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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 318,500 copies, an average of 8167 copies per week.

Purchased Power for Street Railway Service

The question of buying power from outside sources is an occasional problem in street railway service, and when it arises it deserves very careful consideration, especially if the distribution proposed is in connection with a hydro-electric generating plant. Experience at Buffalo, Montreal, and in the Far West especially, shows how unwise it is to generalize hastily upon the power question, when it comes to a stand-off between water power and local steam generation. Fixed charges and operating expenses need to be figured cautiously before one can decide whether a power contract will be advantageous or not. The opinion is widely held that a company can generate its own power more cheaply than it can buy, except in the case of a water-power installation, and while this is generally true with careful management, the question is always worth considering.

Within the past five years there has been a pretty general reduction in both lighting and power rates on the part of central stations and large power companies. In the campaign to increase business by bringing the commodity sold nearer to the average consumer's purse, the telephone companies have reaped a remarkable harvest of added gross earnings, and the same general movement is now visible in the central station field. Consumers of large blocks of power are given rates in many cities considerably below 3 or 4 cents per kw-hour, and in a good many cases a 2-cent rate appears from an analysis of the monthly bills. Now there is little doubt that a very well-operated steam plant can turn out power at a cost not much in excess of 1 cent, including fixed charges, but it is also true that on a large number of systems the cost of each kilowatt-hour is considerably in excess of this figure. We often see figures representing the operating cost of turning out electrical energy, including fuel, labor, maintenance and supplies, but figures accounting for fixed charges per unit of output are by no means common. No one knows what his actual power cost is unless these stand-by expenses are footed up, with a goodly allowance for depreciation. A 5000-kw steam plant may produce a kilowatt-hour at an operating cost of 0.7 cent, but if we allow 5 per cent interest, 8 per cent depreciation, 1 per cent for taxes and 1 per cent for insurance, the fixed charges easily amount to $75,000 per year—by no means an insignificant sum to be pro-rated upon the units of output. If we assume a 40-per-cent load factor upon continuous day and night operation the average load will be 2000 kw, which means a fixed charge of about 0.4 cent, and brings the actual power cost up to 1.1 cents. This is coming perilously close to the minimum power rate found even in small hydro-electric transmission systems. With a gas-engine plant the small street railway is likely to do as well in generating its own power as it can do by purchasing it, for the load factor is apt to be wretched in a small railway station and the demand for energy excessively uneven, though too small in volume to command minimum rates.

Even on a large system the cases are few where absolute dependence upon water power is advisable. Few things are more variable than the available water supply of a hydro-electric system, valuable as such power is when it can be developed. Continuity of service is an absolute necessity in a transportation system, and for this reason the practice of supplementing the regular plants by a hydro-electric supply is an excellent one, as is the opposite plan of installing steam or gas auxiliaries. There is very little doubt that steam

power can ordinarily be generated at less expense in a skilfully managed and good-sized railway plant than it can be purchased from a steam-driven station, but there are cases, even in the practice of large companies, where the reserve power of a local central station supply may be worth having. The winter peak is sometimes too great for the existing capacity of the system without outside help, or again, greater reliability may be essential in the congested district. The power question is a very broad one, and cannot be disposed of in a few paragraphs; no question is of more technical importance than this at the present time in electric railway practice. It is a great mistake to decide off-hand that purchased power is too costly for use under any ordinary circumstances, but it is equally hazardous to assume that the bed rock of power cost has been reached in one's own plant, in view of the progress which is to-day occurring in the field of power generation and distribution. Careful figures for each specific case are the only determinants of the problem as regards future action.

