under side of the trolley wire. For low-potential service, whether alternating or direct current, a modification of the Union Standard trolley is provided, as the bow type could not be used in the city of Indianapolis.

A novel feature of the equipment of these cars was installed



SIMPLE DIAGRAM OF A. C. AND D. C. MOTOR CONNECTIONS

at the suggestion of A. A. Anderson, general superintendent of the road. It consists of a speaking tube connecting the motorman's position with the rear platform, so that the conductor and motorman may talk with each other at any time. The entire electrical equipment of these cars was furnished by the Westinghouse Electric & Manufacturing Company, and installed under the supervision of Sargent & Lundy, of Chicago, the consulting engineers.

There is a plan on foot for the building of an automobile race course in the vicinity of Pennington, N. J., extending around a circle of 20 miles. Part of the course will be located close to the tracks of the Trenton Street Railway, which will be largely benefited by the resultant traffic. Superintendent Beach, of the Philadelphia & Reading Railway, is quoted as saying that his company will run half-hourly trains from Philadelphia and New York on days when there is a meet. Pennington is located 54 miles from New York and 37 miles from Philadelphia, on the New York branch of the Reading system. It is 7 miles north of Trenton.

Work on the Trenton (N. J.), Newhope & Lambertville Street Railway is progressing more rapidly as the weather improves, and cars will doubtless be running late in May or early in June, if the power house is completed by that time. With the exception of the streets in Yardley and Newhope, it is laid with 80-lb. T-rail. The grades are all light, while the curves, outside of the two municipalities, are limited to 4 degs. In Newhope Borough a number of houses had to be torn down to make room for the road following a private right of way, and between Yardley and Taylorsville 80,000 cu. yds. of rock were taken from the side of the hill to make room. Inasmuch as this had to be cut out, it was used for ballasting the line, although, aside from the excavating, other stone was convenient.

KEEPING CAR RECORDS

For keeping records of repairs to cars the Virginia Passenger & Power Company, of Richmond, Va., uses a filing system in which, instead of having a card for each car, an envelope is used. Blank forms for reporting changes in armatures or wheels, painting, or any other items that it is desired to record, are filled out by the man who does the work, and when turned into the office are placed in the envelope belonging to the respective car on which the work is done. This obviates any necessity for copying records, and forms a flexible system by which the history of each car can be accurately kept. Any special data, such as reports of tests, can be easily recorded by simply dropping a memorandum in the envelope belonging to the car on which the test is made.

Car No._____ FORM A 12. 8-16-'02.

Virginia Passenger & Power Co.,

RAILWAY DEPARTMENT.

Old No._____

Open. Closed. Convertible.

Builder_____

Length of Body_____

No. Benches_____

Length over Bumpers_____

FACE OF ENVELOPE FOR KEEPING CAR RECORDS

The envelopes are made of heavy manila paper, and measure 6½ ins. long x 3⅝ ins. wide, with the flap on the long side. On the face of the envelope are spaces for writing in a general description of the car. The blanks for recording the various kinds of work done on the car are 5½ ins. long x 3⅛ ins. wide, and will slip into the envelopes easily. Reproductions of the printed matter on the envelope and on blanks are presented herewith.

FORM A. 11. 8-24-'04. 3000.

Virginia Passenger & Power Co.,

RAILWAY DEPARTMENT.

_____ Report.

No._____ _____ 190____

Taken out } Car No._____
Put in }

_____

_____

_____

Foreman.

BLANK FOR REPORTING NECESSARY CAR REPAIRS

The company at one time started an individual armature record, but this was not found to be of any particular value and it was discarded. The mileage of cars is recorded each day in a book provided for that purpose, and the life of wheels, bearings, etc., is determined by comparison with the envelope file and the mileage book.

S. W. Huff, general manager of the Virginia Passenger & Power Company, states that the envelope system of filing records has proven very satisfactory, as it involves very much less clerical work and there is less liability to error than with other systems previously used. It is much less trouble to slip wheel or motor records into the envelopes than it is to make the entries in a book.

THE EFFECT OF THE PAST TWO WINTERS

In the last annual report of the Massachusetts Electric Companies, published in abstract in the issue of this paper for Dec. 20, 1904, President Gordon Abbott referred to the exceptionally low temperature and heavy snow storms which prevailed during the winter of 1903-04, and their effect upon both the traffic and expenses of operation. This statement attracted wide attention in Massachusetts, and the effect of the severe winters was discussed at some length by the Railroad Commissioners of the State in their last annual report, but little attention has been given to the subject elsewhere, either by the investing or general public.

There is no doubt that both the winter of 1903-04 and that of 1904-05, which is just passing, have been exceptionally severe in the Eastern States. Either one alone would have been remarkable, but coming together as they have, they have been phenomenal. Thus the average temperature in New York for December, 1903, and January and February, 1904, was 26.4 degs. F., the lowest on record—that is, in thirty-four years, while the average temperature for the corresponding three months which have just past has been only 0.4 degs. higher—that is, 26.8 degs. Table I. is taken from the records of the United States Weather Bureau in New York, and shows the mean temperature by months during the past five years:

TABLE I.—TEMPERATURE IN NEW YORK DURING WINTER MONTHS FOR LAST FIVE YEARS

	1900–01.	1901–02.	1902–03.	1903–04.	1904–5.
December	35.2	34.4	32.2	30.1	28.2
January	35.1	29.2	30.6	24.1	27.5
February	25.6	28.5	34.4	25.0	26.4
Mean	30.8	30.7	32.4	26.4	26.8

But it is not alone in temperature that the winters in the Eastern States during the last two years have been exceptional. The snowfall has also been remarkably large, and while the amount has varied greatly even in neighboring cities, the aggregate, as shown by Table II., greatly exceeds the average for the preceding six years. In this table eleven cities have been taken, the first eight to represent important sections in the Eastern States, the latter three representative localities in the Middle West, where the falls have not been either actually or proportionately so great. In this table the figures for the last two years are given by months as well as years, so that the amounts in each month of 1904-05 can be compared with those of 1903-04. As will be seen, the New York City figures are especially large, the fall having already aggregated 53.8 ins., or nearly twice as much as the average for the last seven years.

The effect on operating expenses of removing this snow has, of course, been enhanced by the exceptionally cold weather which accompanied it, and where the street railway company is obliged to remove snow from the street, which is plowed to one side from its tracks, the cost increases rapidly. The expense from this item is not readily obtainable from all the cities mentioned in the previous table, and that for 1904-05 from comparatively few cities as yet. Nevertheless, a study of the reports of the railway companies given in the table shows that this cost item has increased greatly, and in some cases been more than double the average during the preceding six years. Table III. shows the amounts charged to "Removal of ice and snow" on the lines mentioned:

TABLE III.—COST OF REMOVAL OF ICE AND SNOW PER MILE OF TRACK

	Average of Six Years Ending June 30, 1903.	1903–04.	1904–05 to Mar.1
Boston Elevated	374	633	....
Worcester Consolidated	77	94	....
Springfield Street	96	173	140
State of Massachusetts[1]	112	212	....
New York City[2]	211	452	720
New York & Queens County	94	69	108
United Traction, Albany	100	138	80
Syracuse	58	113	55
Buffalo	[3]77	[4]127	....

[1] This includes all the lines in the State.
[2] Average of lines operated directly by Metropolitan Street Railway Company and New York City Railway Company.
[3] Average of International Railway, Buffalo Railway and Crosstown Railway.
[4] Average of International Railway and Crosstown Railway.

Unfortunately the effect of the snowfall is not confined to the direct expense of removing it, but is reflected in other ways. In fact, the actual cost is but a small fraction of the total expense. The other principal results are:

(1) Increase in repair cost.

(2) Decrease in gross receipts, owing to interruption of schedules.

(3) Increase in power required.

It is impossible to determine the exact extent to which these three items are influenced by severe winter weather, but the records on several railways in the list quoted show that the repair account during the first quarter of 1904 was 50 per cent larger than during the corresponding quarter of the previous year, and that the effect of the cold weather, so far as repairs were concerned, extended over even into the second quarter. In view of the continuance of the same weather conditions this year it is not too much to expect a similar increase in the repair account during the coming three months. The loss in receipts owing to the interruption of schedules and the increased power required are also very large, but owing to other conditions which affect them, the total cannot be accurately measured.

If the winters should continue to be as severe as they have been during the last two years there would have to be a modification of all of our ideas of the cost of operation of electric roads. It is too much to expect, however, that for a long time to come there should be such a combination in any one or two years of such conditions. If investors and the public generally should recognize these conditions as exceptional and not general, there need be no unnecessary alarm at some of the reports which may appear during the next three months.

TABLE II.—SNOW FALL IN DIFFERENT CITIES DURING LAST EIGHT YEARS

Cities.	Average of Six Years Ending June 30, 1903.	1903–04.							1904–05.				
		Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Nov.	Dec.	Jan.	Feb.	Total toMar.1
Boston	42.5	2.4	10.6	35.7	16.5	8.9	1.4	75.0	...	12.0	21.3	8.0	41.3
Worcester	[1]48.2	0.5	14.8	35.8	8.9	11.2	...	71.2	...	12.2	25.8	10.2	38.2
New York	34.0	...	7.7	15.2	5.6	4.4	0.1	33.0	0.5	26.8	19.3	7.2	53.8
Philadelphia	25.2	...	5.2	14.2	5.8	4.2	...	29.4	0.9	18.9	11.6	7.9	39.3
Albany	54.2	...	12.5	20.8	8.2	11.1	5.0	57.6	6.2	23.1	18.2	7.8	55.3
Syracuse	[2]	7.3	24.0	39.0	15.6	13.2	11.2	110.3	2.0	7.8	16.7	15.1	41.6
Buffalo	82.2	1.1	25.4	39.2	18.2	10.5	13.9	107.3	2.3	18.0	37.4	18.6	76.3
Pittsburg	36.4	1.0	8.5	6.6	4.5	0.4	1.3	26.3	0.1	8.4	17.2	5.2	30.9
Cleveland	44.7	7.8	14.3	21.6	7.8	7.5	1.0	53.0	0.3	11.8	14.8	13.3	38.9
Chicago	30.8	2.2	18.6	11.0	13.4	14.3	...	59.5	...	6.8	8.5	13.7	29.2
St. Louis	18.0	1.5	2.8	14.3	2.5	...	5.5	24.6	3.3	5.4	6.8	9.6	21.8

[1] Average of four years, report for November, 1900, missing. [2] No station during these years.

CREATING TRAFFIC—II. RELATIONS WITH THE NEWSPAPERS

BY E. P. HULSE

Maintaining friendly relations with the newspapers will take up quite a little of the traffic agent's time, for it is through the news columns of the daily and weekly papers in the territory that your road serves that the public gets the information by which it forms its own opinions; and public opinion begets the most potential form of advertising—the "by-word-of-mouth" advertising or what one friend says to another.

Many managements think that when they have inserted an ad. they have "bought the support" of the paper on all occasions and that it will see to the matter of looking out for the road's interests at all points. The business management of a newspaper nowadays exercises a sort of control over the news end, so far as seeing that no great amount of advertising is given free to any project that should, but does not advertise; but it seldom does the other thing, and sees that an advertiser improves all his chances of legitimate publicity. There exists in the forces of a newspaper a constant arrayal of the "staff" against the business management; a small rebellion at the dictum of the money-producing necessities; a feeling that the business manager is absorbing the prerogatives, and incidentally the perquisites, of the editorial and news end. So when you send in an ad. and perhaps a book of tickets, a theater pass or an invitation to dinner, and congratulate yourself on your ineffable finesse, you have done only a part of what is necessary or may have overdone it entirely. The business office opens the mail, perhaps although addressed to "the editor," and flaunts the passes in the faces of the actual writers on the paper, and you have defeated the object you sought to attain. Although you advertise, your road and its attractions are covertly and sometimes openly "roasted." And, parenthetically, it does not pay to advertise extensive time-tables in the newspapers, not even in summer. Run a short ad. regularly where those who are looking for it can find it, covering especially the attractions, and telling also where detailed time-tables can always be secured, and giving the office or despatcher's or starter's telephone number. Of course, notice of change of schedules, opening of new routes, special features, etc., should be given through the advertising columns. In newspapers your "suggestion" is confusedly surrounded by many others, and your ad. is valuable chiefly to those who already have the desire to go somewhere and are looking through the paper for the best promise of amusement. The "direct suggestion," by means later to be described, I have found more valuable. Of course, you should place an ad. in the newspapers in your territory during the amusement months, and use the trade or class journals for certain purposes and the amusement and theatrical periodicals for others. Insert a season ad. in the newspapers, kept in as small space as possible, in a regular specified position, and changed every week; but you well know that an inch in the news columns voluntarily mentioning your road is worth a column in the advertising part, and I will show you how to get it.

Do not start in by giving a pass-card or a book of free tickets renewable as often as the covers are sent back. The possession of one pass in an office creates a demand for two, then three, then a dozen, until the latest "cub" reporter and the pressmen and the stereotypers feel aggrieved because they have not got one also, and you have made more enemies than friends. Also, when you give a pass-card or book outright you cancel at once the possibility of renewing the obligation. Keep them coming to you. Cultivate their personal acquaintance. Friendship will repay you with items that you could not buy. Give out no books. I am sorry to say that I have had to take up many complimentary books that were issued at the first of the year in times past to newspaper business offices that the conductors reported were being used by barbers, paper-hangers, cloak salesmen and others connected in no way with the newspapers. Nor do I favor the custom of steam roads in this particular, of keeping an account of transportation issued to a newspaper as a credit on the advertising account. But let the actual writers on the paper, the city editor, the reporters, feel that you are anxious for them to take an outing over your road or be entertained at your resort, and that you would appreciate their making their desires along these lines known personally to you. Do not force tickets or passes on them; newspaper men are as independent as any profession and more contemptuous of apparent bribery. But you will strike an unfailing response if you will give them to understand that at all times they can get facts out of you in regard to accidents, projected lines, new methods of operation, etc. If they have scented a news item, and come to you for the facts, they will appreciate your denial if accompanied by the explanation that the interests of the road would suffer by premature announcement and the promise that they shall have the story as soon as it is possible to turn it loose. Then follow this up by doing so.

DISTINGUISHED SPEAKERS AT BOARDS OF TRADE OUTING

Many Interesting and Enjoyable Features at the Gathering at Canobie Lake Park Yesterday

"I did not know there was a place in New Hampshire where such a dinner as we have had could be served. Now that I've found out, I shall make frequent pilgrimages from Lowell to Canobie Lake."

So spoke United States Sub Treasurer George A. Marden at the outing of the Merrimack Valley Boards of ... yesterday ...

tary C. H. Littlefield of Lawrence from Gov. John L. Bates and Lieut. Gov Curtis Guild of Massachusetts, Col. William A Gaston of Boston and Congressman Currier of New Hampshire.

C E. Adams of Lowell, president of

CANOBIE LAKE BECOMING RESORT FOR FOUR CITIES

More and more is Canoble lake becoming the popular inland resort for Lowell, Nashua, Haverhill and Lawrence. Picnic parties from cities and towns further distant seek the many diversions afforded at the park conducted by the New Hampshire Traction company. This company three years ago opened ...

supply. Its only outlet is at the Flume from ... beautiful brook flows along betw... banks, finally to find ...

CANOBIE LAKE AN IDEAL SUMMER RESORT

Many Local People Seek Rest and Recreation on its Wooded Shores

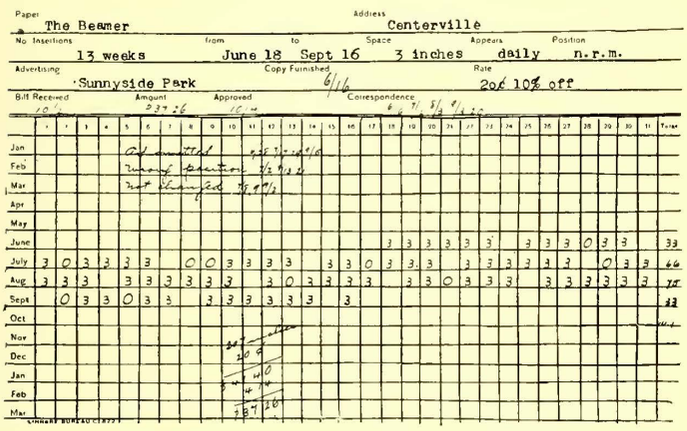
A beautiful jewel of matchless setting, the clear waters of Canobie lake sparkle forth from surrounding verdant, forest clad hills to greet the eye of the tired cityite on his vacation. Situated in the extreme southern part ...

family. The Malden cottage, newly erected, stands across the track from the above and ... Trail of M... Enter... time ...

A GROUP OF NEWS ITEMS, WHICH PROVE MORE EFFECTIVE IN CREATING TRAFFIC THAN PAID ADVERTISEMENTS

You will gain their astonished respect if you occasionally manifold the announcement of a matter that is real news and send it to all without their first nosing it out.

A good press agent should give the papers at least one item of real news each day, and keep his road's name in the reading columns. Then when your line has an accident, or the high-tension wires are down and the return of a Sunday school picnic is delayed until long after dark and anxious mothers are demanding impossible things over the telephone, or a merry-go-round has run away and rained young ones over an acre of ground, it is not the great impersonal "Interstate Corporation" that must suffer publicity; it is John's road, and his road gets the advantage of having all extenuating features mentioned along with the inevitable facts. Then also, when you send in an announcement that is advertising disguised as news, it does not return to you with a note from the advertising solicitor, nor is it thrown into the waste basket, but it is "something that Smith has sent in, and it goes." Do not underrate the amount of good or harm that any newspaper can do your road; the manager that professes to despise the whole newspaper fraternity has to haul down his colors sooner or later. It is simple: forestall any possibility of unpleasant news items being published without your side being represented, and save yourself apoplexy. This close personal relation with the writers on



CARD FOR CHECKING NEWSPAPER ADVERTISEMENTS

all the newspapers in the district you serve may be maintained by the traffic agent without allowing the dignity of the road management to suffer.

I believe every road manager has attempted at some time or other to give a dinner to "the press," and has gone through the "never-again" stage of regret therefor when he found that the mechanical departments were the only ones present. There is no class that is so hard to get together as the newspaper makers. No time can be set when the actual writers on both the morning and afternoon papers can be present. Nor can a dinner be given to the men even in one city. The best plan is to take as small a number as possible from each paper and have them out to your park or resort for a little personal dinner or entertainment. It does not take many days to cover the entire circuit, and it certainly pays as compared with the customary general banquet.

In placing your newspaper advertising, make your contracts direct. You can usually do so at a lower rate than you can get through the agencies. The commissions paid by newspapers to the advertising agencies that send them business average from 15 per cent to 25 per cent. Customs of individual papers differ, some of them sticking to their card rate and others making concessions to secure the business where competition is strong. Specify a regular position, with an understanding that extra space for big occasions is to go at the same rate as the regular ad. Have it understood with the business management that a free advance notice of coming attractions is to be inserted each week in the news columns with the change of advertisement copy. Have someone on the local force give a general write-up on Monday covering Sunday at the various resorts, the crowds out, the weather, how they enjoyed themselves. That is the day when many take their only weekly outing, and they like to see some mention in the paper. Have Tuesday's papers give a criticism of the theatrical attraction for the week, granting that you have some sort of performance. Get someone on each paper to do this, as a general story by the traffic man necessarily bears the press agent earmarks. Design an attractive cut heading for all your advertising, which shall be the trade mark of the road, and also coin some apt phrase or nickname. Hardly a steam road but is called by some name other than its incorporated one. If you do not put some nickname in the public mouth it will start one for you.

As to keeping track of the ads. for the purpose of checking the bills, the best method is a card system, each card containing space at the top for the items of: Name of paper; City or town; Number of insertions contracted for; Space; Appears; Position; What advertised; Copy furnished; Rate; Bill received; Amount; Approved; Correspondence. Space is left at the bottom for the daily checking of the ad. The accompanying blank shows a card of this kind which I designed to serve the purpose of a daily checking record. The newspapers will furnish you an advertiser's free copy for the purpose of checking.

Go through the news columns also of all the newspapers, and where the road is mentioned and used well, drop a note thanking the writer or voice a protest if injustice is done. Clipping bureaus seldom send in half the matter of interest that appears, and when the newspapers learn that you are watching their columns they are apt to be more particular with what goes in concerning your road. Although the newspaper may not be the best medium for your purpose in putting travel suggestions into the mind of the public, it does a great deal in forming public opinion, and relations with the public may be vastly improved through its judicious handling.

THE USE OF TAIL RODS ON ENGINES

The practice of employing tail rods to support the piston of a steam engine is quite common on the Continent of Europe, but there are very few builders of American engines who have adopted this form of construction. An interesting experience on the practical value of the tail rod, however, has been conducted during the past two years in the power station of the Camden & Suburban Railway Company, now a part of the South Jersey Division of the Public Service Corporation of New Jersey. In this station the equipment includes two cross-compound condensing Corliss engines, manufactured by the Pennsylvania Iron Works Company, and with cylinder dimensions 30.5 ins., and 52-in. x 42-in. stroke, each direct connected to an 800-kw Westinghouse generator. The engines are duplicates of each other, except that one which was installed three years ago had no tail rods, while the other, which was installed in the station two years ago, employs these rods on both high and low-pressure pistons.

The experience in this station indicates that there has been a great saving both in steam consumption and maintenance by the use of these rods. The second engine has cost nothing for maintenance during the two years in which it has been in service, even the bull rings have not been changed, and the tool cuts are still visible on the bottom of the cylinder. The other engine has worn out two sets of bull rings during its three years of service, and the low-pressure cylinder has worn down 1-16 ins.; moreover, it is possible to work the second engine at about 10 per cent greater capacity than the other. The general results have been so satisfactory that in a new engine of similar

capacity which the company is about to install, and which is to be of the Westinghouse cross-compound horizontal Corliss type, tail rods have been insisted upon.

The engineers of the company attribute the better results secured with tail rods in Camden than in other similar installations to the fact that very substantial rods have been used, in connection with a proper support. The success of the tail rod, in their opinion, depends upon having a through rod from cross head to tail bearing of sufficient strength and properly bowed upward, so that when the weight of the piston is added the deflection due to this weight simply gives a fair bearing to the piston on the lower part of the cylinder.

Before adopting the tail rod in the present engine the deflection due to the weight of the piston was very carefully calculated and the tail rod was given a bent to compensate for the deflection, so that the movement of the piston is perfectly horizontal. The cross heads were also made extra large and with adjustable wedges, and were so arranged that the piston rod can be sighted with the adjustable tail rod and brought in perfect parallelism.

MARCH MEETING OF THE INDIANA ELECTRIC RAILWAY ASSOCIATION

The Indiana Electric Railway Association held its March meeting at Lebanon, Ind., with Vice-President J. W. Chipman in the chair. The work of the meeting was the discussion of the question of interchangeable coupon ticket books. A committee had been appointed at the February meeting at Anderson to consider the matter and report at this meeting, with the end that some form of ticket book good on the various Indiana roads be adopted. This committee, of which Charles A. Baldwin, of the Indiana Union Traction Company, was chairman, was not ready to report formally. W. H. Norviel, in the absence of Chairman Baldwin, explained that the committee had held several meetings and secured information from the various roads as to their rates of fare. The committee did not feel as if it was ready to make a final report or recommendations as to such an important matter without more time. W. R. McKown, of the committee, however, had prepared a statement which told of some of the ideas of the committee and the work that had been done. This unsigned statement was not to be considered as a report.