Railway Networks

The editorial space available in our issue last week did not allow us to comment on Prof. Rasch's excellent paper before the Milan convention, published in the last issue. Electric railway networks in this country at least are rather spontaneous growths than deliberate structures, so that it is rare to find any systematic following of the principles of network design. Most large systems have come to be combinations of open and closed networks, the outlying members being of the former class and the closed elements being a natural outgrowth of an extension of the feeding system. Obviously the system most economical of copper is a complete inter-connected network involving both working conductors and feeders. The main objection to such a system both in electric lighting and in railway work is the extent to which a single fault may involve the whole system and the difficulty of isolating, when necessary, a part of the system. Thus in alternating-current systems a closed primary method which is extremely desirable in holding the voltage uniform over a large area is rarely employed, one of the chief reasons for avoiding it being the difficulty of obtaining and maintaining high-tension junction switches of adequate capacity. Switches for railway service are easily enough obtained and operated, but the large amount of trolley wire in service implies a probable frequency of short circuits far in excess of anything found in lighting systems. A large plant is able to pull through or to burn out any but very severe faults. This immunity does not extend to plants of medium size which, unless the network is well equipped with circuit breakers, may be practically shut down by the fall of a trolley wire.

Prof. Rasch's suggestion of putting rather a small amount of copper in the trolley wires, and sectionalizing them so as to limit the zone of distribution of each of the feeding-in points is a very sensible one in cases where excessive service is unlikely to be concentrated on sections thus constituted. It is the load-wandering that is the source of most of the electrical troubles on electric railways. With such arrangement of feeders and working conditions it ought to be possible to use automatic cutouts with good success, although in this country hand switches are more freely used. In a big railway system with rather dense traffic hand switches and men to operate them will be frequent enough to take care of most troubles promptly, and, as already stated, the plant is likely to stand up relatively well until help comes. We note, however, that few of the large foreign systems use hand switches, and that the sentiment in favor of automatics is growing. On railways covering considerable territory without heavy enough generating equipment to pull through troubles readily, the use of automatic circuit breakers in the sectionalization of the network is very important. If laid out along the lines suggested by Prof. Rasch, which are not infrequently followed already, the setting of the breakers to isolate trouble is not a matter of particular difficulty. The chief point is to so arrange the sections that normal overload caused by exceptionally severe traffic will not open the breakers. In other words, the working conductor should be so proportioned that a short circuit caused, for instance, by the fall of the trolley wire on the track will be considerably more severe than the worst probable overload and so will open the breakers on that trolley section.

The device of shunting switches and circuit breakers by lamps is effective in locating the scene of trouble, and after all even without these the dead section discloses itself only too promptly. The main difficulty with the closed network, or open network for that matter, having automatic cut-outs, is the blockade that may result incidental to the electrical trouble, and this is up to the repair crew. It strikes us that this is the practical limitation of service irrespective of the network. The immediate effort of a heavy short circuit on a system with somewhat limited generating capacity is paralysis of the service near the point immediately affected, plus practical disability everywhere else. If the short circuit is removed either by clearing the wire or by cutting out the section the widespread effect is also removed, but the local service is still interrupted until temporary repairs are effected. The value of automatic circuit breakers lies in the promptness with which the local effects are isolated. Its danger is in the chance that the circuit breakers may overdo their good work and isolate a much larger area than is necessary, thus delaying the resumption of traffic. This difficulty may be remedied by suitable adjustment of the breakers, as Prof. Rasch has indicated, and also good may be derived from the use of delayed-action circuit breakers at the more important junctions so as to render more certain the isolation of the affected section by its own proper apparatus. Or for that matter if the working conductor is thoroughly protected automatically, the more remote risk of trouble on the feeders may be taken care of by hand switches, chiefly useful in isolating certain areas in case of fire, when traffic would generally be checked anyway. No hard and fast rule can be laid down for network construction, which depends for its success on close knowledge of the operating conditions. That the principle of closed networks is as a whole sound a simple reckoning of the feeder copper will soon show. So far as the network feeders can be controlled from the station the problem is a simple one. The cross connections are more difficult, but in many systems are essential to economical feeding, and should not be neglected. It is fortunate that in big urban systems, where the load-wandering is most severe, the difficulties of network operation are diminished, owing to the usual closer inspection, the free use of telephone connections,

and the large generating capacity. For the rest the matter should be treated cautiously and systematically, and the safety devices located where they will be most accessible.

More Evidence on Braking

The evolutionary cycle in electric railway apparatus at home and abroad, to which we have had occasion to refer in previous issues of this paper and which has had many examples, is again prominently shown in the case of braking apparatus for cars. It may have been simply a curious coincidence that upon the very week that the New York street railway managers were discussing the subject of brakes in Albany the executive officers of the European Continental roads had the same topic as one of the principal features of their Milan meeting. On the other hand it may have been an illustration simply of the tremendous importance of this question of stopping the car—secondary only to putting it in operation—and of its still somewhat unsettled condition which compelled its extended consideration at the same time by two representative street railway bodies in the two hemispheres.

The report of the Milan convention is not yet available, but a comparison of the papers presented on braking at that convention and the papers and discussions at the Albany meeting last week offer striking points of dissimilarity. The European papers are devoted to a discussion of the relative merits of air and electric brakes. The Albany discussion was largely a defense of the hand brake and a definition of its place in the equipment of electric railway cars. The brake referred to, however, was not the old-fashioned hand brake of horse-car days, with a spindle shaft to which the brake chain was attached by a single bolt, but the improved hand brake by which the power of the motorman's arm is multiplied by mechanical methods and in which the danger of the chain parting from the staff is eliminated.

The Albany meeting commenced with a discussion of the relative merits of the single vs. the double brake chain, a subject upon which the Board of Railroad Commissioners had requested the sense of the association, but incidentally all methods of braking, especially hand braking, received considerable attention. The experience of Buffalo, Albany, Jersey City, Detroit, Montreal, Schenectady and Syracuse, as developed at the meeting, seemed unmistakably to be that the improved hand brake was sufficient and in some respects superior to a power brake for light cars at slow speeds, and that it was essential as an auxiliary to the heavy high-speed cars which also carried an air or other power brake. Opinions differed as to the size, weight and speed of the car which should be controlled by the more powerful apparatus; one would confine it to double-truck cars, another to cars 27 ft. over all or longer, while a third thought that it had no place on any city car. No one questioned the necessity of the power brake for heavy high-speed service or that it was per se objectionable for city service. But the tendency of the motormen to interfere with its proper working and to make spectacular or "grand stand" stops, as well as its maintenance charges, were the principal claims brought against it. On the other hand evidence was presented that in some cities, at least, the hand brake was considered safer than the air both against liability to injury and so far as accident to pedestrians is concerned, and that the motormen prefer the hand brake as a matter of protection to themselves.

In the meantime the air brake, magnetic brake and electric brake, which in all of their most popular forms were originated in this country, were being eulogized by European managers, among whom power braking, even for cars weighing as low as 7 to 8 tons, seems to have been taken up actively and spontaneously, and to have grown in advance of municipal requirements. Looking at the statistics of the subject in a somewhat cursory manner, the first thing to strike one is the great vogue of electric brakes on the European railways and the freedom with which they are employed on comparatively light cars. For instance, of 8390 motor cars between the weights of 8 to 10 tons 5318, or a little over 64 per cent, were equipped with electric brakes. In addition 1376 more cars between 5 and 8 tons weight had such brakes, and with 142 companies reporting on the subject and operating in all 14,563 cars, just half the cars used electric brakes. On the other hand, only 15.6 per cent of the cars were fitted with air brakes. For cars over 10 tons in weight, however, the air brake seems to be generally the favorite, outnumbering its electric rival more than two to one. Of course, the relatively small cost of the electric brakes, at least in their simpler forms, in part explains these figures, but withal it seems clear that our foreign friends seem to prefer electric braking on its merits. It is significant, however, that for heavy high-speed cars the choice falls upon air brakes, whether from their independence of the current supply or from greater operative reliability it is difficult to say.

Data on the power required by the two classes and upon the cost of their maintenance are difficult to obtain. There is evidence of lessened energy per car-mile in favor of the electric brake, but it is not altogether conclusive, owing to the general use of the air brakes for heavy service. On the other hand, nearly half of the companies using electric brakes complained that the system was hard on the motors and caused severe depreciation of gearing and controllers. As several varieties of such brakes are in use it is difficult to say whether the troubles reported have a general or specific cause. Improper control, or improper use of control in electric braking may be responsible for very serious difficulties. In spite of what has been done toward semi-automatic control of braking the fact remains that in the last resort the results depend on the skill and judgment of the motorman. This was clearly brought out at the Albany meeting, where the evidence seemed to be that too great power was a detriment with light or slow-speed cars. On the other hand, as one of our correspondents recently intimated, while an improved braking system does not necessarily decrease the number of accidents, it permits heavier cars and better speed.