Mr. McKown then read the statement. The committee had secured figures on the regular rates of fare of all the interurban roads in Indiana. It was found that these rates varied all the way from 1¼ cents to 2½ cents per mile. This difference in regular rates of fare on different roads would make any scheme for interchangeable mileage books impracticable, because no rate per mile for such books could be made that would satisfy all companies and their customers. It was therefore thought that a book of 5-cent coupons which would be accepted at their face value, in place of the regular cash fare on any road signing the agreement, and sold at a discount from the face value of the contained coupons, would be most satisfactory. In Ohio such a book had been adopted, this book containing 240 5-cent coupons for $10, and thus affording a discount of 16⅔ per cent from the regular fare. In Indiana regular rates of fare were in many cases lower than in Ohio, and a discount of 16⅔ per cent would bring the rate of fare down to where several Indiana companies would not come into the agreement. It was thought a book containing $10 worth of 5-cent coupons, selling for $9, equal to 10 per cent discount, would be more acceptable to Indiana roads. A permanent transportation committee would be necessary if a coupon book were adopted. A proposed form of contract was then read.

W. G. Irwin, general manager of the Indianapolis, Columbus & Southern, thought it unfortunate that such low rates of fare had been put in force on the early interurban roads in Indiana. The builders of these roads frequently did not realize that they were building anything more than an extended street car line. As distances became longer there was necessity for heavier equipments and higher speeds, which increased the operating expenses so as to call for higher rates of fare. It might be that some of these interurban roads would not earn as much if they increased the rate of fare, but in any event he was certain that there should be more uniformity about the practice of the various roads in both the regular rates of fare and in the charges for special service. Such a lack of uniformity frequently caused hard feeling on the part of the public. For example, his road might not give as favorable a rate on a certain class of business as some other interurban road, and his customers would complain about it. Likewise, the customers of other interurban roads might hold up his road as an example where his road was lower than the other roads. It would undoubtedly be conducive to better feeling if rates of all kinds were uniform. Nevertheless, under conditions as they are now, he thought a 5-cent coupon book as proposed was probably the best thing.

The chairman then called upon E. C. Spring, president of the Ohio Interurban Railway Association, who was a visitor at this convention. Mr. Spring took the floor and gave a very interesting talk on the situation in Ohio and Indiana. He told how the Ohio Interurban Railway Association had appointed a committee to devise an interchangeable mileage or coupon ticket and how this association had thrashed the matter over for some five months. The committee reported a plan which was at first rejected by the association, and the matter was gone over again month after month, until finally the original coupon book proposed was adopted. The sale of this book had been remarkable, considering the short time it had been offered to the public. He advised the Indiana Association to get figures on the traffic and rates of fare from every road in the State, and then, in considering the matter, to ask the committee of the Ohio Association to confer with them. He wished very much that a book could be devised which would be good for both States. Because of the interchange of business between the roads in the two States, it was very desirable that this be done. Most of the traveling men covering Ohio also covered Indiana, and the same book ought to be good in both States. He offered his congratulations to the Indiana Electric Railway Association for the fine start it had made and the interest shown in the association. He told a little of the work of the Ohio Association and what a great benefit it was proving to its members. He invited the Indiana men to any of the meetings of the Ohio Association. The next meeting would be at Cincinnati, and the subject would be roadbed and repairs required in springs. He favored the standardizing of interurban practice in all respects as far as possible, and such associations would bring this about. Mr. Irwin, who preceded him, was right when he spoke of the importance of uniform practice in the dealings of the interurban roads with the public of the entire State. In response to a question as to how many roads had adopted the Ohio interchangeable coupon book, he replied that about twenty-seven roads in Ohio signed the contract, this being practically every interurban road in the State, with the exception of the Appleyard properties, and it was probable that they would soon enter the agreement.

F. D. Norviel, of the Indianapolis & Northwestern Traction Company, asked Mr. Spring whether, when the Ohio interchangeable coupon book was adopted (which in effect gives a reduction of 16⅔ per cent from the regular fare), there was any objection to this on the part of roads where the regular fare charged was only 1¼ cents per mile. Mr. Spring replied that all such roads had raised their rates. Answering a further question as to what the effect of raising rates was and how it was taken by the public, Mr. Spring cited the case of the Day-

ton & Northern, where, during the last year, the number of passengers had been less after the rates were raised, but the gross receipts had increased. Answering a further question as to the feeling of Ohio companies about the free carrying of baggage, he said that those in the northern part of the State in direct competition with steam roads on long runs favored free baggage. In Southern Ohio, where the roads catered more to the local business and to cross-roads farmer, the companies favored charging for baggage, in order to avoid a lot of farm produce being thrown upon them for free transportation. He cited a case of this kind in his own experience, where a farmer, having secured special permission to carry a few baskets of produce, such as he could handle himself, to town without extra charge, appeared one morning soon after the permission was granted with 1200 lbs. of stuff for which he expected free transportation.

Mr. Irwin raised the question whether interurban roads would not be swamped with free baggage if no charge were made, with the result that special baggage cars would have to be run. Mr. Spring pointed out that it was important that the baggage go with the traveling man, otherwise he will take the steam road, where his baggage will go with him. It is no advantage to the traveling man to be able to go himself if his baggage cannot go at the same time. Mr. Norviel pointed out that a very small percentage of interurban passengers carry trunks, and even if one in ten took a trunk there would be plenty of room in the baggage compartment of an interurban car.

The discussion was concluded by carrying a motion made by C. C. Reynolds, general manager of the Indianapolis & Northwestern, to the effect that the ticket committee be continued and instructed to investigate rates and to confer with a similar committee of the Ohio Association. The ticket committee was added to by the appointment of Charles G. Lohman, superintendent of transportation of the Indiana Railway Company, South Bend, who had been acting on the committee at its recent meetings in place of General Manager Smith, of the same company.

A committee was appointed to confer with H. J. McGowan, president of the Indianapolis Traction & Terminal Company, regarding the maintenance of a joint ticket agent and information bureau at the Indianapolis Terminal Station. This committee consisted of C. C. Reynolds, general manager of the Indianapolis & Northwestern Traction Company; W. G. Irwin, general manager of the Indianapolis, Columbus & Southern Traction Company, and A. W. Brady, president of the Indiana Union Traction Company.

The resignation of A. L. Drum from the executive committee was received and accepted, Mr. Drum having moved to Chicago.

THE AURORA, ELGIN & CHICAGO CARS ENTER CHICAGO

The Aurora, Elgin & Chicago Railway, the high-speed third-rail line running west from Chicago, on March 11 began operating into Chicago over the tracks of the Metropolitan West Side Elevated Railway Company to the latter company's stub terminal on Fifth Avenue, near Jackson Boulevard, in the heart of the city, in accordance with an ordinance recently passed by the Chicago Council. Under the old arrangement the Aurora, Elgin & Chicago cars entered the city as far as Fifty-Second Avenue, at which place was an elaborate terminal depot where passengers changed to the Metropolitan Elevated trains. Under the new arrangement it is not necessary to change cars. In operating over the elevated tracks, Aurora, Elgin & Chicago cars, after leaving the downtown terminal at Fifth Avenue, will make only one station stop within the city limits. This will be at Fifty-Second Avenue, for the accommodation of local passengers living along the line of the elevated road who can transfer at that point. The next stop after Fifty-Second Avenue, which is 6.5 miles out, is Des Plaines Avenue, which is 9.7 miles out. Under the new arrangement the Metropolitan West Side Elevated Railway Company is to maintain the local service on the Aurora, Elgin & Chicago tracks between Des Plaines Avenue and the city, leaving the through business to the Aurora, Elgin & Chicago. The new time-table of the Aurora, Elgin & Chicago calls for trains every half hour. The trains on the even hour go to Batavia and Aurora, and those on the half hour to Elgin. The regular running time to Elgin, which is 41.5 miles distant, as well as to the other two terminals, which are not quite as far, is one hour and twenty-five minutes, of which time twenty-one minutes is consumed on the elevated structure between the city and Fifty-Second Avenue. This one hour and twenty-five minutes is the running time for trains making all stops west of Fifty-Second Avenue. Four limited trains are run each way daily to accommodate regular suburban travel, thus putting this road in a position to compete directly with the steam railroad suburban service for the regular commuter travel for the first time. These limited cars are scheduled to make the run of 41.5 miles between Chicago and Elgin in one hour and ten minutes, including three station stops and slow speed on the elevated road on account of the local trains. This will necessitate a steady maximum speed of more than 60 m.p.h. for at least three-fourths of the distance. These new terminal facilities of the Aurora, Elgin & Chicago make possible one of the most interesting competitions for the suburban business going out of a great city that is to be found anywhere in the United States at the present time. The road has heretofore been handicapped by necessity of transferring passengers at Fifty-Second Avenue to and from the elevated road.

NEW HAVEN ABANDONS THIRD RAIL BETWEEN HARTFORD AND BRISTOL

The New York, New Haven & Hartford Railroad is to abandon the third rail on its line between Hartford and Bristol. All reports to the contrary notwithstanding, there is nothing mysterious about this move by the company. The line was laid some time ago for experimental purposes. A feature of the equipment was the placing of the third rail midway between the service rails. Ever since the installation of the system there has been a disposition on the part of the public to magnify the danger of the exposed rail and to impose upon the company unnecessary expense in protecting the rail against trespassers on the track. This tendency to burden the company, and the fact that the improvements were necessary, have caused the company to decide to abandon the running of electric cars on the line.

The Pacific Electric Railway Company, of Los Angeles, is operating a freight and express service between Los Angeles and Wilmington daily except Sunday. The schedule of rates is interesting, as follows: Minimum charge, both freight and express, 25 cents; freight rates per 100 lbs., first-class, 14 cents; second-class, 13 cents; third-class, 11 cents; fourth-class, 10 cents; express rates per 100 lbs., merchandise rate, 40 cents; special rate, 25 cents.

The Pacific Electric Railway Company and the Los Angeles Interurban Railway Company have undertaken the novelty of delivering coupon tickets to any part of Los Angeles when purchased in lots of $1 or upward.

THE QUESTION BOX

In this issue of the Question Box are continued questions and answers relating to the handling of freight and express, and the track department. Under the subject of freight and express are given opinions in regard to joint traffic agreements, and data on the cost of handling freight and express are also presented. The chief topics discussed in the track department are best ways of securing good drainage and the advantages and disadvantages of concrete foundations under rails and roadbed.

D 8.—An interurban electric railway wishes to make an agreement with a city road for the joint handling and exchange of express and freight matter. What is a fair basis upon which to form such an agreement? What are the essential features of your agreement covering this matter?

I think it should be arranged on the tonnage basis if the terminal line is required to do the warehouse work, if not, on the mileage basis.

A. Eastman.

An interurban road should pay the terminal company a reasonable trackage toll, should either man or pay for the manning of its cars, pay any special taxes levied and share its just proportion of the terminal depot costs, based on tonnage handled.

Geo. W. Parker, G. E. & P. A., Detroit United Ry.

About 5 per cent of ingoing and outgoing business.

J. R. Harrigan, Gen. Mgr.,
Columbus, Buckeye Lake & Newark Tract. Co.

This company has no agreements with any city road for the joint handling and exchange of express and freight matter. In my opinion an interurban line desiring to enter a city over the tracks of another company should make an agreement for the operation of such cars on a car mileage basis. If it is desirable to jointly handle the express and freight matter at the terminal station the proper way of handling this is to pro rate all the expenses based on the gross earnings of each company.

E. J. Ryon, Supt. Schenectady Ry. Co.

The interurban company should pay to the city company a sum per car mile for use of tracks and power, so that the net profit to the city company will equal the net profit earned by one of its regular cars.

H. J. Clark, Interurban Elec. Exp. Co., Auburn & Syracuse.

I believe the express car mileage is the proper basis for an agreement between a city company and an interurban company for bringing the interurban express cars into the city. The car mileage is always a definite figure, and is easy to determine. The interurban express cars make so many miles over the city tracks and the interurban company should pay a fair amount per car mile for the privilege. I believe, however, the amount to be paid per car mile should be redetermined at the beginning of each year, and should be somewhat in relation to the gross receipts from express and freight during the preceding year; as the receipts increase the compensation per car mile paid by the interurban company should increase, as it is usually demonstrable that the increase in business is due largely to the fact that the interurban company is able to reach the heart of the city. The interurban company should furnish its own express cars, the car crews, and men to handle its stuff at the express terminal. It should also, of course, assume all responsibility for accidents caused by its cars or crews while within the city limits. The city company should furnish power and the tracks. A percentage of the gross receipts from express and freight is not so good a basis as car mileage on which to make agreement between the two companies, inasmuch as it is often difficult to decide just what portion of the stuff carried by the interurban company should be considered when determining the amount due the city company.

I am of the opinion, however, that the ideal way of handling the express and freight question, where one or more interurban companies desire to handle express and freight in conjunction with a city company, as, for instance, as at Albany, is to organize a separate company to carry on this business over all the systems. This company should operate itself and pay the different railway companies in proportion to the stock of the express company held by each. Under these conditions the express and freight should be handled entirely at night, when the lines are clear. This would do away with interference with passenger traffic, and would relieve the demand on the power station during the day when power is needed for moving passenger cars.

Edgar S. Fassett, Supt. United Tract. Co., Albany.

D 9.—Does it pay to handle express matter by electric cars? Does it pay to handle freight by electric cars?

Perhaps, I am unqualified to answer this question, but from the best information that I am able to obtain, the express and package business on electric roads has not been, in every instance, an overwhelming financial success, because of the large expense incident in developing and handling the business, and it occurred to me that perhaps in some cases it would be more profitable to contract with one of the large express companies which operate over the steam railroads in the particular locality, to take charge of the express and package business upon similar terms as it is handled over steam roads. The large express companies have agencies in nearly all of the cities and villages, and are prepared to handle the business with the least possible expense, and they could take on the business of the electric lines in these cities and villages, where they operate, with very little additional expense, and could, therefore, pay liberally for the business, and perhaps a great deal more than the net profits amount to, where the business is handled by the electric roads.

E. G. Connette, Gen. Mgr. Syracuse Rapid Transit Ry. Co.

Questions for each individual road, considering its particular circumstances, to solve for itself.

Geo. W. Parker, G. E. & P. A., Detroit United Ry.

The handling of express matter by the electric cars on the lines of this road is profitable. Except in a general way, I am unable to answer this question, but am of the opinion that it can be made profitable under the right conditions and the proper management.

E. J. Ryon, Supt. Schenectady Ry. Co.

It pays to handle both freight and express matter by electric cars.

George Dunford, Gen. Ex. Agt.,
Utica & Mohawk Valley Ry. Co.

This company accepts freight and express packages (at a compensation) only for the convenience of its patrons. This class of business is considered unprofitable here and the front platform of the regular passenger car is the only facility we care to offer to shippers. We give 20 per cent of the carry charges to the conductor and motorman who handle the goods.

A. H. Rogers, President
Southwest Missouri Elec. Ry. Co., Webb City, Mo.

We have found it profitable to handle freight and express by electric cars.

H. J. Clark, Interurban Elec. Exp. Co., Auburn & Syracuse.

The United Traction Company for some time has given a combined express and freight-carrying service over its entire system, and this business has been handled at a fair profit. In my opinion, neither an exclusive express business nor an exclusive freight business can be handled profitably, but the two combined can be made to give a fair return on the investment.

J. W. Gibney, Supt. Ex. Dept.,
United Tract. Co., Albany.

If a company has proper facilities and can secure sufficient tonnage per train at fair rates, there is profit in freight. We carry express matter on passenger trains without extra help for handling, and therefore with good profit. If we did not handle express, passengers would insist on carrying numerous large packages in cars without revenue to the company, and if rules were enforced prohibiting packages, patrons would resent it and go to steam competitor, or drive into town to buy or sell supplies, resulting in loss of passenger earnings.

Southern Superintendent.

D 10.—As a broad proposition, can express or freight matter be hauled as cheaply per ton mile by electricity as by steam?

I think not.

A. Eastman.

No.

Geo. W. Parker, G. E. & P. A., Detroit United Ry.

Under the conditions that electric roads are handling freight and express matter at the present time, I do not believe that freight can be handled as cheaply per ton mile as by steam.

E. J. Ryon, Supt. Schenectady Ry. Co.

D 11.—What does it cost per ton mile to haul express or freight matter by electricity—including all items of expense properly chargeable to this department?

Our information is to the effect that there is such a wide range in the method of accounting pursued by different companies that I would not care to answer this question.

GEO. W. PARKER, G. E. & P. A., Detroit United Ry.

D 12.—Will you please give the following information concerning your express business:

Gross receipts,
Operating expenses,
Cost of power,
Interest on investment,
Total expenses,
Net income,
Total tonnage
Average rate per 100 lbs.,
Gross earnings per express car mile per day,
Earnings per car hour?

In connection with above statistics, please give statement as to general character of express or freight business transacted.

The following is the report of the Electric Express Company, of Schenectady, for the year ending June 30, 1904:

Gross receipts	$36,237.94
Operating expenses	32,089.03
Net income	4,148.91
Total tonnage, pounds	10,371,000
Average rate per 100 pounds, cents	34.9
Gross earnings per express car mile per day, cents	78.9
Earnings per car hour	$5,686

The above figures do not give the cost of power or interest on investment, for the reason that the Electric Express Company is a corporation owned by the Schenectady Railway Company, but not operated as a branch of the railway. The cost of power is included in the car mileage paid by the Electric Express Company to the Schenectady Railway Company.

E. J. RYON, Supt. Schenectady Ry. Co.

The following is a report of the express and freight department of the Utica & Mohawk Valley Railway Company for the year ending June 30, 1904:

Gross receipts	$36,187.96
Operating expenses	22,177.24
Cost of power and interest on investment	4,557.91
Net income	9,452.81
Total tonnage, pounds	17,208,715
Average rate per 100 pounds, cents	21.03
Gross earnings per express car miles per day, cents	41
Earnings per car hour	$4.27

GEORGE DUNFORD, Gen. Ex. Agt.,
Utica & Mohawk Valley Ry. Co.

The following is a statement of the express and freight department of the United Traction Company for the year ending June 30, 1904:

Gross receipts	$38,000
Operating expenses	28,000
Net income	10,000
Total tonnage, tons	22,092
Cost of power, cents per car mile	1.84
Express car miles, own cars	36,645
Express car miles, foreign cars	12,739

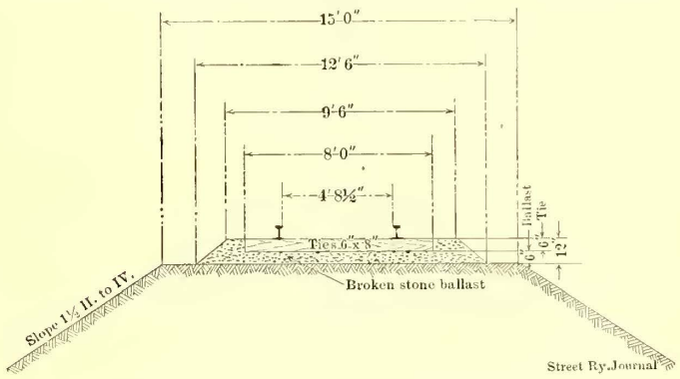
United Tract. Co., Albany.

I 10.—How can good drainage be secured on suburban and interurban electric roads? Please answer this question in detail.

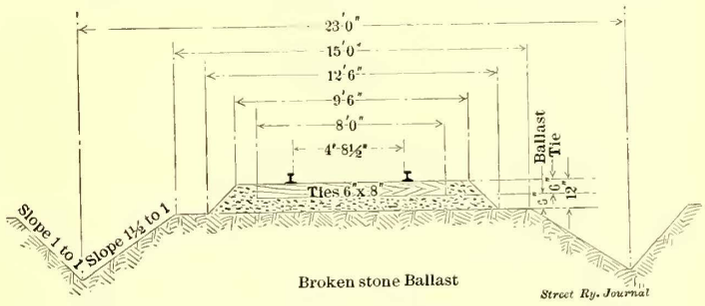
The ideal road is one built entirely upon a fill. The sub-grade should crown at the center with a slope of about 2 per cent, and a free draining ballast, coarsest at bottom, should be used. Drainage ditches of ample capacity bottomed to a depth of at least 12 ins. below sub-grade, and plenty of carefully located culverts, are requisite. It is a better investment to have twice the capacity in ditches and culverts, than insufficient drainage. As an old railroad man once said, "the most important thing in railroad construction is good drainage, the next is more drainage." The ballast should slope from top of tie at center of track to 2 ins. below top of tie at its end. On double track, covered box drains should be placed 500 ft. apart.

M. J. FRENCH, JR., Roadmaster,
Syracuse Rapid Transit Ry. Co.

It is very easy to secure good drainage on suburban roads if the ditches be made wide enough and deep enough, and the transverse drains of tile be large enough. This is a question where the individual cases must be decided by the engineer in charge, and no general laws can be made to cover all cases. I send, however, blue prints of our standard roadbed on which we have little trouble from lack of drainage, so long as we keep our ditches clear.



STANDARD SECTION ON EMBANKMENTS, ATLANTA



STANDARD SECTION IN EXCAVATIONS AND ON LEVEL, ATLANTA

W. H. GLENN, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

Locate the road with due consideration for drainage. Do not let ascending and descending grades meet in cuts, except at summits.

Asst. Eng. Ry. Dept

Best drainage is secured by laying drain tile graded to discharge into ditches at side of track.

H. A. TIEMANN, New York City.

I 11.—How can good drainage be secured on city tracks? Please answer this question in detail.

If the tracks are laid on paved streets, and the streets are sufficiently crowned, and the paving is in good shape, there should be no trouble from drainage except perhaps where two descending grades meet. In this case it is well to make a depression in the center of the track with a cover plate and ample drainage to the nearest sewer.

W. H. GLENN, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

I would construct a catch-basin with man-hole every 500 ft., just outside the tie line on double or single track, and would place track basins reaching from rail to rail of each track, emptying on a good grade, directly into the catch-basin. The drain discharge should be located so as to be readily reached by a man on the man-hole ladder, so that if hose flushing fails to clean the drain, it can be easily reached through its outlet. The catch-basin should be trapped to the surface water sewer and have ample capacity at the bottom for collection of sediment. A sectional concrete catch-basin can be made at comparatively slight expense by unskilled labor.

M. J. FRENCH, JR., Roadmaster,
Syracuse Rapid Transit Ry. Co.

Put catch basin, connected to sewer, at all points where water is likely to collect.

H. A. Tiemann, New York City.

I 12.—What is the best form of cover plate and design of openings for track drains, especially with reference to the prevention of horses' shoes getting caught in openings?

Iron grating is probably the best form of cover for drains, but it is objectionable on account of the horses' shoes getting caught in the parallel openings. To obviate this, a cover slightly concave with round holes 1½ ins. in diameter, and 1½ ins. edge to edge drilled in it, has been found to be very satisfactory. The plate should be so designed that the area of the openings in the plate shall equal the area of the drain pipe below, provided this drain pipe has been figured to carry only such water as comes in through this one cover.

W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

The track drain should be of cast iron, about 12 ins. wide, extending from rail to rail, and be set with cover ½ in. below tram or groove of rail, the groove being cut out at the drain. The cover should be removable and have a double row of 1 in. x 3½-in. oblong holes, flaring out underneath for self-cleaning. The bottom of drain should be semi-circular in cross-section, 8 ins. in diameter in the clear, and have a slope of 3 ins. to the 8-in. circular nose outlet on the end.

M. J. French, Jr., Roadmaster,
Syracuse Rapid Transit Ry. Co.

Make the openings small enough to prevent the trouble mentioned, or provide bosses or projections near enough together to prevent the shoes reaching the openings.