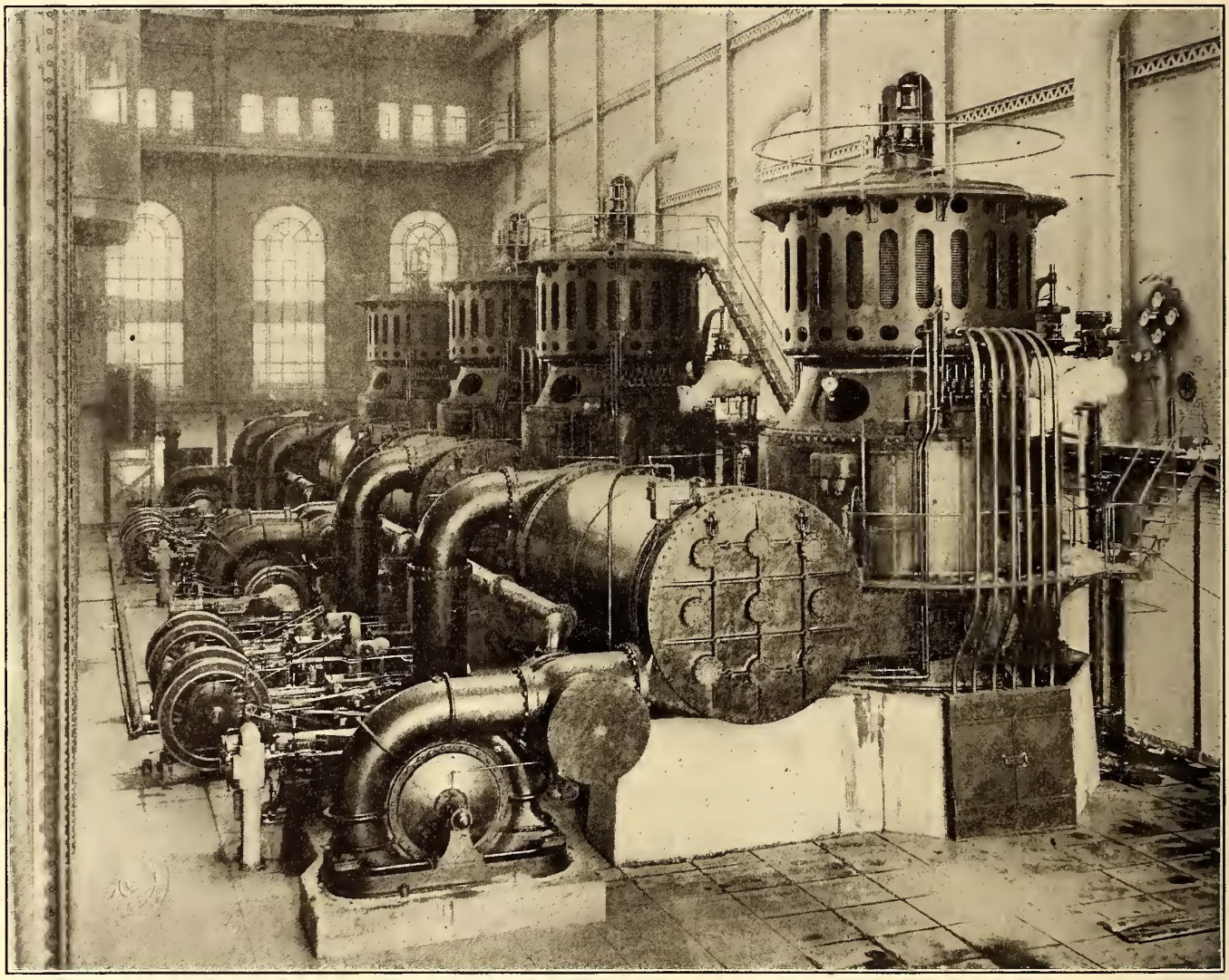
In this connection, we hope to see electric braking given a larger opportunity in this country than heretofore, since experience abroad certainly indicates that it has a useful sphere of action. American electric cars are on the average heavier and faster than those abroad, and it is natural to suppose that air brakes would be more freely used here than there, without going into the details of comparison with electric brakes. Nevertheless there must still be many places where with light cars the electric brake would have an opportunity for usefulness as an auxiliary to the hand brake. It is evident enough that fairly satisfactory brakes of this type are in so common use abroad as to prove their practical economy and desirability.