Asst. Eng. Ry. Dept.

I 13.—What is the best way of keeping tracks to gage in unimproved streets? Give details.

Use tie rods not smaller than 2 ins. x ⅜ in. With this practice the ties in the track may become so decayed that the spikes will loosen up, but still the tie rods will preserve the gage. If rail braces are used they frequently become loose and worthless as soon as the tie begins to decay. It often happens, too, that one end of a tie will decay while the other may be sound. In this instance, the weight of the car will push away the brace on the decayed end, thus destroying the gage. With tie rods it is very evident that this cannot happen.

W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

Insert a row of heavy deep paving headers on both sides of rails and heavy tie rods with lock nuts on both sides of rails. Double spike on inside of rails.

M. J. French, Jr., Roadmaster,
Syracuse Rapid Transit Ry. Co.

By using brace tie plates or tie rods. Prefer brace tie plates for the reason that should improvements be made on the streets the teams would not be able to break them down so easily.

Geo. H. Harris, Supt. Ry. Dept.,
Birmingham (Ala.) Ry. Lt. & Power Co.

Tie plates and tie rods with girder rail or tie plates alone with T-rails.

Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

On T-rail, 6 ins. and under, use braces at curves; on girder rail use tie-road 6 ft. apart.

Asst. Eng. Ry. Dept.

Use tie plates with low rails, brace tie-plates or tie rods with high rails.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Light Co.

I 14.—Have you had any experience with "creeping" rails, and how have you remedied this difficulty?

We have had very little trouble with creeping rails, probably because we slot-spike all our joint plates to the ties. Some time ago a short section of track began creeping a little, and we bolted an anchor plate on the center of each rail and slot-spiked it to the tie. The ballast around these ties was piled up heavily and the trouble was remedied.

W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

At double-track steam road crossings, use timbers extending under all four steam rails, with Portland cement concrete from bottom of timbers to paving or planking. Also use anti-creeping clamps on rails for 20 ties outside of crossing, placed to brace against direction of travel. On T-rail use anti-creepers, two pairs to a 30-ft. rail, and joints slotted for spikes.

M. J. French, Jr., Roadmaster,
Syracuse Rapid Transit Ry. Co.

Yes. The best remedy we have found is "anti-creepers."

Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

I 15.—Have you had any experience with "waves" developing in the top surface of rails? What is the cause of this phenomenon and how can it be remedied?

We have had no trouble with "waves" developing in the top of rails.

W. T. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

Yes. It is caused by the use of insufficient and poor ballast and want of care in maintaining track.

Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

Have had some little trouble from this source, caused by bad lot of ties, not properly adzed.

J. Chas. Ross, Gen. Mgr.,
Steubenville (Ohio) Tract. & Light Co.

I 16.—Do you know of any electric road that has used crude oil on the roadbed to lay dust and kill weeds? What have been the results obtained?

At one time we intended to sprinkle our roadbed with oil, but found it unnecessary to do so.

Boston & Worcester St. Ry. Co.

No. But steam roads have found the practice economical and satisfactory.

Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

We have never tried this and do not know of any roads in this vicinity that have.

E. J. Wilcoxen, Supt.,
Rochester & Sodus Bay Ry.

Do not know of any such road.

W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

I 17.—Is crude oil a satisfactory substitute for salt for preventing obstruction of switches and special work by ice and snow?

We have never attempted to find a substitute for salt. In this section we have very little trouble from snow and ice, but have always found salt a satisfactory remedy.

W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

We do not think it is.

Geo. H. Harris, Supt. Ry. Dept.,
Birmingham (Ala.) Ry. Lt. & Power Co.

No. Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

I 18.—Do you know of any satisfactory device to be attached to each car for cleaning the groove of girder rails? Please give description, with sketch or photograph.

We do not.

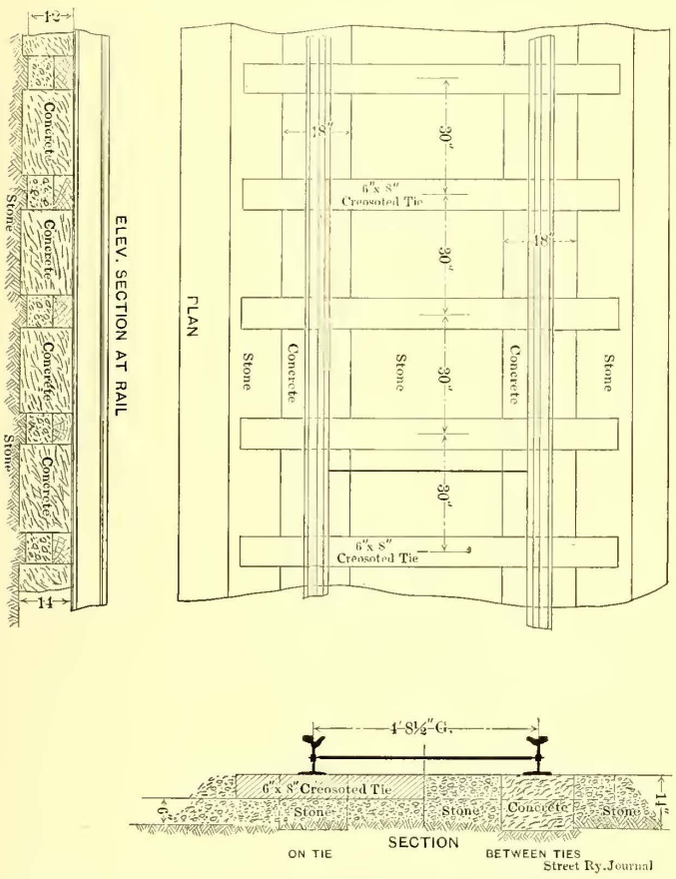
W. H. Glenn, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

We do not.

Columbus, Buckeye Lake & Newark Tract. Co., and
Columbus, Newark & Zanesville Elec. Ry. Co.

I 22.—What has been the experience with concrete foundations under rails or roadbed? Please give details as to how concrete was laid, cost of construction and results secured.

I have never been an ardent advocate of concrete stringer construction. It is almost impossible to get a good line and surface unless the concrete be brought up two or three inches above the base of the rail, which cannot always be done on account of the paving used. When the rail is laid on a stringer, the concrete in setting, contracts and leaves small spaces between the stringer and rail, which gives rise to a vertical motion in the rail when the car passes over it. Some have attempted to fill these small spaces with cement grout, but this soon powders away. In the case of sheet asphalt paving, the rails can be laid on stringers of concrete and this same concrete brought up within 3 ins. of the top of the rail. This makes a very rigid and noisy construction. We have adopted a compromise which admits of some slight elasticity in the track, and at the same time makes a very durable construction. The rails are first spiked down on 6-in. x 8-in. x 8-ft. creosoted pine ties spaced to 30-in. centers. Tie rods 2 ins. x ⅜ in. are then



STANDARD CONSTRUCTION IN PAVED STREETS, ATLANTA

put in every 7⅛ ft. The track is then surfaced and lined on 6 ins. of broken stone, and the cars are run over it for a short while. It is then gone over again and any settling places raised. Between the ties an excavation is then made immediately under the base of the rail 14 ins. deep and 18 ins. wide, and this is filled with concrete, bringing it ½ in. above the base of rail. The remainder of the track is filled to the top of ties with broken stone. (This construction can be more easily understood from the accompanying drawing).

W. H. GLENN, Supt. Roadways,
Georgia (Atlanta) Ry. & Elec. Co.

We have found that 9-in. girder rail, with concrete laid from bottom of tie to within 5 ins. of rail-head, thoroughly tamped under and around base of rail, has given good results. Materials should be distributed along the track in right proportions; stone on one side and sand and cement on the other. The mixing board or machine should be drawn along on the rails ahead of the work. If on double-track work, the mixing board should be on track nearest stone piles. Concrete be mixed 1 part of Portland cement to 3 parts of sand, thoroughly mixed in a dry state, wetted to the consistency of good mortar, and then 7 parts of thoroughly wet broken stone placed upon it and thoroughly mixed. Thorough mixing is essential to good results. Concrete should be carried ahead for tamping under the base of rails, but only so far as will insure its becoming thoroughly bonded with the main body before setting. The spaces between ties should be first filled and thoroughly tamped, and the top layer brought directly over the ties and tamped until it flushes on the surface. The spaces under head and flange of rail should be packed full of a soft mixture consisting of 1 part cement to 3 parts of sand, the headers and stretchers being set in the same mixture. If gravel is used the proportion 1 to 10 gives good results. With broken stone, delivered at $1.25 per cubic yard, and Portland cement at $1.20 per bbl., the cost would be about $2.75 per cubic yard. With gravel at 60 cents, the cost would be about $2.10 per cubic yard.

M. J. FRENCH, JR., Roadmaster,
Syracuse Rapid Transit Ry. Co.

Concrete foundation is necessary under tracks in paved streets if proper grade is to be maintained. Several types of concrete construction are employed. One that has proven the cheapest and fully as durable as any employed by the writer, has the following features: A beam of concrete in the form of a flat top pyramid, 12 ins. at the base, 6 ins. at the top, and 7 ins. high is laid under each rail from tie to tie; and under every second tie is laid a similar beam, 12 ins. at base, 10 ins. at top, and 6 ins. high. With 7-in. rails ties should be placed 4 ft. center to center, and with 9-in. rail, 5 ft. center to center. This construction requires 420 yds. of concrete per mile of single track, and at $5 per yard laid, the cost will be $2,100 per mile of track for concrete. The total cost with 9-in. girder rails at 93 cents per ft., laid with brick pavement, costing $1.25 per sq. yd., will be $16,508 per mile of single track. Itemized, this cost is as follows: Pavement per mile, $5,866; material per mile, exclusive of pavement, $7,702, and labor per mile, exclusive of pavement, $2,939; total, $16,508. If granite blocks, special brick or Medina sand stone are used, the cost of pavement per mile will be practically doubled.

H. A. TIEMANN, New York City.

There is probably no city in the country of equal size, that has more track on concrete foundation than can be found in Richmond. This concrete is laid 6 ins. deep under the ties between the rails, and 2 ft. on each side of rails, and is also placed in the cribs level with the top of the ties. It is made from a rich mixture, subject to city inspection. The webs of the girder rails, which are 8 ins. and 9 ins. in depth, are filled with a rich mixture composed of sand, fine stone and Portland cement. The actual cost of this concreting is $1.50 per running foot of single track road. No contractors' profits are included in this, as the work is done entirely by the company. A city ordinance requires all tracks to be concreted in paved streets. When the work was first done, although the cost was high, I considered the concreting of tracks a good thing, and something that would last forever, but finding after a time that the tracks at places were getting out of surface, and on investigation discovering that same was caused by this slab of concrete (as it might be called) settling at points, I have radically changed my mind. If we were building any sort of a structure on a concrete foundation, we would not stop at 6 ins. regardless of foundation, but would naturally go down to bedrocks or to some firm material, which would safely hold the structure. Of course it would be folly for street railways to hunt such foundations, for a mile of track might cost more than a squadron of first-class battle-ships. Another difficulty we find is that when the ties in this concrete have rotted, the question is how to renew them, it being almost impossible to take them out, and when one is finally gotten out, it is a difficult matter to find one to fit exactly in its place. On a short stretch of paved street in the heart of the city, and over which passes our heaviest traffic, there is no concrete under the ties, this particular piece of track having been laid before the ordinance went into effect. It is, however, ballasted with broken stone, and I consider it to be the finest piece of track, and the least costly to maintain, on the system. Whenever any part of it appears to be getting out of surface, all that is necessary to do is to pull up a few paving stones, tamp the ties, and surface same, as one would do on a steam road. This, as is well known, is impossible to do with a concrete foundation. On one of our divisions, instead of placing the 6-in. broad slab of concrete under the whole roadbed, permission was obtained from the authorities to dig a trench and construct a stringer of concrete, 15 ins. wide and 18 ins. deep, under each rail, connecting the rails with tie-rods and steel channel cross-ties every 5 ft. Experience has shown that this is not even as good as the original method, on account of lack of footings. The concrete beam at points broke entirely in two where the foundation was not of the proper material to support it, and I am strongly of the opinion that the same would have happened even had this concrete beam been constructed with reinforced metal.

Ch. Engr. Ry. Dept.

REPORT UPON INCREASING THE CAPACITY AND REDUCING THE NOISE OF THE UNION ELEVATED RAILROAD OF CHICAGO

The report on these two subjects, submitted to the committee on local transportation of the Chicago City Council by Bion J. Arnold, was made public this week, so that it is possible to present a brief extract of it in this issue. In his letter of transmittal, Mr. Arnold acknowledges the assistance rendered him in the preparation of this report by J. B. Strauss, C. E., and George Weston, C. E.

In discussing the elevated loop, Mr. Arnold refers to a previous report which he submitted to the local transportation committee of the Chicago City Council, November, 1902, relating to the Union Elevated loop. In that report he pointed out that at that time 1600 trains, ranging from two to five cars in length, are delivered to the loop railroad daily. The total number of cars operated on the loop per day was 5000. The traffic of the elevated railroads, like that of the surface lines which terminate in the business district, is principally handled during ninety minutes in the morning and ninety minutes in the evening. The period of maximum congestion on the loop tracks extends over approximately thirty minutes during the morning and thirty minutes during the evening rush hour. At these times the average headway between trains on the outer loop is 19.8 seconds and on the inner loop 19.5 seconds. The ultimate capacity of the loop tracks is fixed by the number of in-bound and out-bound trains which it is possible to pass through the junctions at Lake Street and Fifth Avenue, Wabash Avenue and Van Buren Streets, and Van Buren and Fifth Avenue. The present capacity, however, might be somewhat increased by lengthening the station platforms so that two trains of five or six cars could simultaneously occupy a platform. Mr. Arnold also recommended the establishment of auxiliary stub terminals and, if feasible, the through routing of trains.

Fig. 1 represents the loop as it is now constructed and operated. The point on the loop which now limits its apacity is at *a*, where the Metropolitan tracks cross the outer loop track to enter and leave the inner loop at Fifth Avenue and Van Buren Street, where, under present conditions of maximum operation, forty in-bound and forty out-bound Metropolitan trains meet sixty-seven Oak Park and Northwestern trains in one hour. The next most congested point is at *b*, Van Buren Street and Wabash Avenue, where thirty-one in-bound and thirty-one out-bound trains of the South Side Road meet sixty-seven Oak Park and Northwestern trains in one hour.

Assuming that it is practicable to pass a train through these points and clear for another train in forty-five seconds, the maximum number of trains that could enter the loop in one hour from either of these points would be forty-five, provided the interlocking plant had to be worked for each train; but since it is possible for a train to pass off from the loop at each of these points at the same time that a train is also passing on to it, the interlocking device needs to be worked but twice to allow the passage of three trains—one entering the loop, another leaving the loop and the third crossing the tracks of the other two—and it is this feature that gives the present junction points their efficiency over any other that can be devised for the present method of loop operation, for it permits three trains to be handled through them in one and a half minutes, provided the trains chance to come, or are arranged, in such manner as to utilize this advantage.

The perfection during the past few years of power mechanism for operating switches and signals at junction points has been such as to warrant its adoption on the loop, and if used

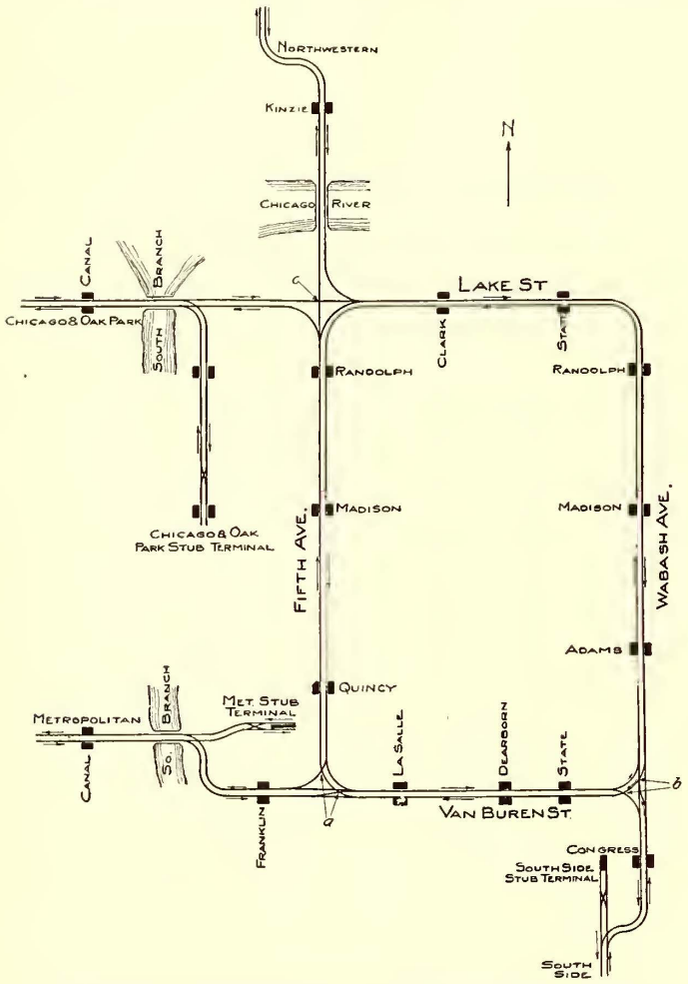


FIG. 1.—PRESENT ARRANGEMENT OF THE UNION LOOP

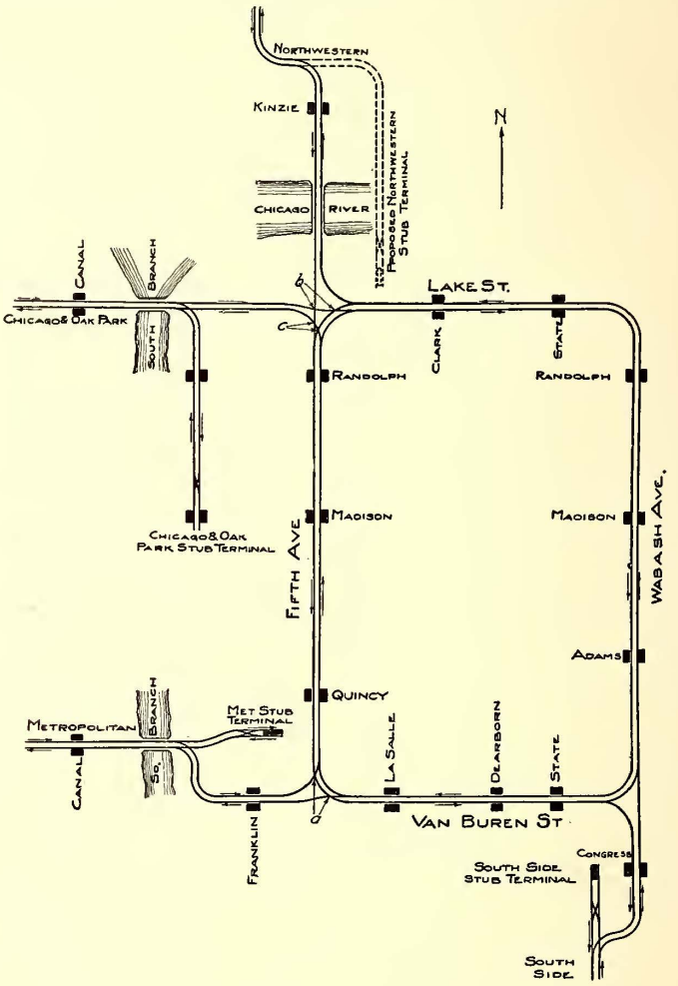


FIG. 2.—PROPOSED REARRANGEMENT OF UNION LOOP

the capacity of the junctions could be somewhat increased, owing to the quicker action of the mechanism. When the advantages of this improvement and of the use of "the multiple-unit system" on the cars are utilized, there is no way that the capacity of the loop, as now built, can be increased under the present method of individual ownership operation except by extending the platforms, and when this is done relief to the present loop district must come from the development and operation of stub-end or other terminals for each road, unless unification or some method of joint operation can be effected whereby through routing can be adopted.

Mr. Arnold then discusses several methods of through routing, giving the advantages of each. Of these, he recommends either that shown in Fig. 2 or Fig. 3.

In Fig. 2 provision is made for routing through trains from the South Side Road to the Northwestern Road and back, and from the Metropolitan Road over the Union Loop to the Chicago & Oak Park Road and back, and at the same time it makes provision for the operation of loop trains for all the roads. It places the trains of the South Side and Northwestern roads on the outside loop track, and the trains of the Metropolitan and Chicago & Oak Park roads on the inside loop track. It also reverses the running of the trains of the Northwestern Road to right-hand running, and those of the Metropolitan Road to left-hand running. The routing of the through trains under this system would be as follows:

A train originating on the South Side Road would run north on the east track of the Wabash Avenue section of the loop, thence west on the north track of the Lake Street section of the loop, thence north on the east track of the Northwestern Road. Returning it would run south on the west track of the Fifth Avenue section of the loop; thence east on the south track on Van Buren Street and south on the west track of the South Side Road, thus intersecting traffic on the Metropolitan Road at point *a*, and the Oak Park Road at points *b* and *c*, as at present.

A train originating on the Metropolitan Road would enter the loop on Van Buren Street from the north track of the Metropolitan Road, thence north on the east track of the Fifth Avenue section of the loop, thence west on the south track of the Chicago & Oak Park Road. Returning it would run east on the north track of the Chicago & Oak Park Road, thence east on Lake Street on the south track of the loop, thence south on the west track of the loop on Wabash Avenue, thence west on the north track of the loop on Van Buren Street, and out to the south track of the Metropolitan.

Suitable curves are provided at Van Buren Street and Wabash Avenue and Fifth Avenue and Lake Street on the outside loop track to allow the operation of loop trains for both the South Side and Northwestern systems, while similar curves are provided at Fifth Avenue and Lake Street and Fifth Avenue and Van Buren Street on the inner loop track to allow the operation of loop trains of both the Metropolitan and Chicago & Oak Park Roads.

This plan gives all the advantages of the present system of operation and all necessary advantages of through routing, and at the same time reduces the congestion on the loop, or increases the capacity of the entire elevated railway systems up to the full capacity of the junction points, an increase of not less than 25 per cent over its present capacity, and if power operated junction point mechanism is employed a further increase will be effected. It would necessitate the changing of cars for passengers desiring to go from either the south or the north divisions of the city to the west side, and vice versa, but inasmuch as all roads could operate a certain portion of their trains around the loop, all stations could be made transfer stations, thus avoiding congesting the people at a few transfer points, and with a suitable transfer system would give to the citizens the best elevated service possible with the present elevated loop structure when using grade crossings.

Still a better plan is shown in Fig. 3, which is submitted as the best possible solution of the entire problem. It is the same as the plan shown in Fig. 2, except that the crossings are eliminated by elevating the tracks of the inner loop over those of the outer loop at Fifth Avenue and Lake Street, and the outside track of the loop over the Metropolitan tracks at Fifth Avenue and Van Buren Street. The routing of the cars would be the same as in the case shown in Fig. 2, but the capacity of the systems would be limited only by the facilities for loading and unloading on the loop structure. Assuming that all trains operated were through trains, the capacity of the present loop and of the roads connected therewith would be increased 100 per cent, and by extending the platforms, thereby permitting increased facilities for loading and unloading, the capacity would be still further increased, and thus the advantages of the entire elevated and loop systems utilized to their possible maximum capacity. If then each road should be allowed a stub-end terminal, its rush-hour capacity could be still further increased, so that the only limit to the capacity of the elevated roads of the city would be determined by the number of main line tracks leading away from the terminals.