THE PORT MORRIS POWER STATION OF THE NEW YORK CENTRAL RAILROAD

In the Street Railway Journal for March 11, 1905, an account and plans were published of the Port Morris and Yonkers electric power stations of the New York Central & Hudson River Railroad. Since that time work has been progressing rapidly both on the stations and on the remainder of the electrification, and during the latter part of October, or early in November, the company expects to make the anticipated change in its motive power from steam to electricity in the initial electric zone south of High Bridge and Wakefield. The work incident to this change has progressed to such a point that were it not for new signals and the abnormal passenger traffic in the early autumn, the change, so far as motive power is concerned, could be made early in October.

As stated in the previous article, the electricity to operate the cars and locomotives will be generated in two power stations; one at Yonkers on the Hudson River, and the other at Port Morris on Long Island Sound. These two stations have capacity enough and to spare for the ultimate electric zone, which will extend to Peekskill on the Hudson division, and to North White Plains on the Harlem division. The Port Morris station is now in operation, but the Yonkers station will not be completed for some months. The Port Morris station, however, has ample capacity to operate the initial electric zone, and the four sub-stations for this zone are practically in readiness, so that electric service by the time specified is assured.

The Port Morris and Yonkers stations will be almost duplicates, and although they embody no radical departure from recognized practice, each is an excellent example of modern engineering. The station sites, besides being near the load centers of the electric traction system, are at once adjacent to navigable waters and existing railroad tracks, so that an unlimited supply of circulating water is available, and shipments of coal may be received by rail or by water. Provision is made at each station for an ultimate capacity of 30,000 kw, which is sufficient to operate a train service much greater than that now operated by means of steam locomotives.



GENERATING ROOM IN THE PORT MORRIS POWER HOUSE OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD

The station building at Port Morris is a brick and steel structure with concrete foundations extending down to bed rock. Every precaution has been taken to eliminate fire risks, and not a little attention has been given to the illumination of the interior. The building is divided longitudinally by a brick wall into boiler and generator rooms. The latter room extends clear to the roof, and what with windows on all sides and skylights in the monitor, this room is exceptionally well lighted. As the boiler room is surrounded by the coal bunkers, and as the boilers are arranged along both sides of the room, there is little chance for much natural illumination. On the north side of the generator room are three galleries; the first gallery is occupied by a machine shop and

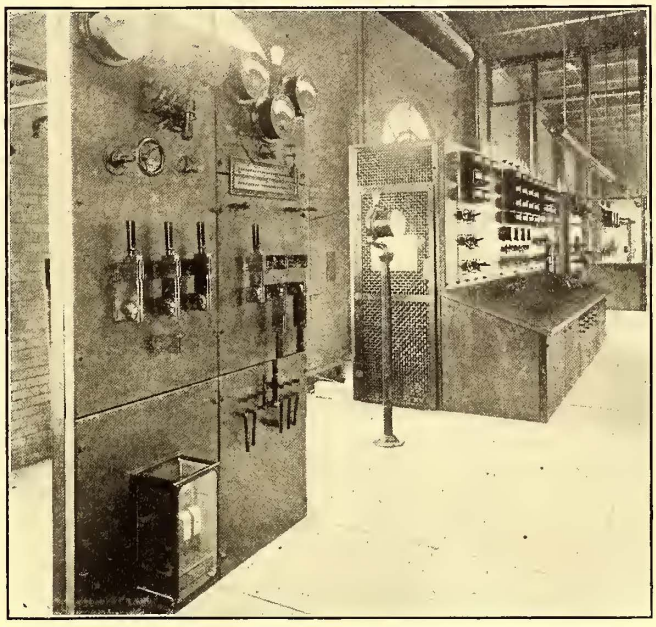
a few offices; the second contains the operating switchboards, and the top gallery is given over exclusively to offices. The boiler room is also provided with galleries and runways for convenient access to all parts of the piping and apparatus.