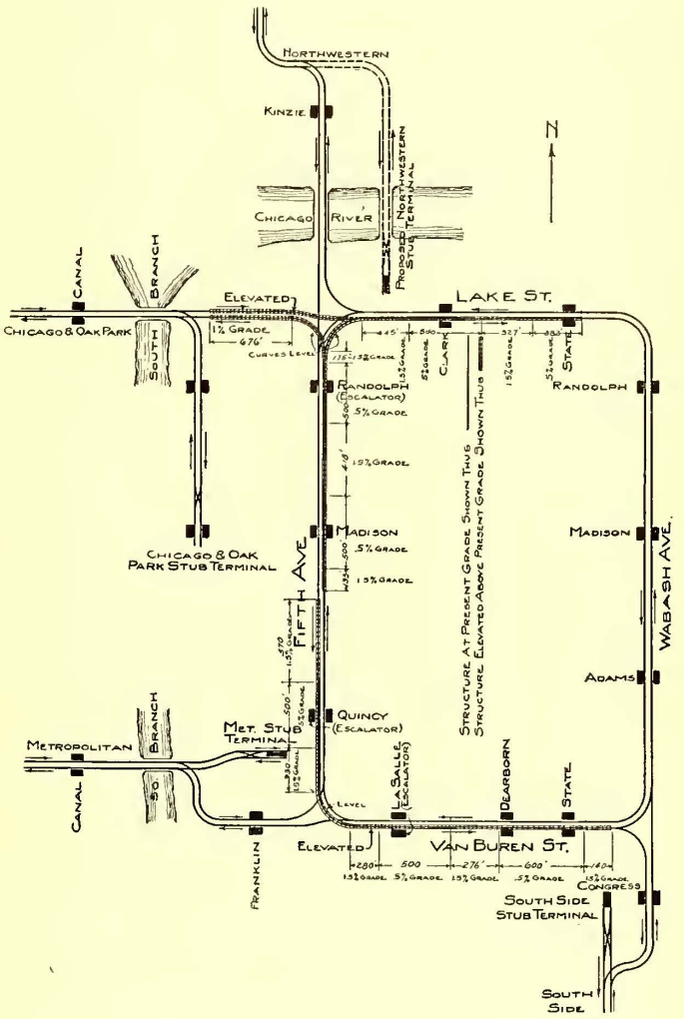


FIG. 3.—PROPOSED REARRANGEMENT OF UNION LOOP TO GIVE MAXIMUM CAPACITY

Modifications of the plan shown in Fig. 3 were suggested in case it should prove practicable to enlarge the loop by extending it in various ways. In all the plans calling for the tracks of the loop to be elevated, the grades have been kept well within the limit for safe operation, as the maximum grades are 1½ per cent, while in front of stations all grades have been reduced to one-half of 1 per cent for a distance of 500 ft., thus giving

ample room for two trains in case the platform should be extended. Universal through routing of trains can be accomplished, if necessary, with either of the plans proposed.

The cost of changing the loop to conform to the above described systems would be about as follows: For the plan shown in Fig. 2, including necessary changes in special work, new interlocking power mechanism and the extension of platforms, but not including any alteration of present track or structure to reduce noise, $97,000.

For the plan shown in Fig. 3, including elevation of structure, removing and replacing track on elevated portions, modification of stations and platforms due to elevation, new power mechanism for interlocking plants, necessary changes in special work and the installation of escalators at Clark, Randolph, Quincy and La Salle Streets, but not including any alterations of present track or structure to reduce noise, $500,000.

Summarized then, Mr. Arnold's recommendations for increasing the capacity of the loop are as follows, arranged in the order of their merits in general and in sub-classification:

First—(a) Reconstruct, elevate and through route in accordance with plan shown on Fig. 3; (b) extend the platforms; (c) develop the stub-end or auxiliary terminals.

If it is found impracticable to elevate, then:

Second—(a) Reconstruct and through route in accordance with plan shown on Fig. 2; (b) extend the platforms; (c) develop the stub-end or auxiliary terminals.

If on account of the diversified ownership of the roads, or for any other reason, it is found impracticable to secure through routing, then:

Third—(a) Leave the loop as it is now and install power mechanism for operating the switches and signals at the junctions; (b) extend the platforms; (c) develop the stub-end or auxiliary terminals.

PART II.—SUGGESTIONS FOR REDUCING THE NOISE UPON THE UNION ELEVATED LOOP

The question of deadening or reducing the sound on metallic elevated railway structures has been a serious one ever since such structures have been put in operation, and though public remonstrance has been great at times, and some experiments for reducing the noise have been made, but little has been accomplished which can be accepted as definitely pointing toward a satisfactory solution of this trying problem, although recent methods of using concrete have made the solution more likely.

The first elevated railroad company to meet criticism of this nature was the Manhattan Elevated, of New York, and a number of experiments were made by this company between the years 1871 and 1878 in an endeavor to find some method of reducing the noise caused by the operation of trains on its elevated metal structure. Many schemes were proposed by various individuals whose theoretical considerations had led them to believe that a practical demonstration of their ideas would solve the problem.

Most of the schemes proposed were methods for supporting the rail upon some cushioning material, such as lead, felt or asphalt, while others proposed to not only support the rail in this manner, but also to surround it with some substance, such as sand, asphalt mixed with sand, crushed stone, felt, lead, etc. Almost all those who offered solutions seemed to think that some method of shrouding the rail and providing a cushion between it and the structure would prevent the difficulty.

Figs. 1, 2 and 3 show some of the most meritorious schemes proposed. These were tried, with others, but it was found that the deadening effect on the noise was not sufficient to warrant the expenditure necessary to put the plans into execution over the system and experiments were abandoned.

When the New York Central & Hudson River Railroad Company completed its steel viaduct, extending from the Harlem River to 110th Street, in 1897, where its trains enter the city of New York through one of the most densely populated districts of the city, it was soon confronted with damage suits on the part of the people, due to the excessive noise made by trains running over its track on this steel viaduct. The company's engineers went into the subject thoroughly at the time, and, after experimenting to a considerable extent with various substances, such as sawdust mixed with asphalt and other mastic material, came to the conclusion that no such material placed around the rails and under the ties would effectually

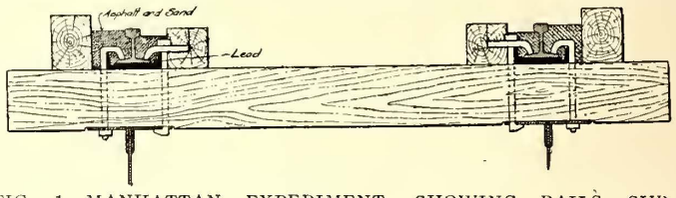


FIG. 1.—MANHATTAN EXPERIMENT, SHOWING RAILS SURROUNDED WITH ASPHALT AND RESTING UPON LEAD STRIPS CARRIED IN STEEL CHANNELS

overcome the difficulty, for while they deadened the noise somewhat, they were not strong enough to hold the track. Fig. 4 represents a longitudinal section of this structure as built at the time it was first put in operation. It will be noticed that the rails were clamped rigidly to the steel deck plates of the structure, thus providing the best possible means for the transmission to the structure of whatever blows or shocks the rails

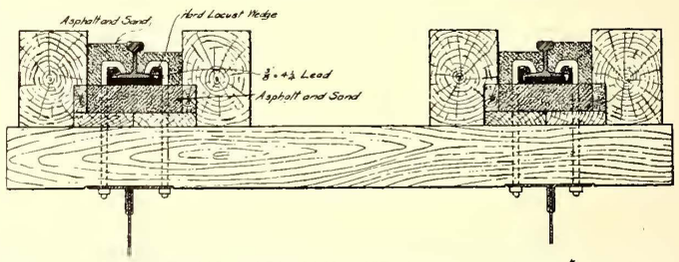


FIG. 2.—MANHATTAN RAILWAY EXPERIMENT, SHOWING SAME AS FIG. 1, EXCEPT THAT STEEL CHANNELS REST UPON ASPHALT

received from the rolling stock. Fig. 5 represents a longitudinal section of the same structure after the rails had been raised and provided with sawed ties underlaid with crushed stone ballast, thus making the track similar to the later type of ballasted steel railway bridges and street crossings. The ill effects produced by the operation of the trains were so reduced as to cause the citizens living along the right of way to cease their

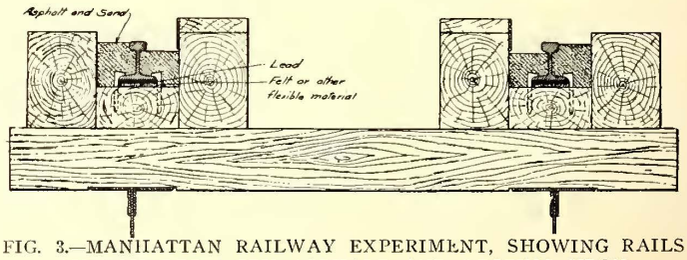


FIG. 3.—MANHATTAN RAILWAY EXPERIMENT, SHOWING RAILS SURROUNDED WITH ASPHALT AND RESTING UPON LEAD STRIPS UNDERLAID WITH FELT

objections, which resulted in the withdrawal of the damage suits previously brought, thus showing that the remedy applied in this case was somewhat effective, although the noise was only partially eliminated. The structure occupies one of the principal street in Harlem, and is lined on each side with high apartment buildings. The tracks on leaving the steel structure extend for a considerable distance over a stone viaduct, thence into a tunnel underneath Park Avenue. This case, therefore, offers about the best example of the relative sound deadening effects of four classes of construction that I have been able to find during my investigation, as the trains coming from the north operate first over a steel drawbridge, where the rails rest

directly upon the plates of the bridge, then over a rock-ballasted steel viaduct, then over a rock-ballasted stone viaduct, and thence into a tunnel, where they are completely surrounded for certain distances and open to the streets at other places. It will be found by one who investigates this case that the noise is greatest on the bridge, less on the steel-ballasted structure, considerably less upon the stone viaduct, and if the observer is on the surface of the street over the tunnel where the trains are completely enclosed, the perceptible noise is very slight. It will thus be seen that in this case the only place where the objectionable noise is eliminated entirely is where the trains are completely surrounded by a mass of non-metallic and non-vibrating material.

One of the earliest European attempts to deaden the noise on an elevated structure was made on the Liverpool Overhead Railway at Liverpool, England, in 1893. This road was built with a ballasted floor with asphalt and ballast supported on circular steel arches bent from flat plates, in accordance with the type of construction known as Hobson's arch plate system. The rails were supported upon longitudinal wooden sleepers, which rested directly upon the arch plates, and the space between these plates was filled with asphalt and ballast. Fig. 6 shows this type of construction.

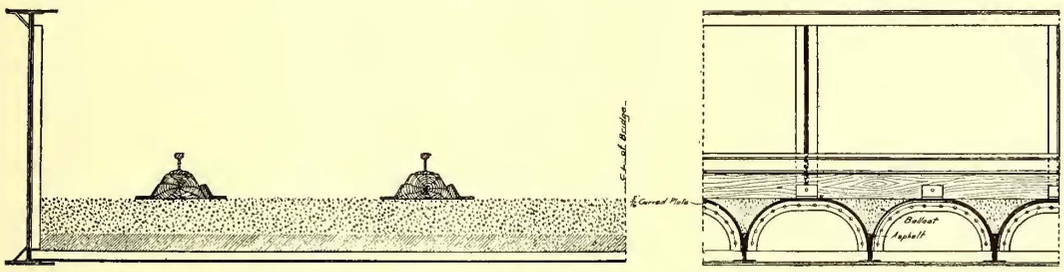
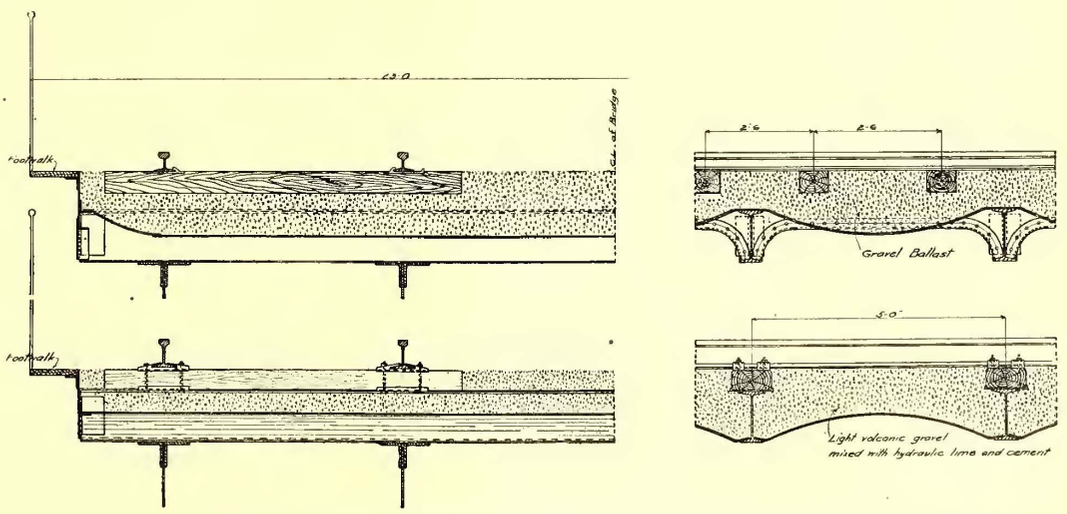


FIG. 6.—ROADBED OF LIVERPOOL OVERHEAD RAILWAY

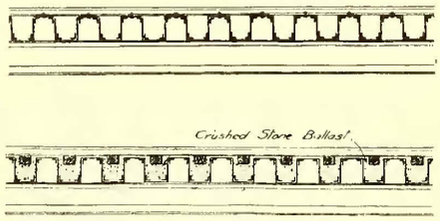
The latest European attempt made in this direction was made in connection with the Elevated Electric Railroad of Berlin, Germany, completed in 1901. This is a rapid transit line, about 6 miles long, and in both the business and residential sections the construction was intended to reduce the noise, the general design for this purpose embracing a solid floor of buckled plates, filled with special ballast of volcanic gravel secured from the Rhine Valley. This construction is shown in Figs. 7 and 8, and it will be noticed that in Fig. 7, which represents the road as constructed in the western or residential portion of the city, the ties are embedded in ballast, while in Fig. 8, which represents the type of construction used in the eastern part of the city, the ties are further apart and rest directly upon the I-beams of the structure, the rails here being of extra depth and weighing 86 lbs. per yard, to allow for the increased distance between the ties. While these methods of construction have accomplished to a considerable degree the object sought, they have not eliminated the noise as thoroughly as is desirable upon the Union Loop.



FIGS. 7 AND 8.—ROADBED OF BERLIN ELEVATED RAILWAY

PRESENT LOOP STRUCTURE

The present steel structure of the Union Elevated Railway in Chicago, while well designed from a structural standpoint, shows that little consideration was given to the problem of noise, which makes it very difficult to reconstruct it in such a manner as to apply what is now known regarding sound deadening without costing a great deal more than it would have cost had the subject been given careful consideration at the time of construction.



FIGS. 4 AND 5.—NEW YORK CENTRAL VIADUCT AS ORIGINALLY CONSTRUCTED, AND AFTER TIES IN BALLAST WERE USED

Fig. 9 is a side elevation and plan of a typical loop span, comprising latticed deck, longitudinal trusses, semi-latticed girders and riveted posts; and Fig. 10 shows an enlarged transverse section with detail of floor. It will be seen that the rails rest immediately upon ties which, in turn, are rigidly secured to the upper chords of latticed steel trusses, thus giving the best condition for imparting the hammer blows, caused by the wheels upon the rails, directly to the structure that could have been devised, unless the rails had been placed immediately upon the upper chords or upon a metallic support between the rails and the chords. While this construction is not questioned from a railroad engineering standpoint, for it is well designed, attention is called to it to show some of the difficulties that will be encountered in attempting to modify it so as to deaden the sound to such an extent as may be found practicable. Were the present structure not in place, I am firmly of the opinion that a concrete structure could be designed and built which would prevent to a large degree the noise now emanating from the present steel structure, for a cost which would not be greatly in excess of the cost of the present structure, and such a design is shown in Figs. 11 and 12; but to change the present structure into one resembling such a form is a difficult and expensive task.

In analyzing the relative merits of different classes of construction, the fact should not be lost sight of that the noise comes primarily from the trains, and a large part of this noise

cannot be eliminated entirely, no matter how good the design of the structure, and the best, therefore, that can be expected is to minimize the noise caused by the operation of the trains, to the greatest possible extent, and prevent it being intensified by the supplemental action of a vibrating or ringing structure.

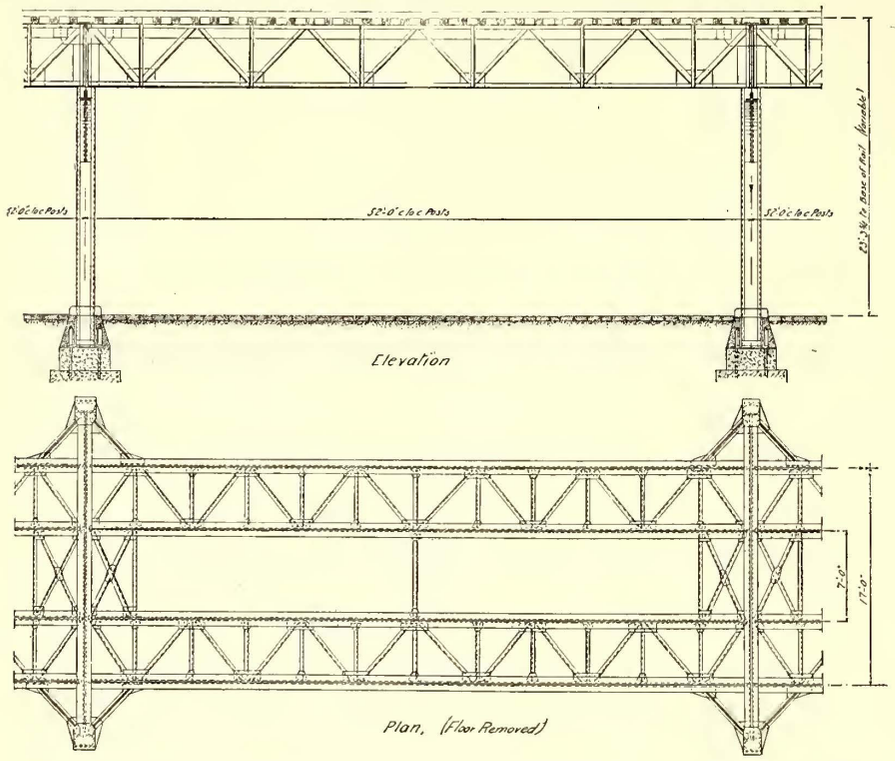


FIG. 9.—SIDE ELEVATION AND PLAN OF PRESENT TYPICAL LOOP SPAN

The structure shown in Figs. 11 and 12 would be built of stone or concrete reinforced with steel parts embedded in the concrete, similar to the methods now becoming so generally utilized in the construction of railway bridges, buildings and other structures.

The use of concrete would eliminate almost all of the difficulty encountered with the present structure due to vibration, and if, in addition, the structure were carried up solid on each side of each track to a point slightly above the bottoms of the cars, as shown, the noises produced by the wheels upon the joints and by other working parts of the train would be largely confined to the space underneath the train, and would to a certain extent dissipate themselves and be prevented from being immediately transmitted in a horizontal plane to the sides of the tall buildings on each side of the structure, thence upward, to the annoyance of the occupants of the upper stories, as at present. This class of construction would be objected to by the operators of the road, owing to the fact that it would introduce difficulties in removing ties; but in answer to this it may be said that the underground railroad of New York (the latest to be constructed), as well as the Berlin Elevated Road and others, have at the present time this objection in a greater or less degree, so that it should not be considered prohibitive if, by its adoption, other advantages could be gained.

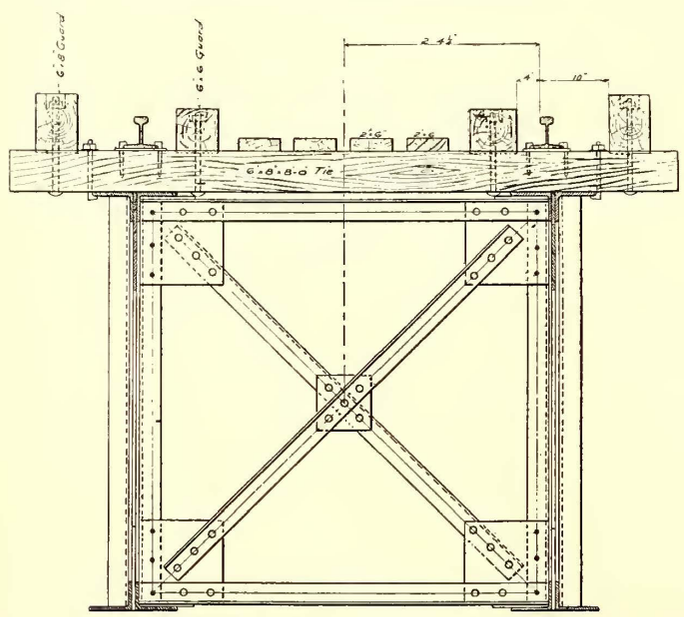


FIG. 10.—TRANSVERSE SECTION OF PRESENT TYPICAL LOOP SPAN

Furthermore, the ties on an elevated structure should last many years, and the use of concrete steel ties, similar to those now beginning to be used in steam railway service, would almost entirely eliminate this objection, as they would seldom, if ever, have to be renewed.

Since it would be manifestly unjust to ask that the present loop structure be removed, and thus permit the erection of a design of this character, the problem then is how best to modify the present design so as to reduce the noise to the greatest possible extent without making the cost prohibitive.

There are four primary causes of the noises of the loop, which are as follows:

1. Imperfect track construction.
2. Imperfect rolling stock.
3. Imperfect roadbed.
4. Defects in structure. (a) Elasticity of the steel; (b) lack of rigidity.

IMPERFECT TRACK CONSTRUCTION

The track when built in 1895 was laid with 80-lb. steel rails upon light tie plates, and provided with all necessary special work for operating the trains in and out of the loop, and so long as the joints of the track remained new and in good condition the noise was not excessive, after the inequalities incident to the opening of a new line of track had worn off, except at the junction points and on cross-overs, where many frogs and switches were necessarily placed. As the track became worn and the joints hammered, the noise began to increase, and it has continued to increase until the present time, when it is almost unbearable in certain places, and especially at the junction points. The present condition of the track is largely due to the failure of the tie plates, which proved to be too light for the duty imposed upon them.

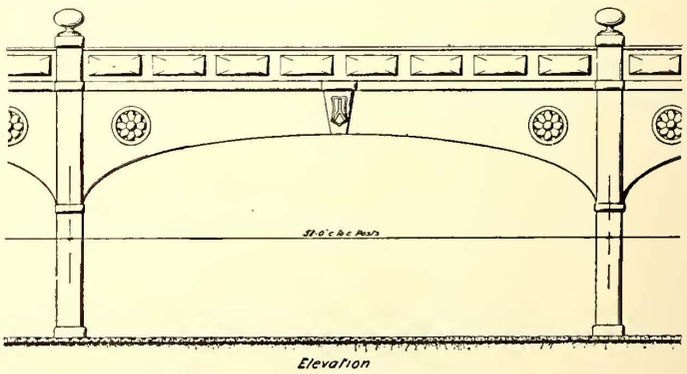
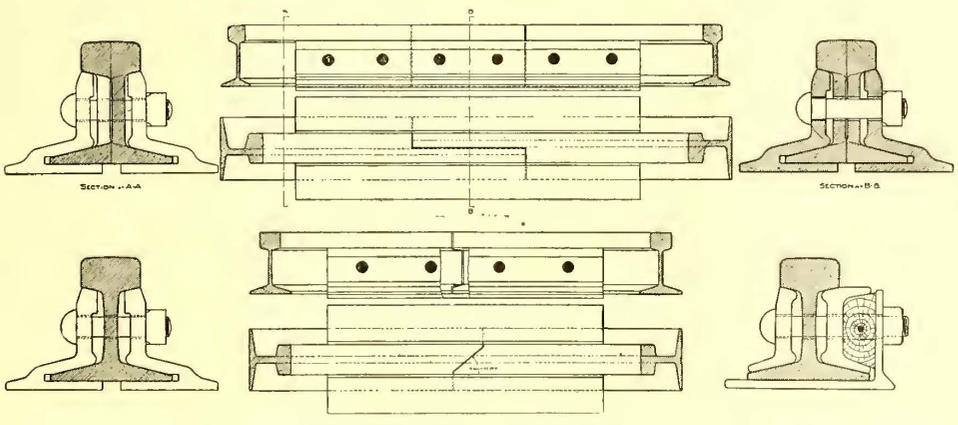


FIG. 11.—ELEVATION OF SUGGESTED CONCRETE STRUCTURE

As the hammering of the wheels over the joints is the chief source from which noise is imparted to the structure, it is of

vital importance that these joints and the entire track be built in as thoroughly first-class manner as possible, and maintained in this condition. It seems almost impossible to procure a type of joint over which a heavily loaded wheel will pass without imparting to the rail a blow sufficient to produce sound of considerable magnitude, and in time cause a hollow place in the rail upon which the wheel strikes after leaving the joint.

I have given careful attention to the rail and joint question, and believe that the most practical thing to do under the circumstances, in view of the fact that the present rail is badly worn and would have to be renewed before experiments with any new type of rail could be conducted, during a sufficient length of time to determine its practicability, is to use the American Society of Civil Engineers' standard section, rerolled steel T-rail, weighing not less than 80 lbs. to the yard, having its ends cut at an angle of about 40 degs., and provided with some first-class joint of the bridge type, such as the continuous, the Weber, or other equally as good joint. A bridge type of joint is one which allows the ends of the rails to be jointed midway between two ties and the joint itself extends from tie to tie, thus bridging the space between the ties and forming a support for the open rail ends. Fig. 14 represents such a joint as seems best to adopt under the circumstances. This joint is not new and has been used in different forms by various railroads, and especially by the Lehigh Valley Railroad, where it was known as the Sayre joint, for a period of about twelve years, and to a certain extent by the Buffalo, Rochester & Pittsburg Road. While it has been abandoned by the former road, due probably to the fact that the advantages gained in steam railway service were not considered by the management sufficient to pay for its increased cost, I believe it to be the most practical thing to adopt in this case at present, for, by its use, it will be possible for the Union Loop Company to equip its road during the coming summer with new rail, and thus at once eliminate a large part of the present noise. If this type of joint is used, the rails should not be over 45 ft. in length,



FIGS. 13 AND 14.—SECTIONS AND PLAN OF MITERED JOINTS AND SCARF JOINT

on account of expansion difficulties. It is important that the joint be made with shoulders on the rails, as shown, thereby removing the sharp points.

If there were sufficient time to secure special rails, there is one other type of joint which I believe would do good service. This is known as the scarf joint, shown in Fig. 13, and is the standard joint used by the Prussian State Railways for a number of years, and at present used on the Berlin Elevated Road. In its best form, however, it necessitates a specially rolled rail, as it will be noticed that the web is eccentric or off-center of the rail, this construction permitting the rails to be alternated and allowing the webs to lap at the joints, thereby making a stiff, substantial joint, and, at the same time, providing a practically continuous rail for the wheel when passing the joint. It is this form that is used on the Berlin Road, and is there known as the Haarmann-Vietor rail, after the patentees.

All "special work" not absolutely necessary for the proper operation of the trains should be removed, and worn special work now in place (and ultimately all the present special work) replaced with the best and most improved type of manganese steel special work, which, although very expensive, lasts so much longer than ordinary special work that, under the conditions existing on the loop, it is advisable to use it. All frogs

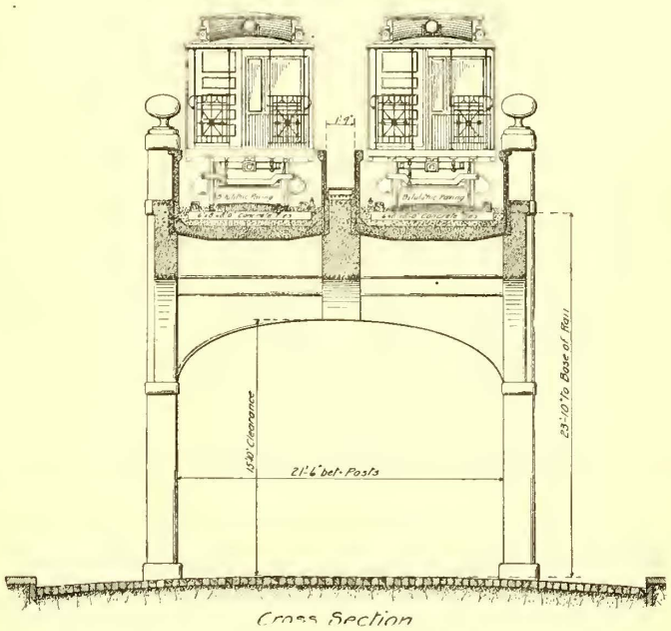


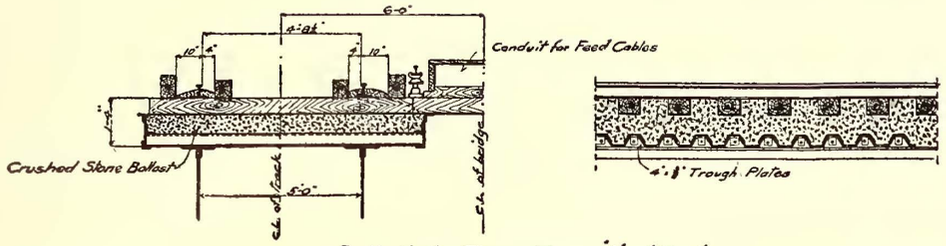
FIG. 12.—TRANSVERSE SECTION OF SUGGESTED CONCRETE STRUCTURE

should be of the movable point type where conditions will permit, or of a type which will offer as nearly a continuous rail as practicable for the rails over which the wheels are passing. In order to make the rail and its support a unit, all rails should rest on large and heavy tie plates and be secured to the ties by means of screw spikes or otherwise in such a manner as to prevent the rattling of the rail and plates, and be maintained in this condition.

IMPERFECT ROLLING STOCK

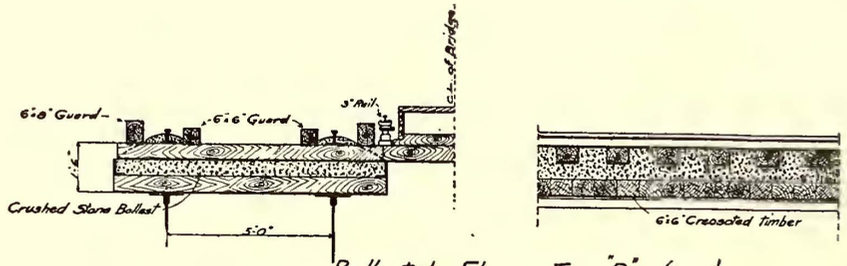
The rolling stock in use on the Union Loop consists mainly of rather light cars with open running gear. Since a large part of the noise proceeds from this running gear, it is important to apply some corrective for this either on the cars or on the structure. Unless the railroad companies will maintain this apparatus in good condition and thereby prevent much of the present noise from this source, some method of enclosing the entire truck, including the wheels, with a light casing of sound deadening, non-combustible material, such as asbestos sheeting, should be tried. This casing should come as close to the guard rails as practicable and clear the third rail, so as to intercept as much of the noise from the wheels as possible. It should have a bottom, and the sides should be hinged to permit inspection.

A truck casing of this type should, to a considerable degree, smother the noise due to brake beams and shoes, defective gears, rattling of bolts and rivets on trucks, etc., which is particularly annoying at times, and in a large part that resulting from the impact of the wheels on the rails. From a railroad standpoint this is a very objectionable thing to do, for the reason that inspection of the truck and motor parts would be made more difficult and the capacity of the electric motors



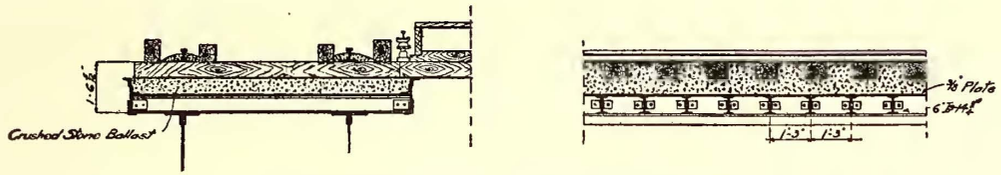
Ballasted Floor Type "A" (Steel)

Weight Inner Stringer 1170# per lin foot
" Outer " 1070 " " "
Total 2240 " " "



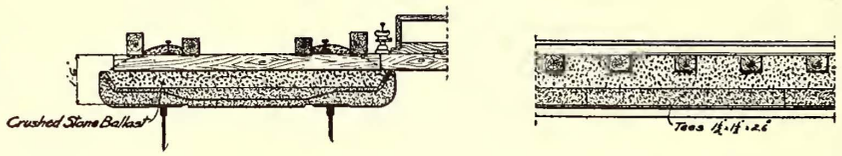
Ballasted Floor Type "D" (Wood)

Weight Inner Stringer 1050# per lin foot
" Outer " 950 " " "
Total 2000 " " "



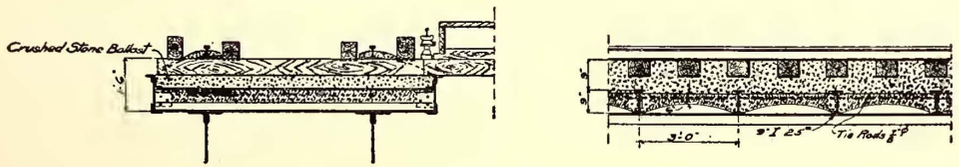
Ballasted Floor Type "B" (Steel)

Weight Inner Stringer 1100# per lin foot
" Outer " 1000 " " "
Total 2100 " " "



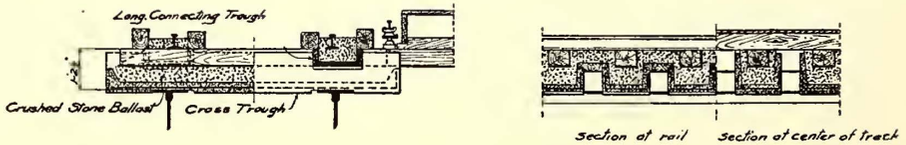
Ballasted Floor Type "E" (Concrete Steel)

Weight Inner Stringer 1300# per lin foot
" Outer " 1200 " " "
Total 2500 " " "



Ballasted Floor Type "C" (Concrete Arch)

Weight Inner Stringer 1300# per lin foot
" Outer " 1200 " " "
Total 2500 " " "



Ballasted Floor Type "F" (Concrete Steel)

Weight Inner Stringer 1000# per lin foot
" Outer " 300 " " "
Total 1300 " " "

Note.
Ballast Broken Stone 6" deep under ties
Ties. 6:8"x8"x8'-0" spaced 2'-0" c. to c
Every 4th tie extended to carry cable conduit

FIG. 15.—SHOWING TYPES OF FLOORS APPLICABLE TO THE UNION LOOP

would be reduced owing to their enclosure. Careful inspection and the prompt renewal of all defective and badly worn parts would largely remove this source of noise and, by adopting side walls on the structure as hereinafter described, the noise from the same would be rendered less objectionable.

The Northwestern and Chicago & Oak Park roads use single motor cars on their trains, which method of operation imposes upon four sets of motor gears the entire duty of accelerating any train, no matter how heavy. This results in excessive gear noise on heavy trains, which could and should be eliminated by the adoption of the multiple-unit system, which provides each car with its own motors and thereby imposes less duty upon individual gears. Furthermore, the average speed of the trains could be increased by its adoption.

The latest types of cars used for intramural transportation, such as those recently put into service in the subway by the Interborough Company, of New York, are provided with sound deadening material in the hollow spaces of the floors and sides. There are several fireproof substances that can be used for this purpose, and all new equipment purchased by the elevated roads of Chicago should have all hollow places filled with some such material. Such of the present cars as have no sound deadening material in them should have the hollow spaces filled with mineral wool, asbestos or some other light, non-combustible material.

The present cars and trucks should be put in first-class condition and kept so, and all future cars should be equipped with trucks having as few parts as practicable.

The relief opening of the triple valves of the air brakes should be provided with some device for muffling the noise of the escaping air when the brakes are released, and thus prevent the sharp whistle now common to some of the cars. This can often be accomplished by changing the size of the orifice.

IMPERFECT ROADBED

As has been previously pointed out, the roadbed of the present structure, though satisfactory for railroad operation, is defective from the standpoint of sound deadening, and in order to remedy this defect as far as practicable some type of ballasted floor must be used. This might involve the reinforcement of the loop structure to provide for the added weight, and this reinforcement governs the selection of the type of floor to be adopted. Considerations of cost, maintenance, interruption of traffic and cutting off the light in the streets below, as well as the difficulties attending the alteration of the existing structure, enter into the problem.

Ballasted floors have been used in this country, and especially in the vicinity of Chicago, by different steam railroads in crossing streets on viaducts, the ballast generally being supported on steel trough plates or I-beams with steel plate decking. In some instances creosoted plank has been substituted for the steel decking, and in some types the ballast has been omitted altogether, as in the case of the first track on the New York Central viaduct.

In order to compare the various types of floor construction, six such ballasted floors applicable to the loop are shown on Fig. 15, designated as types A, B, C, D, E and F. These types have all been designed to support a single track only, leaving an open space between tracks for the feeder conduit and third rails, except at crossings, turn-outs and junction points, where the floor would extend across this space. All floors have been figured for 12 ins. of broken stone ballast, weighing 140 lbs. per cubic foot, and providing for 6 ins. of ballast under the ties. Types A and B are what may be termed ballasted steel floors. Type C is a ballasted concrete arch floor, and type E a ballasted concrete steel floor resembling the latest type adopted by steam railroad companies for bridges. All of these are "solid" floors—that is, they form a continuous decking under the track. Type F is a type of open ballasted concrete steel floor.

The effect of the ballast as used in these various types would be a cushioning of the rails, and a reduction of the impact due to the cars, improving the riding qualities of the track, reducing the noise and increasing the durability of the structure. By carrying the ballast up and around the rails the noise due to the singing or humming of the rail would be greatly reduced.

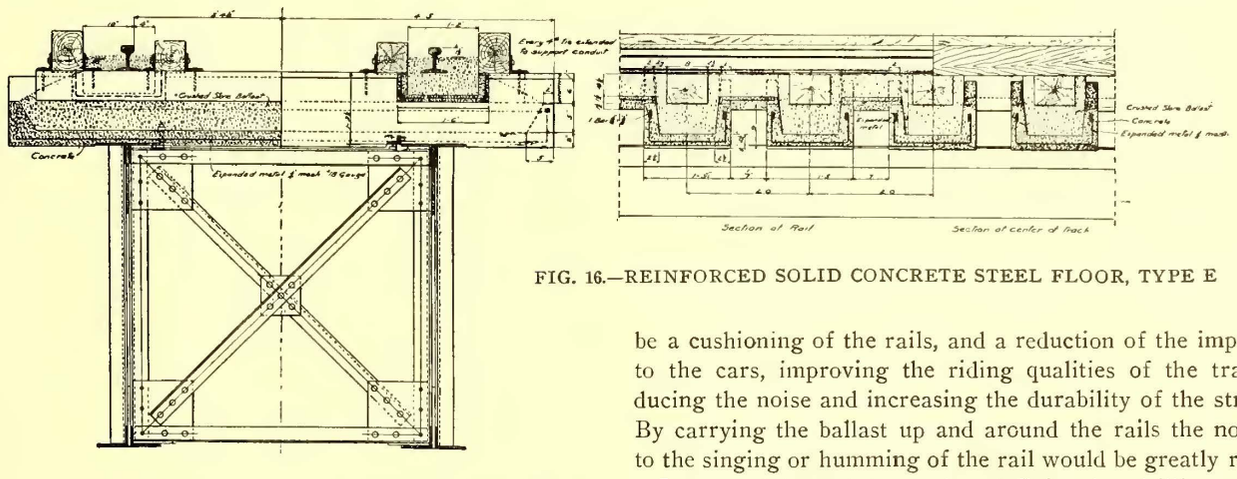


FIG. 16.—REINFORCED SOLID CONCRETE STEEL FLOOR, TYPE E

In respect to cost, types A and B involve drilling of many holes and much field riveting; type C likewise involves such work, but to a less extent, the gain, however, being offset by the cost of the forms required for the concrete arches; type D has but little field work, but in order to insure durability the timber must be treated, which increases the cost and removes the main argument for its adoption; types E and F are the cheapest floors both in first cost and maintenance.

Experience in the application of ballasted floors to railroad bridges has shown that the track maintenance has been reduced to such an extent that the saving is more than sufficient to pay the interest on the increased investment, made necessary by its adoption.

Where the weight of a floor is not excessive, as with types D and F, it is probable that the reduction of impact, due to its distribution by the ballast of the floor, would so far reduce the overstress in the members of the present structure as to make its reinforcement unnecessary, although this would somewhat reduce the present factor of safety.

The wooden ballasted floor, similar to type D, is now in experimental use on a section of the Boston Elevated Railway, with marked effect toward deadening the sound. The ballasted steel floors are objectionable because they add to the amount of metal in the structure. This not only increases the noise due to the steel in the structure itself, as will be explained hereafter, but it likewise adds to the cost of painting and maintenance. Steel thus used in a ballasted floor is exposed to deterioration from the water, oils and greases which find their way to the bottom of the ballast.

The concrete floor, on the other hand, is free from these objections, being, in the first place, practically inelastic, and therefore almost noiseless in itself, and, secondly, being proof against deterioration from any of the agencies herein referred

to. Type E would probably be made in 6-ft. sections, weighing about 4000 lbs. each, and is adapted to be constructed in any convenient shop near the site, allowed to set and erected in place as required. This would avoid all work in the field except placing and setting, and thus greatly expedite the work and reduce the cost.

Type F, shown in detail in Fig. 16, is in some respects an improvement on type E. While the amount of concrete is about the same, the individual cross troughs weigh only 1000 lbs. each, which facilitates handling and setting. The field work embraces the bolting of the connecting longitudinal troughs to the cross troughs, and the placing of this floor in position would require the least time and therefore involve the minimum delay to traffic. An important advantage of this floor is that there is a 7-in. opening between each cross trough, which would admit light to the street below and allow snow falling on the structure to be handled as at present. In types E and F hook bolts would be provided for securing the concrete to the structure.

The principal objection, aside from its cost, that is usually brought against the use of a solid floor in a city street is the difficulty of removing snow from the track. While it is admitted that this difficulty is more serious with a solid floor than when an open type of floor is used, it is not insurmountable, since the Berlin and Liverpool roads, a portion of the Boston Elevated, and the portion of the New York Central previously referred to, have been successfully operated, and this objection should not be allowed to prevent the adoption of some type of solid floor if it proves efficient in reducing the sound. I am of the opinion that a type of snow-plow or snow-collecting device could be perfected which would effectually remove the snow by collecting it and carrying it away in case it became necessary to operate the loop with a solid floor.

The most important characteristic of these floors is their increased weight, as compared with present floor, the greatest increment being 1680 lbs. per lineal foot of track for type E, and the least 1080 lbs. per lineal foot for type F. This additional weight increases the stresses in the structure throughout and necessitates its reinforcement to secure a corresponding increase of its strength to a greater or less degree, depending upon the reduction of impact due to the use of ballast.

DEFECTS IN STRUCTURE

The volume of sound given forth by a medium is due to its elasticity, and metals, being the most highly elastic solids, are the best sounding bodies. For the same reason, the duration of sound is greater in metals than in other solids. It is likewise true that an enclosed air space, set in vibration by a sounding body, magnifies the volume of sound according to the laws of resonance.

The present supporting structure of the Union Loop is constructed entirely of steel, which is set in elastic vibration by the passing loads. The various component parts of the structure enclose air spaces more or less confined, which are in turn set in vibration by the molecular motion of the adjacent steel, while the structure as a whole is free to vibrate under influence of the live loads. It will be apparent, therefore, that the Union Loop as built realizes every essential condition for the production of noise.

The concrete steel reinforcement, hereinbefore referred to, does the exact opposite. As a sounding medium it is very low, having about one-tenth the sound wave velocity of steel. In encasing the steel it places an inelastic medium between it and the confined air spaces, and thus destroys their resonance. It also largely increases the rigidity of the structure and the bulk of material in it, thus destroying all noise due to vibration. For these reasons the concrete steel reinforcement should completely eliminate the noise created by the structure itself, leaving only such noises as are inherent in the trains themselves, as hereinbefore discussed.

From the foregoing and from observations made during my investigation of this subject, I am of the opinion that the objectionable noises now caused by the operation of cars over the Union Loop can be greatly reduced. Since the loop occupies the most congested section of the municipality and therefore causes annoyance to the greatest number, and is at the same time the best paying piece of elevated road in the city, its owners ought to be willing to spend sufficient money on its improvement to reduce the noise to as great an extent as it seems reasonable to expect from the adoption of modern engineering methods, even though the accomplishments of the results should prove too expensive for application to lines less favorably located.

While the methods suggested in this report would, in my judgment, prove effective, some of them are to a certain extent experimental, and it would therefore be unjust to demand that they be adopted and applied by the railroad company to the entire loop without their relative efficiencies having first been determined by experiments on short sections of structure, thereby keeping the experimental expense as low as practicable until the best type of construction could be determined by actual demonstration.

My recommendations for reducing the sound upon the loop and suggested methods of procedure are then as follows:

First—If practicable adopt the plan of increasing the capacity of the loop shown on Fig. 3 of Part I. of this report. This would eliminate the maximum amount of special work and thus reduce the noise, due to the hammering of wheels on frogs and switches, to the greatest possible degree, and at the same time increase the capacity of the loop to the greatest extent possible by track modification, and leave it in the best condition for through routing or loop operation, or both.

Second—If the arrangement shown on Fig. 3 is not adopted, reconstruct in accordance with the plan shown on Fig. 2, which leaves all tracks at the present grades. Reinforce the structure at all junctions and provide each junction with a solid floor ballasted with crushed stone or slag.

Third—If neither of the above plans are adopted reinforce the present structure at all junctions and provide each junction with a solid floor ballasted with crushed stone or slag.

Fourth—Equip sections of about 300 ft. each of the Market Street stub terminal of the Chicago & Oak Park Road over which trains do not now operate regularly with different floors, as shown by types D, E and F, using stone, slag or gravel ballast in different sections, and reinforce the structure supporting these sections with the concrete steel reinforcement. Operate trains over this stub terminal when so equipped until the relative merits of the different types can be determined. The equipment of this terminal is suggested to prevent interfering with present traffic, but should the railroad company prefer to conduct the trials upon the loop or elsewhere it should be allowed to do so.