The present steam generating equipment comprises sixteen Babcock & Wilcox boilers, and space is available for eight more. Each boiler has 6250 sq. ft. of heating surface and 112 sq. ft. of grate surface, giving 10 sq. ft. of heating surface per rated horse-power and a ratio of 55.8 to 1 between the heating and grate surface. A total superheating surface of 1230 sq. ft. is provided in each boiler, in which the steam is superheated 200 deg. F. above the temperature due to the pressure. The rated working steam pressure is 185 lbs., and the maximum steam pressure is 200 lbs. The boilers are rated at 625 hp each and are arranged eight on each side of a central alley. Roney stokers are fitted to all the boilers, and the fuel used is Clearfield bituminous coal. The second pass of each boiler is provided with a soot chute discharging into the ash hopper below the boiler, and the rear of the setting is connected to an outboard drain to carry off the washing-out water. Two radial brick stacks carry off the products of combustion. These stacks are supported on steel columns and a reinforced concrete staging 40 ft. above the boiler room floor, and directly over the boiler-room alley. The chimney has an internal diameter of 15½ ft. and is 250 ft. high above the grates. The flues are of steel, lined with fire brick and tile, and are designed to give a natural draft of not less than 0.7-in. water pressure at the smoke flues.

Coal is at present being brought by rail, the slip at the south side of the station by means of which coal barges may moor alongside the hoisting tower not being completed as yet. The coal cars ascend the trestle on the south side of

BOILER ROOM IN THE PORT MORRIS POWER HOUSE

the station and dump their load into concrete-lined hoppers which discharge into hoppers of two coal crushers. From the crushers the coal is fed to an elevating conveyor of the bucket type, which carries it to a point over the bunkers, whence it is distributed by four suspended-flight scraper conveyors operating independently. Coal delivered by boat will be elevated by means of a hoisting tower to a hopper over the car tracks, and from here it will follow the course of the coal delivered by rail. With the exception of the hoist which is used to unload the boats, the coal and ash-handling machinery is driven by electric motors, ranging in size from 7½ hp for the ash conveyor to 40 hp for the coal crushers and conveyors. The motors are of the three-phase induction type and operate at a potential of 220 volts. From the coal bunkers the coal is discharged to the hoppers of the stokers through cast-iron chutes and distributing aprons. The ashes fall from the grates to hoppers below, which discharge into hand push cars of one ton capacity. These dump their load into conveyor hoppers in the basement beneath the boiler



REMOTE CONTROL SWITCHBOARD IN THE PORT MORRIS POWER HOUSE

room, and the ashes are carried up by a malleable iron bucket conveyor to storage bins over the trestle, where they are loaded into cars.

The apparatus in the station is divided into groups. Each generating unit is provided with four boilers, one feed pump and feed-water heater and a complete condensing plant. The feed pumps are of the Epping-Carpenter duplex, outside-packed plunger type designed for hot water and capable of feeding eight boilers. Each pump delivers through a Wainwright corrugated tube closed heater of counter-current design. The plan of steam piping is quite simple. Expansion is provided for in all places by long bends, no packed expansion joints being employed. The turbines are connected in pairs by 14-in. loops and each turbine may take steam from either of two banks of four boilers each. The auxiliaries are fed with steam taken from the cross-connecting bends between adjacent turbines. Each turbine is provided with a short free exhaust pipe which is independent of the exhausts of the auxiliaries except through the heater vents and emergency connections. The high-pressure steam piping is of mild steel with Van Stone joints and feed and blow-off piping is of heavy cast iron. The main cut-off valves of the turbines are operated from the floor by means of gears and shafting, the operating shaft having a hand wheel on the boiler-room side of the wall as well.