Fifth—After the type of floor and kind of reinforcement which most effectually accomplishes the elimination of noise is determined, the loop structure between junctions should be reinforced and the type of floor selected applied.

Sixth—In any event reconstruct the track and special work in accordance with the suggestions contained in this report, and maintain the rolling stock, track and special work in first-class condition under rigid city inspection.

Seventh—All changes in the structure should be made in accordance with plans approved by the city and prepared with the special object of sound deadening in view, and the experimental and permanent work done in a manner satisfactory to the city.

SUBWAYS IN CLEVELAND

As outlined in a recent issue of the STREET RAILWAY JOURNAL, the city officials of Cleveland and the officials of the Cleveland Electric Railway are considering plans for relieving the congestion of surface traffic in the downtown section of that city by means of subways. The peculiar layout of Cleveland, a fan-shaped city, with principal streets radiating from the Public Square, brings all car lines to a central point, and although attempts have been made to deviate some of the routes away from this center, there have always been strenuous objections to this plan. The point of greatest congestion is the center of the Public Square, where Superior Street crosses Ontario Street. On Superior Street, west of the center of the Square, the street railway company has four parallel tracks, terminate in the center of the Square. The plans also provide for a large transfer station and waiting room in the center of the Square. The transfer scheme would be simple, as a passenger could step from one car into another. The tracks would be depressed slightly below the platforms, making only one step into a car. It is proposed to have the subway system a shallow one, with light and air shafts placed at frequent intervals. The soil in this district is sandy, making close shorings necessary.

The Cleveland Electric Railway Company has retained the services of William Barclay Parsons, the well-known authority on subway construction, to consider the advisability of establishing the subway. Mr. Parsons spent two days in Cleveland last week, and with President Andrews and the company's engineers went over the congested territory. He was given

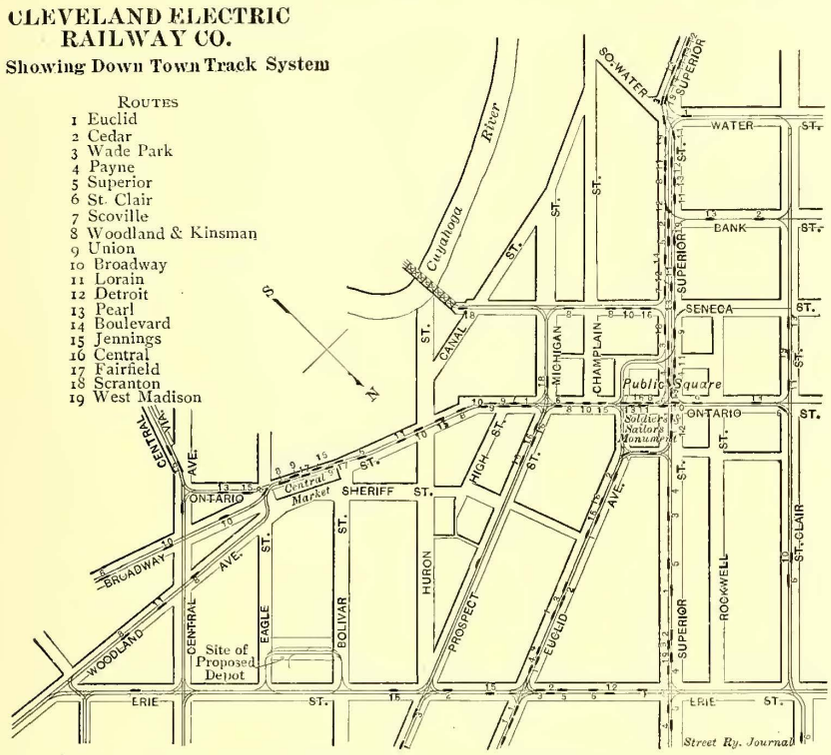
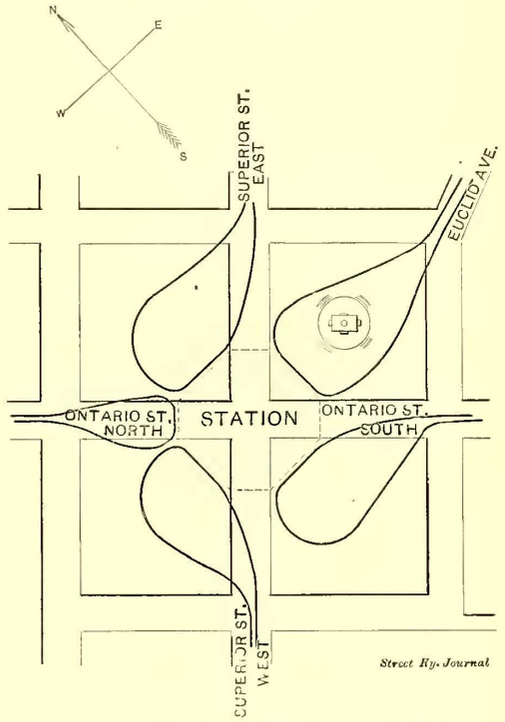


DIAGRAM SHOWING DISTRIBUTION OF CARS DURING RUSH-HOUR SERVICE



PLAN SUGGESTED FOR PUBLIC SQUARE SUBWAY

and while this improves the situation considerably on that street, it aggravates rather than improves the situation at the crossing point mentioned. The accompanying illustration shows the downtown section of the city within a radius of less than ½ mile of the Square. It represents the location of cars under existing schedules at 5:40 in the evening, and it shows about 150 cars within the radius mentioned. Practically no interurban cars are included, as they arrive and leave on the hour.

When the subject of a subway was first given consideration it was proposed simply to remove the crossing in the center of the Square by depressing one or the other of the main streets, but later plans propose improvements which it is believed would take care of the trouble for a long time to come. The plan most favorably considered provides for five subway loops in the downtown section; one to be north of the Public Square and extending to the proposed Union passenger station and group of public buildings, the other four to be under the four corners of the Square, with approaches on Ontario Street, Euclid Avenue and Superior Street, as indicated in the plan presented. The subway entrances would be at Erie Street on Euclid Avenue, at Erie Street on Superior Street, at Lake Street on Ontario Street north, at the viaduct on Superior Street west, and at Broadway on Ontario Street south, thus leaving the heart of the city without surface cars. The present plan of operating cars across the city would, of course, have to be abandoned if the loops were adopted and all lines would data and maps covering the downtown section, the Public Square, Cuyahoga River and the viaducts.

The plans for financing the project are at this time entirely hypothetical, and President Andrews, of the street railway company, declines to be interviewed on this point. A plan which is said to have found more or less favor with the street railway company may be outlined somewhat as follows: The city to build the subway on a bond issue, the company paying the interest and retiring bonds as they fall due. At the end of a certain period the company would surrender the property to the city. The company is said to favor fifty years, while the city officials are said to favor a shorter term. But, of course, as intimated, the plans are wholly in the air as yet.

It is generally believed, however, that the company will soon have some definite proposition to make on the franchise matter and that its proposition will embody something about the subway.

One point which might render it impossible for the company to build and own the subway is the fact that the Public Square was deeded to the city for park purposes, and it was only recently that the street railway company was prevented from building an interurban passenger station there, on the ground that such action might forfeit the city's right to the Square.

During the present week President Andrews and a party of his own engineers, city officials, newspaper men and representatives of the Chamber of Commerce, have visited Boston and New York to study the subways in these centers.

THE AUTOMOTONEER IN ITS NEW FORM

The automotoneer for preventing too rapid advancement of the controller handle, or, in the language of the shop, "fast feeding," was originally made to go inside the controller and thus be a part of the controller itself. The Garton-Daniels

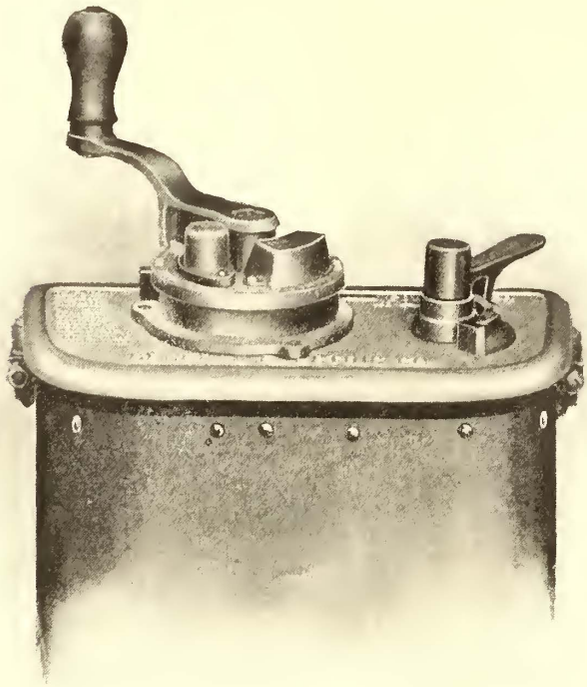


FIG. 1.—IMPROVED FORM OF AUTOMOTONEER

Company, of Keokuk, Iowa, which has been developing this apparatus for the past six years, has now worked out a new type of apparatus intended to go on top of the controller. One of the new automotoneers, which is shown in Fig. 1, is a simple and compact piece of apparatus which is applied by simply slipping it over the controller and fastening it by screws to the controller top. It is not necessary to alter the controller in any way except to remove the pointer collar on top of the controller. There are two principal parts to this apparatus; the

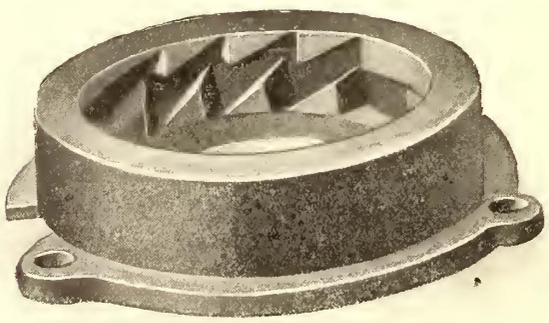


FIG. 2.—STATIONARY PORTION BOLTED TO CONTROLLER CASE

stationary part shown in Fig. 2 is bolted to the top of the controller. Inside of this either one of the parts shown in Figs. 3 and 4 revolves with the controller handle, and may be considered as forming a part of the controller handle. In the stationary portion, Fig. 2, which is in the form of a cylinder, a zigzag channel is cast, as seen. The revolving part of the automotoneer, which moves with the controller handle, has a dog on it, which follows this zigzag groove or channel. The notches in this zigzag channel correspond to the controller notches. In advancing the controller, the dog which travels in the channel is raised in passing from one notch to another. After each notch, time must be given for the dog to fall before the controller can be advanced to the next point. In one form of this device, Fig. 4, the movement of this dog is regulated by an adjustable dash pot. As the dog is raised in following the zigzag channel from one notch to the next it compresses the dash pot. As the dash pot releases the dog and allows it to fall in the predetermined time for which the dash pot is set, the controller handle is released so that it can be advanced to the next position.

In Fig. 3 is another form in which the rapidity of this disengagement is fixed so that it cannot be altered after it leaves the shop. The one with the adjustable dash pot can be adjusted at any time after the device leaves the shop. Both types are very simple, but the one with the fixed time ratio has

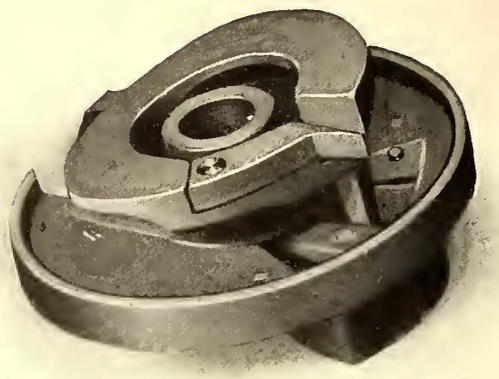


FIG. 3.—ONE FORM OF MOVABLE PORTION

fewer working parts, owing to the omission of the dash pot and its accompanying lever. In the operation of this automotoneer, the handle is simply moved from point to point, just as if the device were not present. No backward movement of the handle is necessary to allow the dog to fall and release it before going to the next point if the device is properly adjusted so that the points of the automotoneer match with the points of the star wheel inside the controller. The former types of auto-

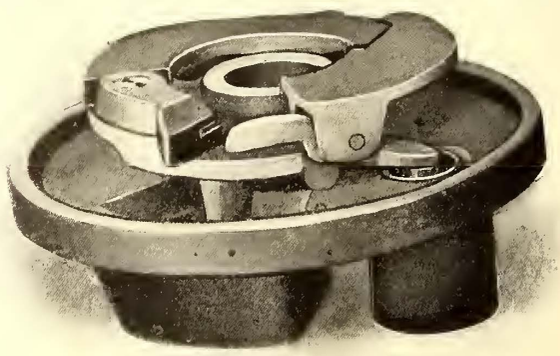
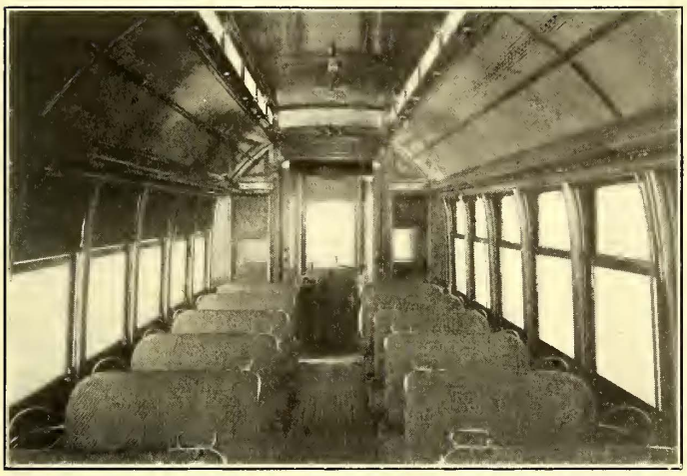


FIG. 4.—MOVABLE PORTION WITH ADJUSTABLE DASH-POT

motoneer placed inside the controller took the place of the star wheel. On the present type, the star wheel, and in fact everything inside the controller, is left intact, with the result that the star wheel performs its usual function, and if the device is properly adjusted does not place on the automotoneer the work of stopping the controller handle at each point. In case the motorman tries to go beyond a point before the automotoneer releases, it immediately checks the handle. These two new styles have proved entirely satisfactory in actual service during the past nine months, giving no indications of undue wear. All parts are made interchangeable.

CONVERTIBLE CARS FOR INDIAN TERRITORY

The American Car Company has recently delivered to the Muskogee Electric Traction Company, Indian Territory, three convertible cars built under the Brill patents. The convertible type of car is well adapted to service in that part of the country, where the climate is mild and the summers are long and have a large rainfall, while the winters are short and have little snow. The cars are for use in Muskogee, which, though



INTERIOR OF MUSKOGEE CAR

having a small population, is one of the two most important trading centers in Indian Territory. It is centrally located, and is on the line of the Missouri, Kansas & Texas Railway. There are 5½ miles of track in the town and about twelve cars are operated. The lines of the railway company reach an attractive amusement park which the company owns.

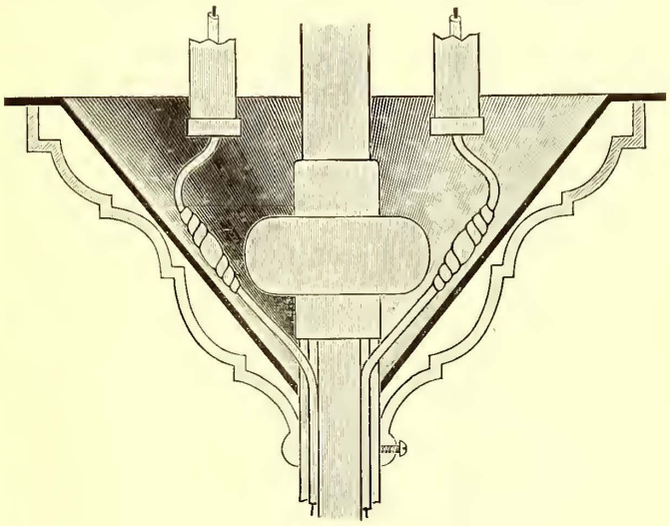
The new cars are finished in ash, with bronze trimmings, and have ceilings of decorated birch. They are mounted on Brill No. 21-E trucks. The general dimensions are: Length over the end panels, 20 ft. 7 ins., and over the crown pieces, 30 ft.; from the panel over the crown, 4 ft. 8½ ins.; width over the sills, including the facing, 6 ft. 11¼ ins., and over the posts at the belt, 7 ft. 9 ins.; sweep of the posts, 5 ins.; centers of posts, 2 ft. 7 ins.; side sill size, 5¼ ins. x 6 ins.; end sill size,

MUSKOGEE CAR, OPEN

4¼ ins. x 6 ins.; sill plates, ⅝ in. x 8 ins.; thickness of the corner posts, 3¾ ins., and of the side posts, 3⅜ ins.; length of the seats, 33½ ins., and width of the aisles, 18 ins.; height of the steps, 14 ins., and of the risers, 12 ins. The No. 21-E trucks used have a wheel base of 7 ft., and 33-in. wheels. The furnishings include Brill sand boxes, "Dedenda" platform gongs, angle-iron bumpers and reversible seats, with corner grab handles.

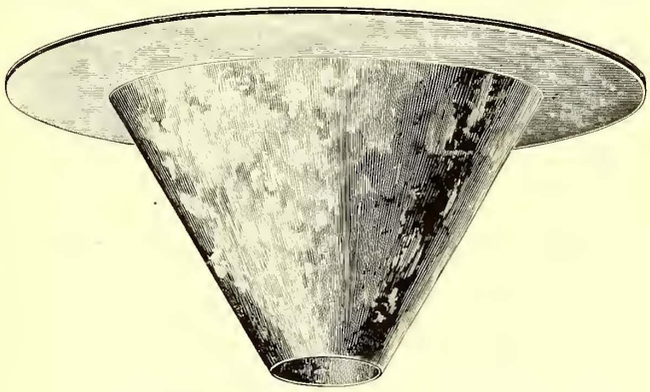
A NEW CANOPY INSULATOR

To obviate the many ceiling fires, due to defective insulation on the joint where the wires project through the floor or wall



SECTION OF CANOPY INSULATOR

and make connection with the wires of the electrolier, the Mica Insulator Company, of New York, has placed on the market a



EXTERIOR OF CANOPY INSULATOR

new insulator known as the "Young" canopy insulator. It is claimed by the manufacturer that this is an improvement over the present ring form of canopy insulator which does not give protection at the most vital point. The flange of the "Young" insulator also gives perfect protection to the brass canopy from the surface of the ceiling or wall, thereby removing any possibility of a short-circuit between the two conducting wires, between either of the conducting wires and the canopy, or between the wires through the canopy to the ceiling.

The new insulator is made from the well-known material micanite, made up from large laminations of mica, and molded with both flange and taper into one solid whole.

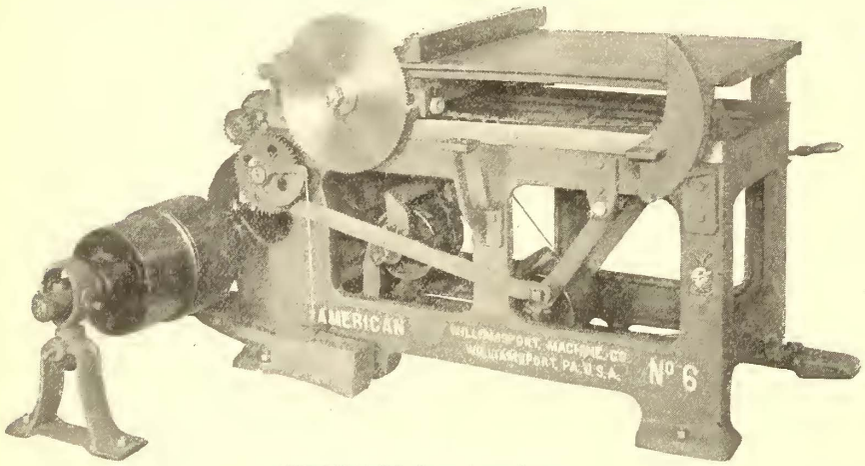
It is stated to be the only canopy insulator which is absolutely fireproof, and also the only one which insulates the canopy from the ceiling and from the service wires as well. It has been approved by the National Board of Fire Underwriters.

W. L. Stehlau, general manager of the Springfield & Xenia Traction Company, has arranged with the Dayton & Xenia Traction Company to operate through service from Springfield to Dayton by way of Xenia, Ohio.

RAILWAY CUT-OFF SAW

The improved automatic cutting-off saw (No. 6), shown in the accompanying illustration, has been designed by the American Woodworking Machinery Company, of New York, for cutting off lumber square in all kinds of woodworking factories. The ease with which the saw is operated should recommend it to all parties wanting a machine of this kind.

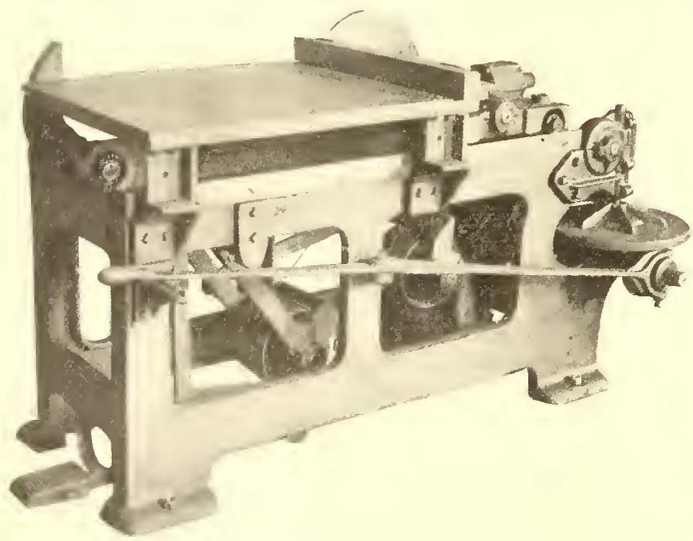
The main frame is very compact and is cast in one solid casting with internal ribs, and the guide rails that the rolls in carriage revolve on are steel, securely bolted to the main frame. The saw arbor is made of steel and journaled in long self-oiling boxes cast solid to the sliding carriage, which is moved to do



AUTOMATIC CUT-OFF SAW

its work by friction drive operated by the foot treadle at front of the main frame.

There are four changes of feed for the saw to travel, 13 ft., 20 ft., 28 ft. and 35 ft. per minute. These changes are controlled by the hand lever at the right of operator. The foot treadle controls the length of travel of saw from 2 ins. to 26



AUTOMATIC CUT-OFF SAW

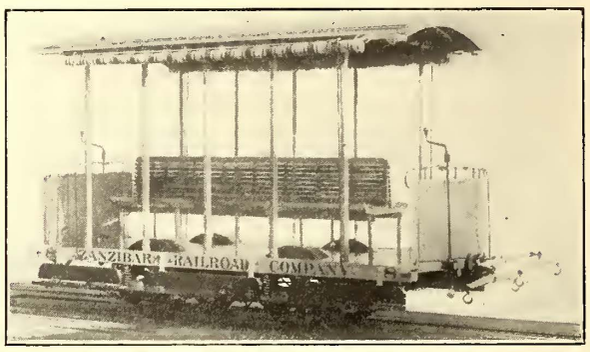
ins. As soon as the foot treadle is released the saw carriage is returned by the weight of the tightener on the belt. By this arrangement the operator, having the use of both hands, can more readily handle the stock. In this way double the amount of stock can be cut as compared to the old style machines, where the saw is drawn forward by hand, or the old style foot treadle, where the movement of same is about the same as the saw carriage travels.

The table is of iron, provided with a cut-off gage, which can be used either in the front or the back of the table, as shown. An endless belt 5½ ins. wide is furnished with each machine. There are sub-brackets attached to the main frame with holes drilled in them for attaching wooden extensions.

The builder furnishes one 16-in. diameter saw and necessary wrenches, and tight and loose pulleys, self-oiling, 12 ins. x 6 ins., running at 490 r. p. m. The size of the table is 33½ ins. x 25¾ ins. Its capacity covers 2-in. stock up to 26 ins. wide, and a 16-in. saw will cut through 5 ins. in thickness.

AMERICAN CARS FOR ZANZIBAR, SOUTH AFRICA

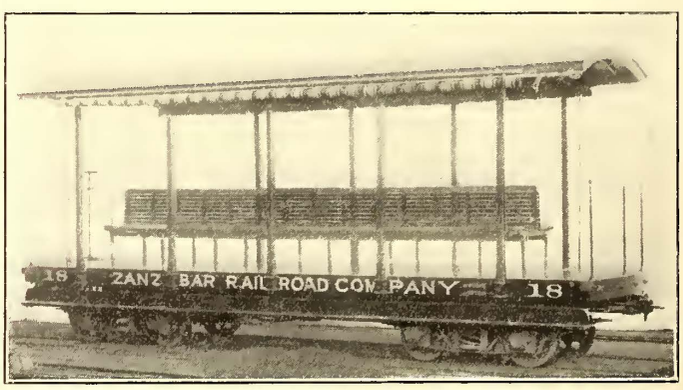
Ten of the larger and eight of the smaller cars illustrated have lately been shipped to the Zanzibar Railroad Company, of Zanzibar, Africa, by the J. G. Brill Company. Zanzibar is a city on the island of the same name near the western coast of South Africa, about 200 miles north of Cape Town. This city has a population of about 100,000, and does considerable export business in ivory, rubber,



OPEN HORSE CAR

skins, cloves, etc. The island is an English protectorate, with an area of 625 sq. miles.

The ten double-truck cars are for use with steam dummies, and the eight cars on gear trucks will be drawn by horses. There were also two closed horse cars especially fitted up for private use. The double-truck cars measure 22 ft. over the crown pieces and are 5 ft. wide over the sills. The roofs are simply constructed and arranged to be readily removed, and the seats are also removable. The cars are mounted on freight trucks of the builder's manufacture. The weight of the car



OPEN STEAM CAR

and the trucks is 8770 lbs. The length of the short cars is 13 ft. 8 ins. over the crown pieces, and width over the posts, 5 ft. The curtains of both styles of open cars are arranged to be raised or lowered from one end by means of ropes with pulleys. These cars are mounted on Brill gear trucks with 6-ft. wheel base. The "private" closed cars are 14 ft. over the end panels, 21 ft. over the crown pieces and 5 ft. wide over posts at belt. There are five windows to each side, arranged to drop into wall pockets. The interiors are finished in cherry and ash of natural color, and the ceilings have carline finish. The cars are furnished with wicker chairs and the floors are covered with carpet rugs. They are also mounted on Brill gear trucks with 6-ft. wheel base.

INDESTRUCTIBLE PACKING

Porter & Berg, of Chicago, have recently been appointed sales agents for the Rogers journal packing throughout the United States and Canada. This packing is composed of equal quantities of very fine, long, hair-like steel shavings and the best grade of cotton waste mixed together by special machinery. When once mixed, the steel shavings cannot become separated from the cotton waste, as the character of the materials and the method of mixing prevent this. The steel shavings are very elastic and give the necessary spring to the waste to sustain its weight when saturated with oil, and hold it firmly up against the journals without packing the journal tightly, as is the case when wool or cotton waste is used.

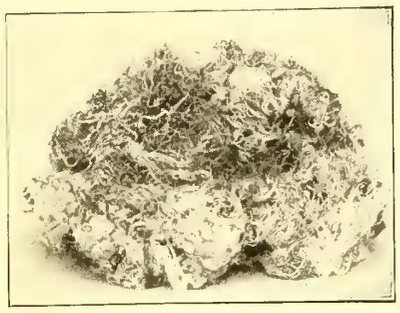
This packing will not become covered with the metallic incrustation, where in contact with the journal, which soon forms on other packings, and is so fatal to proper lubrication and the cause of a majority of all hot boxes.

To those who are not acquainted with the results obtained from the use of this packing, there may at first be some doubt about the wisdom of using a mixture containing steel shavings in journals. It is claimed, however, that this doubt has in every instance been dispelled after such parties have a more intimate knowledge of and experience with this packing, and that it will not injure the bearings or cause any wear on them.

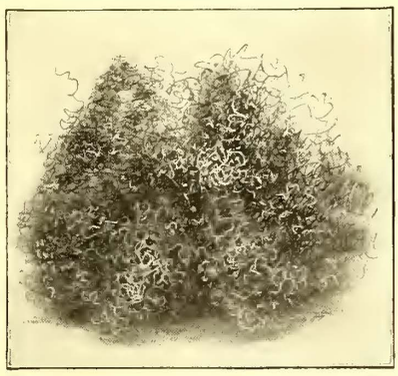
Both cotton and steel are conductors of heat and convey the heat away from the journal into the oil and keep the oil limpid in cold weather. The steel shavings act as a filter, thus cleansing the oil, and by their elasticity keep the waste from falling away from the journal. The cotton waste has a strong capillary attraction and draws the oil from the box up to the journal and insures a constant and even lubrication. On the contrary, woolen waste is a non-conductor of heat, has not as strong a capillary action as cotton, and when saturated with oil becomes soggy and will not stay up against the journal, thus necessitating constant attention and frequent renewals.

This journal packing is said to keep in good condition in the journals for from fifteen months to two years, or longer, according to conditions. This makes a great saving in labor, oil and waste, as ordinary wool waste packing has to be renewed many times a year and requires frequent attention, and for every pound of wool waste thrown away about 2 pints of oil is lost. In order to keep the wool waste up against the journals it is necessary also to crowd at least twice as much of it into the journal box as is required when Rogers' packing is used.

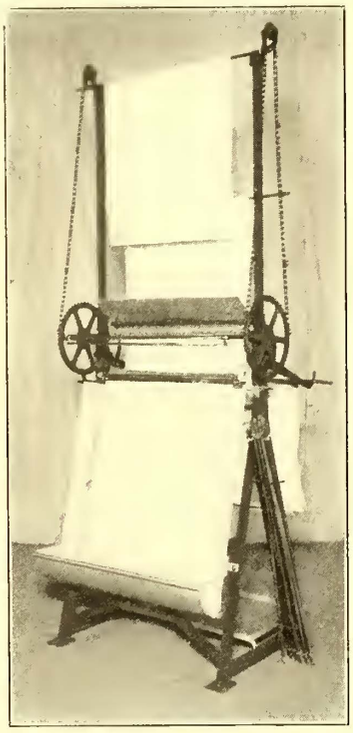
As a positive evidence of the durability of this packing, the following is cited: Engine No. 969 on the Illinois Central Railway was packed with this journal packing for an endurance test, and made 210,000 miles, going through the repair shop twice during duration of test, and used the same packing for entire mileage. This road has used the packing for over seven years and has had no trouble with hot boxes caused by defective packing.



INDESTRUCTIBLE PACKING



STEEL SHAVINGS



BLUE PRINTING MACHINE

BLUE PRINT WASHING AND DRYING MACHINE

C. F. Pease, of Columbus, Ohio, has designed a machine for reducing the cost and labor of producing large quantities of blue prints, and to do away with the large washing tanks and drying paraphernalia usually occupying a great deal of space in a blue print department. The construction effects great economy in floor space, avoids wet, sloppy floors, and thoroughly dried prints are secured in much less time than by the old process.

The washing of the prints is accomplished by a spray of running water flowing over the treated side of the paper only, removing the surplus ferroprussiate in the quickest time possible. Prints are not soaked through as in the old process, as the water coming in contact with one side of the paper only, and for but a very short time, leaves it in a condition to dry in about one-third of the time usually required. Therefore the delivery is greatly expedited.

The print is placed on the drying rod before washing and remains there during the entire process of washing, wiping and drying, making it unnecessary for the operator to wet his hands. He can therefore work to and from the printer and washer without difficulty, washing sheets as fast as printed, as the time required at the machine is but a fraction of a minute. As it hangs in the washing tray on the drying rod the water flows down both sides of the doubled print, half of it on the side toward the operator and the balance between the print and the back of the tray. When the front portion of the print in view of the operator is completely washed the balance is always in the same condition.

The surplus water is removed by a device which wipes the print as it is moved upward out of the way on the drying chains. As the next print is pulled through the wiping device the previous one is carried still higher and over the top, and finally downward until it is automatically stripped from the chains of the machine, falling into a drying rack, from which the dry prints may be removed as required. The construction of the machine is of a very rigid, light, cast-iron frame work, thoroughly braced and supporting the washing, dripping and drying devices, making a completely self-contained and portable machine, and occupying but small floor space.

The washing tray, guard and pan are made of extra heavy galvanized iron, reinforced and supported by galvanized malleable iron fittings, especially designed for the purpose. The upper frame carrying the small sprockets and chains is of iron tubing, well braced and secured to the main frame of the machine, and provided with screws for adjusting the chain. The spray is through brass tubing properly guarded by a copper shield to direct the spray where required. The drying rods, of which a sufficient number are supplied to meet all requirements, are of the best air and kiln-dried maple, are varnished, polished, metal tipped and provided with rubber separators.

FINANCIAL INTELLIGENCE

Wall Street, March 15, 1905.

The Money Market

There were no important changes in the local money market this week. The tone continued easy, and, if anything, the tendency of rates was toward a lower level, despite the preparations making for the payment of $13,500,000 of government funds by the depository banks, and the demand for funds in connection with the flotation of various railway bond issues, chief of which were the $6,000,000 Long Island Railroad refunding 4 per cent bonds, guaranteed by the Pennsylvania Railroad Company, and the $5,000,000 4 per cent gold bonds of the St. Paul, Minneapolis & Manitoba Railroad, which are guaranteed by the Great Northern Railway Company. As in the previous week, the inquiry for accommodations was confined largely to the call money market, borrowers generally continuing to draw their requirements from the open market rather than to pay the prevailing rates for time contracts. As a result, the rates for demand money held relatively firm, practically all the business being transacted at from 2½ to 4 per cent, the ruling rate for the week being 2¾ per cent. In the time loan department business was practically at a standstill. The banks continued to hold rates for all fixed periods at last week's level, but there was no disposition on the part of borrowers to enter the market at the present time. In some instances maturing loans were renewed at the old rates, while in others they were promptly liquidated. At the close the market was extremely dull and easy at 3 to 3¼ per cent for sixty and ninety days, and 3¼ to 3½ per cent for four to six months. Loans for over the year were negotiated at 3½ per cent on first-class collateral. The weekly statement of averages issued by the banks on last Saturday was favorably received. The changes in the principal items were insignificant. Loans decreased $1,505,000, presumably due to the shifting of loans, or to liquidation of bond holdings. Instead of an expected decrease in cash, the banks gained the small sum of $312,400. Deposits were $2,304,200 smaller than in the preceding week. Reserve required decreased $576,050, which, added to the gain in cash, brought about an increase in the surplus reserve of $888,450. The surplus is now $9,278,150, against $29,937,075 in 1904, $1,024,000 in 1903, $3,112,900 in 1902, $10,002,600 in 1901, and $2,686,425 in 1900. Apart from the reduction in the Bank of England's discount rate to 2½ per cent, there were no important changes in the foreign money markets. The action of the Bank of England directors was taken as an indication that an easy monetary situation abroad is expected for some time to come. At the close sentiment in the local market was rather mixed. In some quarters it was said that the stiffening of rates at all the interior cities, as a result of the increased activity in spring trade, would soon be reflected in firmer rates here, but on the other hand it was believed that the market would not advance much above the present level of rates. This latter belief was based upon the attitude of foreign bankers, who are ready to take advantage of any appreciable increase in rates, to place large amounts of foreign funds in the local market, against exchange transactions.

The Stock Market

There was a decided improvement in the local securities market this week. Trading was considerably more animated, and prices, with few exceptions, ruled substantially above those prevailing at the close of last week. Early in the week trading was only moderately active, and prices displayed more or less irregularity as a result of profit-taking sales. Later on, however, sentiment became more cheerful, and prices advanced sharply on the announcement of the reduction in the Bank of England discount rate to 2½ per cent, which was taken to mean that the managers of that institution were of the opinion that a period of cheap money abroad was at hand. The local money market also continued easy, and there was nothing in the statement of the New York banks to indicate any appreciable change in rates. This, together with the improved railroad earnings for the first week of March, and the gratifying reports from the Western traffic managers, imparted pronounced strength to the entire market, which was continued up to the close on Saturday. There were no unfavorable developments over Sunday, and at the beginning of the present week the upward movement was continued, many issues making new high records. Noteworthy strong features were Reading, the Vanderbilt issues, Louisville, Baltimore & Ohio, Norfolk & Western, Lackawanna, Union and Southern Pacific. On Tuesday the advancing tendency was checked. The announcement that Paris bankers had ordered the adjournment of the negotiations for a new Russian loan, was followed by heavy realizing for foreign account, which carried prices off sharply. In several instances, however, decided strength was shown, especially in Delaware & Lackawanna, which touched 400, a gain of 23 points since Monday, and in American Smelters, which crossed par.

The stockholders of the Pennsylvania Railroad have authorized the directors to issue $50,000,000 bonds, making the total amount to be put on the market, $100,000,000. They will probably bear interest at the rate of 3½ per cent, and will be convertible into stock at 150. The bond market was fairly active and firm.

The local traction issues were neglected, but prices generally held firm.

Philadelphia

There was a material falling off in the dealings in the local market for traction stocks this week. Trading included a larger number of issues, but in most instances the individual totals were considerably smaller than in the preceding week. At the opening the market developed weakness, especially in the speculative stocks, but toward the close prices responded to the improvement in other quarters of the market, and in many issues the early losses were fully recovered. United Gas & Improvement was the principal feature of the trading, both as regards activity and price fluctuations. At the opening the stock was under pressure, the price declining a point to 115½ on moderate dealings, but later there was a sharp rally to 117¾, on the declaration of the quarterly dividend of 2 per cent and on buying by the pool. In the subsequent dealings there was selling by the speculative element, which caused another reaction to 115¼, but at the close an active buying movement developed, which lifted the price to 116¼, or within ⅛ of last week's closing figure. About 25,000 shares of the stock were dealt in. Pressure was also brought to bear in Philadelphia Company common and Philadelphia Electric, the first named declining to 43½ and the latter to 10½. In the last half of the week, however, both issues displayed strength, Philadelphia common advancing to 45, or nearly a point above last week's closing, while Philadelphia Electric rose to 10¼. Philadelphia Traction was quiet but strong, about 1000 shares selling at 99⅞ to 100, an advance of ¼. Philadelphia Rapid Transit was fairly active and irregular. From 29¾ at the opening, the price ran off to 29⅛, but toward the close there was a recovery to 30, the final transaction taking place at 29⅜. Upwards of 9000 shares changed hands. Other transactions included Fairmount Park Transportation at 22½, Union Traction at prices ranging from 58½ to 58¾, Consolidated Traction of New Jersey at 82¼ to 82¾, United Traction of Pittsburg preferred at 49⅞, American Railways at 53⅛ to 52⅞, Reading Traction at 30, and United Railways & Improvement of San Francisco at 80⅛.

Chicago

A meeting of the directors of the Metropolitan Elevated Railroad Company has been called for next Monday, when the reports of the committee appointed to recommend a successor to Mr. McAllister, as president of the company, will be received, and it is possible that a new president will be chosen before the annual meeting of the stockholders on April 4. Several names are under consideration, including that of Vice-President Higginson, but no decision will be reached until after the return of F. A. Delano.

Although the contest for control of the company continues, it is said that an agreement between the contending interests is not improbable. Nothing official is obtainable at this time, but leading interests on both sides are said to have intimated that the matters in dispute will be adjusted before the annual meeting.

The feature of the market for street railway issues this week has been the strength displayed by the various elevated railroad stocks on the reports of a renewal of the negotiations for the merging of the various properties. The leading feature was the activity and strength in Metropolitan issues, the common advancing to 24 and the preferred to 66. The advances in these issues were partly due to the operation of the cars of the Aurora, Elgin & Chicago over the Metropolitan tracks into the new terminal at Fifth Avenue. Chicago & Oak Park Elevated was strong, sales taking place

at 6½ to 6⅝. Earnings of the company are very gratifying, and it is expected that the operations of the road for the present six months will be sufficient to wipe out the deficit of the last six months, and that the earnings for the fiscal year will show a small surplus. Northwestern Elevated common held firm around 24½, while several hundred shares of the preferred brought 62 to 61¾. South Side Elevated was strong and a point higher, sales being made at 96 and 97. Very little interest was manifest in the stocks of the surface roads, but prices ruled firm. Chicago Union rose from 12 to 12¾, in sympathy with the strength of the stock in the New York market, and small lots of the preferred sold at 50. West Chicago broke from 63 to 60. In the bond department transactions included $4,000 North Chicago 5s of 1909 98¾, 3000 North Chicago 4½s at 95, and $10,000 Northwestern Elevated 4s at 95¼.

Other Traction Securities

Trading in the Baltimore market was upon a much smaller scale, but prices generally held firm at near last week's closing figures. The United Railway issues, although considerably less animated, continued to furnish the prominent feature of the trading, both as regards activity and price movements. Early in the week heaviness was displayed in all three issues, due, in part, to the cessation of aggressive buying of the income bonds on reports of an amicable settlement of the questions at issue between the management of the company and the income bondholders committee. No confirmation of the report was obtainable. The stock opened ⅜ lower at 16½, and declined further to 16¼ on fairly active trading. Later on there was an advance to 17, but at the close profit-taking carried the price off to 16½, or ⅜ below the previous week's close. The income bonds also opened fractionally lower at 67⅝, and gradually eased off and closed at 67, a loss of ⅞. The 4 per cent bonds, however, displayed decided strength and ended the week with a small net gain at 94¾. Total transactions in the stock aggregated 15,000 shares, while upwards of $525,000 of the incomes, and $80,000 of the 4 per cent were traded in. Other transactions included $11,000 Charleston Railway & Electric 5s at 94¼ to 94, $5,000 Augusta Street Railway 5s at 104½, $130,000 Norfolk Railway & Light 5s at 94¾, Atlanta Street Railway 5s at 106½, Charleston Street Railway 5s at 106⅜, Washington City & Suburban 5s at 120⅝, City & Suburban 5s at 114¼, North Baltimore Passenger Railway 5s at 121, and Central Passenger 5s at 117. In the Boston market interest centered almost exclusively in the Massachusetts Electric issues, both of which displayed decided activity and strength. The common, on purchases of nearly 4000 shares, advanced from 16⅞ to 19¼, while the preferred rose from 62½ to 65 on the exchange of nearly 3000 shares. There was no news to account for the sharp advances in these issues. Boston Elevated was also strong, the price rising from 155 to 156 on limited dealings. West End common was unchanged, with sales between 97 and 98, but the preferred rose to and closed at 116, a small gain over last week's final price. On the New York "curb" the principal feature was the activity and wild fluctuations in Interborough Rapid Transit. Opening at 210, the price ran off to 203¼, but later on, the strike being declared off, the price advanced sharply to 221, an extreme gain for the week of 11 points. In the final dealings, however, there was renewed selling, which resulted in a reaction to 214, from which it rallied only a point. About 20,000 shares were dealt in. Other transactions included 700 Washington Railway & Electric common at 34 to 34⅜, $100,000 Washington & Electric Railway 4s at 89½ to 89¾, $20,000 North Jersey Street Railway 4s at 81¾ flat, $35,000 Jersey City, Hoboken & Paterson 4s at 79⅞ flat, 900 shares Public Service Corporation stock at 128, $40,000 certificates at 77¾, and $50,000 5 per cent notes at 98 and interest.

Aurora, Elgin & Chicago securities attracted a great deal of attention in Cleveland last week on account of the opening of the road into the heart of Chicago. The bonds are held in a pool in Cleveland, but within the past two weeks several hundred thousand dollars worth have been sold at a range of from 80 to 86½. A considerable amount of the common stock has sold in small lots at 10, while the preferred had one small sale at 65; holders are now asking 90. Detroit United advanced from 79¾ to 83 on the prediction that the dividend will be increased next quarter. Toledo Railways & Light advanced to 26, also on dividend rumors. Northern Texas Traction advanced to 51¾; another dividend increase predicted. Several lots of Western Ohio 5s sold at 78, an advance from 76⅞. At Cincinnati, Cincinnati Street Railway advanced to 149 on several sales. Cincinnati, Newport & Covington preferred advanced to 93¾, while common sold at around 32½.

Security Quotations

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

	March 8	March 15
American Railways	52½	52½
Boston Elevated	155	155
Brooklyn Rapid Transit	66	66¾
Chicago City	198	a199
Chicago Union Traction (common)	11¾	12¼
Chicago Union Traction (preferred)	48¼	47¾
Cleveland Electric	82½	82½
Consolidated Traction of New Jersey	81	81
Consolidated Traction of New Jersey 5s	110¼	110¼
Detroit United	80	81½
Interborough Rapid Transit	209	214
International Traction of Buffalo	—	29
International Traction of Buffalo (preferred)	—	64½
International Traction of Buffalo 4s	81	81
Manhattan Railway	171½	171
Massachusetts Electric Cos. (common)	17⅛	a18½
Massachusetts Electric Cos. (preferred)	62	a64½
Metropolitan Elevated, Chicago (common)	22½	23
Metropolitan Elevated, Chicago (preferred)	64½	65
Metropolitan Street	123¾	122½
Metropolitan Securities	84⅝	84¾
New Orleans Railways (common)	3½	3½
New Orleans Railways (preferred)	14	14
New Orleans Railways, 4½s	81	81
North American	102	103
North Jersey Street Railway	23	23
Philadelphia Company (common)	43½	46¾
Philadelphia Rapid Transit	29⅛	29¾
Philadelphia Traction	100	100
Public Service Corporation 5 per cent notes	97¾	97¾
Public Service Corporation certificates	72½	72
South Side Elevated (Chicago)	94	a95
Third Avenue	131½	130
Twin City, Minneapolis (common)	109	109
Union Traction (Philadelphia)	58½	58¾
West End (common)	97½	98
West End (preferred)	115¼	115¼

a Asked.

Iron and Steel

The "Iron Age" says the outlook continues very cheerful in all directions. Considering the very heavy tonnage placed earlier in the year in pig iron, the buying has been very good in such widely distant points as New England and Chicago, Philadelphia and Cincinnati, and the market is firmer. This is particularly true of New England, where the announcement of an advance of fifty cents in the prices of Buffalo irons is to be especially noted since that producing point has been relatively low in that particular territory.

STRIKERS SEEK OLD PLACES IN NEW YORK

Discredited by their national bodies, the local leaders in New York of the Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and the Amalgamated Association of Street Railway Employees of America, under which the employees of the Interborough Rapid Transit Company of New York were organized, became conciliatory. Friday morning saw a rush of ex-employees to the company's officers for reinstatement. All of them have to fill out formal application blanks, as though they had never had any connection with the company. On these blanks they must put down where they were last employed. Those who are taken back lose their seniority.