The generating room is at present equipped with four 5000-kw General Electric turbo-alternators, reserve space sufficient for two more units of the same size being provided. The turbines are Curtis five-stage machines mounted on cast-iron bases forming exhaust chambers which are provided with condenser openings and free-exhaust connections. The alternator and turbine are connected together by a coupling. The shaft rests upon a step bearing consisting of two cast-iron blocks between which water is forced under a pressure of 800

lbs. per sq. in. The piping for this system is in duplicate and is fed by three pressure pumps in addition to two accumulators, each of which is normally supplied by a large steam pump. The turbines are governed by successive openings and closings of automatic valves operated by hydraulic pressure controlled by a cam shaft. The valves deliver steam to two sets of nozzles. Should the turbines speed up abnormally, an automatic speed device with which each unit is equipped trips the main steam valve, thus cutting off the supply of steam and causing the turbine to stop.

As shown in the leading engraving, the condenser equipment, which is of Worthington make, is external to the base of the turbines. The condensers are of the counter-current surface type and have 17,000 sq. ft. of cooling surface. They are guaranteed to maintain a vacuum of 28 ins. with cooling water at 70 deg. F., and with a barometric pressure of 30 ins. The condenser auxiliary apparatus is composed of independent units. The air pumps are of the standard Worthington rotative fly-wheel type with air and steam cylinders arranged in tandem on a common base. The pump is double acting and the steam end is equipped with a variable cut-off valve gear and guaranteed to show an economy of 35 to 40 lbs. of steam per hour per horse-power. The circulating water pumps are of the centrifugal type and are driven by Fleming side-crank engines at 250 r. p. m. The hot-well pumps are of the two-stage turbine type, direct driven by 10-hp, 125-volt, direct-current motors. The intake and discharge tunnels for the condensers are elliptical in shape, 7 ft. 3⅞ ins. and 9 ft. 11 ins., respectively, across the minor and major axes. These rest on solid rock and extend into the waters of the Sound.

The alternators are of the revolving field type, delivering three-phase current at 25 cycles and 11,000 volts. The armatures are star connected and the neutrals are grounded through individual cast-iron grid resistances connected to a common ground bus, limiting the ground current under all conditions to the amount necessary to operate the overload relays on the line switches. The guaranteed efficiency of the alternators is 96 per cent at full load. Each alternator is designed for a 50-per-cent overload for two hours and a momentary overload of 100 per cent. The efficiency at one-quarter load is guaranteed to be 90 per cent. The leads from the alternators are brought down to the floor through brass pipe to the ducts leading to the high-tension switches, the arrangement being such that no high-tension conductors are exposed in the generator room.

The exciter system comprises two 150-kw horizontal steam turbine generator sets, running non-condensing under a steam pressure of 175 lbs. and delivering 1200 amps at 125 volts. Floating on the system is a battery of 74 cells with a capacity of 1200 amps. for one hour. There is an additional exciter consisting of an induction-motor generator set running at 500 r. p. m. and delivering 1200 amps. of direct current at 125 volts. The induction motor is a 25-cycle machine of 200-hp capacity taking current at 200 volts. The motor is started by a special switch which puts the transformer windings first in delta, then in star connection. The exciter generators and battery are connected to two independent positive bus-bars and one common negative bus. Two end cell switches are provided on the positive side of the battery. One positive bus is used to excite the fields of the turbo-alternators, while the arc lamps and direct-current motors in the station are connected to the other positive bus.

The entire electrical equipment in the station is controlled from the switchboard gallery on one side of the generator room. Enclosed in a glass booth in the center of the gallery is the operating bench board, on either side of which are separate boards for controlling the exciters. The lamp and motor circuits in the station are controlled from smaller switchboards situated at either end of the operating gallery, and the field panels are located outside of the operating booth on each side. All cables and connections running to the boards are carried on concrete trenches under a stone floor.