Grand Chief Warren S. Stone, of the Brotherhood of Locomotive Engineers, in discussing the situation, said that the action of the strikers was in direct violation of the laws of the order, and that they had repudiated their agreement with the general body.

"This action was taken," said Mr. Stone, "to show the public that we will not countenance any man violating his agreement and allowing him to remain in the organization. We have 172 bodies in the Brotherhood throughout the country, and we cannot afford to allow our well-established reputation for integrity to be besmirched by any unwarranted action of a particular subdivision. All the employees of the company, from the officers down, who remained faithful have been voted two weeks' additional pay by the directors in recognition of their loyalty.

ANNUAL REPORT OF THE UNITED RAILWAYS COMPANY OF ST. LOUIS

The fifth annual report of the United Railways Company, of St. Louis, has just been published. President Murray Carleton, in reviewing the events of the year ending Dec. 31, 1904, refers to the termination of the lease of the road on Oct. 29, 1904, by the St. Louis Transit Company, and the reassumption of the property by the United Railways Company. During the year the company purchased 450 new cars. The improvements recommended by Mr. Carleton are the erection of a new wood-working ship at a cost not to exceed $40,000, and of a new car house on Kossuth Avenue at the same expense. Generally speaking, the condition of the company is good, and it is the expectation of the managers that its present condition and degree of efficiency can be maintained and improved out of earnings. With this end in view it is proposed to renew some 10 miles of track this year, and pay for the cost of renewal out of earnings. The following is a summary of the business of the company during the last four years:

	1904	1903	1902	1901
Earnings from operation and other income	$9,977,564.17	$7,295,847.38	$6,452,218.90	$5,783,912.72
Operating expenses and taxes	5,751,066.65	4,513,514.57	3,967,721.32	3,692,400.58
Gross ineome, less operating expenses and taxes	$4,226,497.52	$2,782,332.81	$2,484,497.58	$2,091,512.14
Deductions:				
Interst on funded debt, miscellaneous interest and organization expenses	2,446,292.36	2,257,273.22	2,165,720.44	2,040,932.14
Net income	$1,780,205.16	$525,059.59	$318,777.14	$50,580.00
Dividends	598,022.50	587,846.25	586,860.63	576,210.00
Surplus	$1,182,182.66	.....	.....	.....
Deficit	.....	$62,786.66	$268,083.49	$525,630.00
VOLUME OF BUSINESS				
Revenue passengers	201,316,532	147,141,429	130,830,722	117,546,811
Transfers and passes	83,974,502	63,096,679	54,247,218	46,449,131
Total passengers	285,291,034	210,238,108	185,077,940	163,995,942
Car mileage	37,910,484	32,535,626	31,074,581	29,340,361
Percentage of passengers using transfers	39.64	40.25	38.68	36.76

ASSETS

Property and Plant:			
Railroads, properties and securities purchased		$75,732,073.10	
Pacific Railroad Company		46,713.95	
C. B. Holmes		7,542.16	
Construction and equipment (Exhibit "D")		13,547,745.77	
Total property and plant			$89,334,074.98
Preferred capital stock of United Railways Company of St. Louis (70,000 shares), held by the National Bank of Commeree in St. Louis, trustee, for the use and benefit of this company			7,000,000.00
Capital stock of the Louisiana Purchase Exposition Company, par value, $210,000			2,100.00
Material and supplies			278,955.26
Current Assets:			
Cash		$286,528.08	
Cash on deposit to pay bond coupons		406,525.00	
Brown Brothers & Company, syndicate managers.		1,224,000.00	
Bills receivable		76,559.17	
Bills collectible		45,561.02	
United States Government—postoffice department.		8,283.54	
City of St. Louis		4,407.33	
Sundry debtors		6,962.50	
Fidelity & Casualty Company of New York		75,000.00	
Fidelity Trust Company of Louisville, Ky., deposit for redemption of Southern Railway Company first mortgage bonds of 1884		2,000.00	
Interest accrued on bills receivable		1,388.65	
Total current assets		$2,237,215.29	
Deferred Assets:			
Insurance paid in advance		$31,552.02	
Water tax paid in advance		17,769.50	
Prospecting for oil—Central Power Station		25.60	
Total deferred assets		$49,347.12	
Total current and deferred assets			2,286,562.41
Total assets			$98,901,692.65

LIABILITIES

Capital Stock:			
Preferred shares	$20,000,000		
Less—Reserved for acquisition of capital stock of eonstituent companies not purchased	16,800	$19,983,200.00	
Common shares	$25,000,000		
Less—Reserved for acquisition of capital stock of constituent companies not purchased	86,200	24,913,800.00	
Total capital stock issued			$44,897,000.00
Funded Debt:			
General first mortgage 4 per cent gold bonds	$42,000,000		
Less—Reserved for underlying liens	13,708,000	$28,292,000.00	
Underlying Liens—Bonds outstanding, schedule No. 1		13,688,000.00	
St. Louis Transit Company improvement 20-year 5 per cent gold bonds, dated Oet. 1, 1904, guaranteed by this company		10,000,000.00	
Total funded debt outstanding			51,980,000.00
Current Liabilities:			
Bills payable—St. Louis Transit Company		$367,331.00	
Audited vouchers and accounts payable		277,205.03	
Unclaimed wages		3,554.30	
Trust Fund Certificates — Employees' savings deposit		5,720.00	
Employees' Badge Deposit—St. Louis Transit Company		285.65	
Outstanding Tickets—St. Louis Transit Company.		9,405.83	
Matured interest coupons unpaid (paid after Dec. 31, 1904)		746,525.00	
Dividend on preferred capital stock outstanding (1¼ per cent)		162,290.00	
Southern Railway Company first mortgage bonds of 1884, due and unpaid		2,000.00	
Total current liabilities		$1,574,316.81	
Deferred Liabilities:			
Interest accrued on funded debt		$213,124.99	
Interest accrued on bills payable		5,021.07	
Outstanding tickets		11,832.26	
Reserved for damages and removal of World's Fair terminals		55,498.98	
Miscellaneous accounts accrued, or accounts awaiting distribution		26,278.50	
Total deferred liabilities		$311,755.80	
Total current and deferred liabilities			1,886,072.61
Profit and Loss:			
Surplus, Dec. 31, 1903	$229,941.25		
Less—Dividend paid on preferred stock, Jan. 10, 1904	229,941.25		
Rental from St. Louis Transit Company for ten months ended Oct. 31, 1904		$790,261.66	
Net income from operations for November and December, 1904		246,813.38	
Total net income for the year ended Dec. 31, 1904.		$1,037,075.04	
Less—Dividends on preferred stock		898,455.00	
Surplus			138,620.04
Total liabilities			$98,901,692.65

In addition to the above tables, the report contains a list of the underlying liens, a summary of income for the years ending Dec. 31, 1904 and 1903 (ten months by St. Louis Transit Company and two months by United Railways Company of St. Louis); a table of traffic statistics, showing the revenue passengers, passes and transfers; construction and equipment expenses from the organization of the company up to and including Dec. 31, 1904, and cost of additions, acquisitions, betterments and improvements to the properties and lines of railway of the United Railways Company of St. Louis made by the St. Louis Transit Company and United Railways Company of St. Louis for the year.

The one hundred and ninety-fifth meeting of the American Institute of Electrical Engineers will be held at the chapter room, Carnegie Hall, 154 West Fifty-Seventh Street, New York, on Friday, March 24, 1905, at 8:15 p. m. The following papers will be presented and discussed:

1. "Line Construction for High-Pressure Electric Railraods," by George A. Damon.
2. "High-Pressure Line Construction for Alternating-Current Railways," by Theodore Varney.
3. "Application of High Pressure to Electric Railroads," by Ernest Gonzenbach.

HIGH-SPEED LINE FROM NEW YORK TO NEWARK

Every year reports are circulated about the probable use for electric railway purposes of the bed of the Morris Canal, in New Jersey, should the Legislature of that State decide to abandon the waterway. In order fully to acquaint the public of its attitude toward this matter, the Public Service Corporation of New Jersey, through its president, Thomas N. McCarter, has issued a statement concerning the use to which the property would be put if it were acquired by that company. According to Mr. McCarter, if a bill is passed by the Legislature authorizing the abandonment of navigation upon the canal, and permitting the sale of the property of the canal company, and its diversion to other public uses, the Public Service Corporation will endeavor to acquire so much of the roadbed or right of way of the canal as lies within the city of Newark, and northwesterly thereof, at least as far as Bloomfield. If the company is successful in this it will proceed also to acquire by purchase or condemnation whatever private or reversionary rights there may be in the canal bed, and devote the property to subway purposes, free from grade crossing, operating therein high-speed trains as used in the New York subway. Mr. McCarter is of the opinion that this undertaking would furnish adequate rapid transit to the sections of the city reached by it, and would greatly reduce the time now consumed in a trip from Broad Street, Newark, to East Orange, Orange, Bloomfield, Glen Ridge and Montclair.

This right of way the company would also connect with a private right of way across the meadows, which it has already acquired, and build a high-speed line to and through Jersey City over a route already surveyed, to a point where it would connect with the new tunnels now being constructed to New York City, thus giving a new route and direct connection to different parts of New York City from Newark, as well as furnishing rapid transit between Newark and Jersey City, and between the entire Hudson Hill and New York City. Mr. McCarter says frankly that negotiations to this end between the companies controlling the tunnels and the Public Service Corporation Company are now awaiting the result of legislation for the abandonment of the canal, for it does not seem feasible to carry out the schemes in any other way, because there is no other practicable entrance into Newark.

CLEVELAND INSPECTS THE NEW YORK SUBWAY

In connection with the plans now under discussion for a subway at Cleveland to relieve surface congestion in the downtown section of that city, a party of prominent financial, technical and newspaper men from Cleveland visited New York on March 14, as the guests of Horace E. Andrews and J. J. Stanley, of the Cleveland Electric Railway Company, for the purpose of studying the latest achievements in subway building. The party was brought to New York in a special car attached to the Cleveland & New York express over the New York Central Railroad. The gentlemen made a tour of investigation through the New York subway lines, and left in the evening for Boston, where an inspection of the Boston subway was made. Included in the party were the following: A. B. McNairy, president, Cleveland Chamber of Commerce; F. A. Scott, secretary, Cleveland Chamber of Commerce; J. G. W. Cowles, member, Chamber of Commerce; William J. Carter, city engineer, Cleveland; Chas. E. Kennedy, editor, "Cleveland Plain Dealer;" B. F. Bower, editor, "Cleveland Daily World;" Edward B. Lilley, managing editor, "Cleveland Plain Dealer;" Henry J. Wendenthal, editor, "Cleveland Press;" E. R. Johnstone, editor, "Cleveland Leader;" Chas. A. Otis, Jr., of Otis & Hough, bankers and brokers, proprietor of the "Cleveland World;" Mr. Andrews, Mr. Stanley, H. J. Davis, secretary, and C. H. Clark, engineer maintenance of way, Cleveland Electric Railway Company.

NEW HAVEN BUYS THE HARTFORD SYSTEM—NEGOTIATING FOR SPRINGFIELD PROPERTY

The New York, New Haven & Hartford Railroad Company, through its electric railway holding company, the Consolidated Railway Company, has negotiated the purchase of the Hartford Street Railway Company, of Hartford, Conn., at a compromise figure understood to have been $285 cash per share for this stock, and 285 per cent for the East Hartford & Glastonbury Horse Railway Company's debentures. Negotiations for the purchase of the system have been in progress for some time, and were delayed somewhat by the demand of the owners of the Hartford Company for $300 per share.

The Hartford Company has an authorized capital of $2,000,000, of which $1,000,000 is issued, and on this it pays 6 per cent dividends. It has also $2,500,000 4 per cent bonds outstanding, with power to issue $500,000 more. The company has guaranteed $200,000 5 per cent debentures of the East Hartford & Glastonbury line, which it has a right to convert into its own stock, dollar for dollar. This rests with the board of directors. The company owns lines to West Hartford, to Newington, to Burnside, to East Windsor Hill, to Windsor and Rainbow and to Wethersfield, leases the line to Glastonbury, and has an intimate connection with the Farmington line to Unionville. At Windsor the line for Windsor Locks, Suffield and Springfield comes in; at East Windsor Hill the line for Enfield and Springfield on the east side of the river comes in; at Newington is the line to New Britain and beyond; at Burnside is the connection for Manchester and Rockville, and connections south are contemplated from Wethersfield on this side of the river and from Glastonbury on the east side.

In connection with this sale the rumor is revived that the New Haven Company is still conducting negotiations for the lines in the vicinity of Springfield, Mass., and that a deal for these properties is likely to be closed soon. A slight variation from the plan of this purchase as set down in the Street Railway Journal of Jan. 28, 1905, is proposed, however. Mentioned to be included in the deal now are the Springfield Street Railway, the Springfield & Eastern and the Woronoco Street Railway. It is said that the majority interest in the Springfield Company demand $250 a share for their holdings.

ANNUAL BALL OF B. R. T. EMPLOYEES

The second annual ball of Brooklyn Rapid Transit Employees Association, and the closing exercises of the educational classes of the association for the season of 1904-05, were held in the New Labor Lyceum, at Willoughby and Myrtle Avenues, Brooklyn, on Tuesday evening, March 14. An excellent entertainment was given, after which the floor was cleared for dancing.

Geo. F. Wolfram, trainmaster of the Brooklyn Bridge division, opened the exercises with a short address. He referred briefly to the excellent service rendered by employees in all branches of the system, and graciously acknowledged the debt of the company to the trainmen for their untiring efforts during the very severe winter weather. Then he read a report of the association, contrasting conditions on March 1, 1905, with those of April 30, 1904, which reflects great credit upon the committee on management of the association and especially upon Geo. W. Edwards, the secretary.

This report showed that on March 1, 1905, there were 4021 members enrolled and a credit to the association of $11,912.94, as against 2742 members on April 30, 1904, and a credit of $674.64, a surprising gain. Donations from the company were acknowledged to the sum of $5,044.99. Since May 1, 1904, a total of $7460 has been paid for sick benefits. For school purposes and in providing entertainments for the members of the association and their friends $2,365.91 has been expended since Oct. 1, 1904. Figures of attendance at the educational classes show 100 men in the electrical class under Edward Taylor, engineer of tests of the company; 30 under a professional physical culture teacher; 10 enrolled in civil engineering; 30 in the band under the leadership of the bandmaster of the Thirteenth Regiment, N. G., of New York, and 40 in the English branches.

Mr. Wolfram brought his remarks to a close by referring to the plans of the association for the future. Several selections were next rendered by the B. R. T. band, one of the few of its kind. Dr. Cardoza, of the Fourteenth Regiment, of Brooklyn, then gave an exhibition with the foils and with broadswords. The instructor of the physical culture class then exhibited the members of his class in classic poses. An exhibition of feats of weight lifting brought this part of the entertainment to a close. Preceding the clearing of the floor for dancing, several selections were rendered by the band of the St. John's Orphan Home drawn up in the center of the hall. Among the officers of the company present were: Dow S. Smith, general superintendent; W. B. Graham, superintendent of the surface division; Geo. R. Folds, assistant to Vice-President and General Manager Calderwood; W. O. Wood, superintendent of the elevated division; F. D. Valentine, superintendent of employment; Edward Taylor, engineer of test and instructor of the class of the association in electricity; Henry Pistor, superintendent of the Bergen Street division; Frank Bush, superintendent of crosstown division; William Seibert, superintendent of Ridgewood division; M. J. Kennedy, superintendent of Flatbush and Ninth Avenue division; George Stone, superintendent of East New York division; W. W. Atwood, trainmaster eastern division of the elevated; E. F. Reeves, superintendent Brooklyn Bridge division; A. K. Stone, trainmaster southern division of the elevated; J. R. Williams, general foreman of southern division, and Geo. W. Edwards, the secretary of the Employees' Association. The entertainment committee in charge of the affairs was Geo. W. Wolfram, Henry Pistor and G. W. Edwards.

NEW CARS TO BE ORDERED FOR CHICAGO

The Chicago City Railway Company will probably let contracts for 200 new cars the latter part of March. The Chicago Union Traction Company is drawing up specifications for 60 new cars.

THE SALE OF THE MEMPHIS SYSTEM—EIGHTEEN MILES OF LINE TO BE BUILT

The sale of the Memphis Street Railway, of Memphis, Tenn., to Ford, Bacon & Davis, of New York, has been effected, as noted in the Street Railway Journal last week. New officers were elected immediately after the transfer was made. Geo. H. Davis has been made president of the company to succeed C. K. G. Billings, of Chicago, and Thomas H. Tutwiler, one of the engineers in charge of Ford, Bacon & Davis' Nashville office, has been elected vice-president and general manager to succeed Frank G. Jones. Other changes in the management are the appointment by Mr. Tutwiler of E. W. Ford as superintendent, and the election of W. H. Burroughs, for a number of years with the St. Louis Transit Company, as secretary and treasurer. The purchaser proposes to carry out the new work provided for in franchises recently granted the company. This will involve the building of 18 miles of new line.

NEW PUBLICATIONS

Cement and Concrete. By Louis Carlton Sabin, B. S. C. E., New York: The McGraw Publishing Company; 496 pages. Price, $5.00

This is a treatise designed especially for American engineers, covering the manufacture, properties and testing of cement and the preperation and use of cement mortars and concretes; effect of variations in manipulation of cement tests: characteristics of materials and methods of preparing mortar and concrete; strength of mortars in cohesion, adhesion, bending, etc., and the effect of variations in treatment; the use of concrete with and without reinforcement. There are one hundred and sixty-one tables, more than two-thirds of which are from original tests by the author, who is assistant engineer of the engineering department of the United States Army.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED MARCH 7, 1905

784,037. Switch for Overhead Trolley Tracks; Robert N. Cundall, Hopedale, Mass. App. filed Jan. 4, 1905. The switch-plate is mounted in a transversely slidable manner between fixed sections of main and branch tracks, and provided with depending track sections to complete the gap between the ends of one or the other of the fixed tracks, and means for locking the plate in position.

784,038. Automatic Self-Dropping Trolley Pole; John Deland, Terre Haute, Ind. App. filed Sept. 5, 1903. Details of construction of a trolley wheel adapted to automatically lower upon becoming disengaged from the wire.

784,237. Electrical Rail Guard; Lewis B. Stillwell, Lakewood, N. J., and Frederick R. Slater, Yonkers, N. Y. App. filed Sept. 16, 1904. Relates to the construction of a bracket for supporting a horizontal board above the third-rail.

784,238. Electrical Rail Guard; Lewis B. Stillwell, Lakewood, N. J., and Frederick R. Slater, Yonkers, N. Y. The insulator and base for the guard is formed of a single casting, the guard consisting of a board horizontally supported above the third-rail.

784,298. Construction of Railway Cars; George M. Brill, Philadelphia, Pa. App. filed Nov. 24, 1903. The object of this invention is to construct a car generally of wood, so that it can be readily made practically fire-proof during the course of its construction.

784,303. Third-Rail Electric Railway System; Thomas J. Casey and Fred H. Pickles, New York, N. Y. App. filed Aug. 11, 1904. The third-rail has a vertical contact surface facing the car; the guard consisting of a hinged board projecting over the rail and connected to but insulated from the same by blocks of insulating material.

784,357. Circuit Controller for Electric Railway Signals; Harry B. Snell, Jackson, Mich. App. filed April 15, 1904. Two contact plates are connected to but insulated from the trolley wire and used in connection with a switching apparatus of such character that either one of two devices will be actuated, depending upon the direction of movement of the vehicle.

784,389. Railway Rail; Franz Bertgen, St. Louis, Mo. App. filed April 30, 1904. The base of the rail is slotted to receive a tongue on the tread of the rail.

784,386. Car Street; Samuel M. Curwen, Philadelphia, Pa. App. filed Oct. 29, 1903. A "walk-over" seat providing co-operating mechanism, so that a plurality of links at one end of a seat actuate a single link at the other.

784,426. Walk-Over Car Seat; Charles K. Pickles, Philadelphia, Pa. App. filed Sept. 9, 1903. This construction utilizes only one link at each end of the seat, and mechanism which co-operates with said links to shift the seat cushion in unison with the back.

784,428. Car Seat and Guard; Charles K. Pickles, Philadelphia, Pa. App. filed Feb. 10, 1904. An improvement upon patent 784,386, above.

784,429. Car Seat; Charles K. Pickles, Philadelphia, Pa. App. filed July 22, 1904. Provides a "walk-over" seat in which the back may be inclined at certain definite and predetermined angles to the seat cushion to suit the convenience of the occupant of the seat.

784,448. Trolley; John H. Thompson, Charleston, W. Va. App. filed Aug. 4, 1904. Details.

784,518. Grab Handle for Railway Cars; Samuel M. Curwin, Haverford, Pa. App. filed Dec. 17, 1904. A handle for open cars, consisting of two vertical rods arranged parallel on each side of the stanchion and so connected with the seat that the handle will always be operative at the back thereof, and prevent passengers leaving the car from facing in the wrong direction.

784,519. Grab Handle for Railway Cars; Samuel M. Curwen, Haverford, Pa. App. filed Dec. 17, 1904. A handle attached to the car seat and reversible with the seat to either side of the stanchion.

784,520. Grab Handle for Railway Cars; Samuel M. Curwen, Haverford, Pa. App. filed Dec. 17, 1904. See preceding patent.

PERSONAL MENTION

MR. AUGUSTUS WOLFF has resigned as chief engineer of motive power of the United Railroads of San Francisco. Before becoming connected with the San Francisco system, Mr. Wolff was with the Brooklyn Rapid Transit Company.

MR. WILLIAM B. GRIMSHAW, formerly freight agent of the Trenton, Lawrenceville & Princeton Railroad and the Trenton-Newtown Street Railway, both controlled by the New Jersey & Pennsylvania Traction Company, has been appointed freight agent of the Philadelphia & Easton Railway, with headquarters at the Raubsville (Pa.) power house. The line traverses a country practically without freight facilities, excepting at the terminals and the town of Riegelsville.

MR. GARDINER C. SIMS has become the general manager of the Marine Engine & Machine Company, of Harrison, N. J., and New York. The company will build Armington & Sims engines in addition to its other products, to meet the requirements of the market. The original and constituent characteristics of the Armington & Sims design are still the fundamental features of the engine, which has been steadily improved in detail as necessitated by modern steam practice, since the introduction of the engine in 1872. The present patterns are all new, having been reproduced and perfected by Mr. Sims since the cessation of his services during the Spanish-American war. Mr. Sims is well known in the electrical field, where his pioneer work did so much to ensure the success of incandescent lighting 25 years ago.

MR. H. A. NICHOLL, general manager of the Cleveland & Southwestern Traction Company, of Cleveland, Ohio, has been elected general manager of the Indiana Union Traction Company, of Anderson, Ind., to succeed Mr. A. L. Drum, who, on March 1, became general manager of the Chicago & Milwaukee Electric Railway Company. Mr. Nicholl is a man versed in steam and electric railway work. At one time he was superintendent of the Rochester Railway Company, of Rochester, N. Y. After leaving this company he became assistant manager and treasurer of the Ithaca Street Railway Company, the Brush-Swan Electric Light Company and the Cayuga Lake Railway Company, all of which are under one management. Among the companies with which he has been connected are the Chicago & Northwestern; Natchez, Jackson & Columbus; Yazoo & Mississippi Valley; Illinois Central; North Side Electric, of Chattanooga, and the Rochester & Sodus Bay Electric Railway, the construction of which he superintended. In the Indiana Union Traction system are embraced more than 250 miles of line.