Separated from the main station is a switch house containing all the high-tension switching apparatus. In the basement of this building, which is 50 ft. 10 ins. wide and 100 ft. long, are located all the high-tension connections, instrument transformers, cables, manholes, etc. These are placed in separate fireproof compartments, corresponding to the several generating units. Reinforced concrete, vitrified brick and stone are used for barriers and bus-bar compartments, and each leg of the feeder circuit is isolated until three legs meet at the switch. Two sets of high-tension bus-bars are provided, each of which is sub-divided into two and three sections by tie switches. The connections to the bus-bars and oil switches are made with ¼-in. copper tubing flattened at the ends so as to reduce to a minimum the number of insulators. The high-tension bus-bars are connected to the generators through a main switch and two selector switches. Each feeder is provided with two selector switches which connect to the two respective high-tension bus-bars below them. Overload relays are connected in the generator and feeder circuits and the former has in addition reverse-current relays connected to indicating lamps.

On the first floor of the switchhouse are located all the oil switches, divided into unit groups. For each pair of groups there is an auxiliary operating board and instrument board, the latter being equipped with instruments not essential for the switchboard operator, but necessary for the complete equipment of the station. The switchboard equipment in the switchhouse is such that the main operating board in the station may be put out of service for cleaning or repairs, the entire electrical equipment being then controlled from the switchhouse. The entire electrical control apparatus is of General Electric make. The oil switches are type-H and the knife switches which disconnect these from the high-tension system are located in compartments at the bottom of the switch casings, one in each side.

The alternator leads, which are isolated from one another their entire length and from the low-tension cables, are brought over to the switchhouse through underground conduit lines. The same is true for all other cables running between the switchhouse and the station, so that any damage from short-circuits or burn-outs is necessarily confined to the duct in which it occurs. All cables coming through the duct system enter manholes in the basement of the switchhouse. The low-tension cables enter through manholes in a passage separated from the high-tension compartments by a fireproof wall, and are brought up in enclosed chases in the wall. The oil switches have a rated capacity of 500 amps. with the exception of the tie switches, which have a rated capacity of 1200 amps. On the same floor are installed two three-phase transformers, each having a rated capacity of 200 kw, and giving 220 volts at the terminals of the secondary. One transformer is used for the general lighting and motor equipment, while the other is used to supply the induction-motor generator set in the turbine room.

On the second floor of the switchhouse are located the load despatcher's office, the exciter battery with booster and switchboard, storeroom, toilet rooms and apparatus for heating and ventilating system. The load despatcher's office is arranged for the proper distribution of electricity over the system, and in order to give quick relief in case of accident

or trouble the office is equipped with a record board, indicating by means of lamps and plugs which generators, lines, rotaries, etc., are in or out of service and which switches are open or closed. An independent telephone system, exclusively for the use of the load despatcher, interconnects both power stations, all the sub-stations and the train despatchers in the electric zone.

The high-tension cables and the majority of the single-conductor, low-tension cables are cambric-insulated and lead-covered. The insulation is 10-32 in. for the high-tension cables and 4-32 in. for the low-tension cables, with a lead cover 3-32 in. thick. Multiple-conductor cables for instruments and control wiring have a combined cambric and rubber insulation. Single-conductor cables are used for connecting the generators with the oil switches. Provision has been made in the station for fifteen feeders.

Alternating and direct current is used for lamps and motors, the former being three-phase at 220 volts and the latter being at a potential of 125 volts. With a few exceptions all the incandescent lamps in the station, about 1000 in number, will be fed with alternating current, although the lamp circuits are arranged so that they can be thrown on the exciter bus-bars should occasion require it. The thirty-six lamps in the station and on ornamental posts outside the station are fed from the excited circuits, as are also the crane and elevator motors and a few others. The greater part of the motor load is carried by three-phase motors. The amount of power required to operate auxiliary machinery in the Port Morris station is approximately 430 hp, of which 250 hp is supplied by alternating-current motors and 180 hp by direct-current motors. Compressed air is used in the station and switch house for cleaning the electrical machinery and apparatus. This is supplied by induction motor-driven two-stage compressors delivering air at a pressure of about 100 lbs.

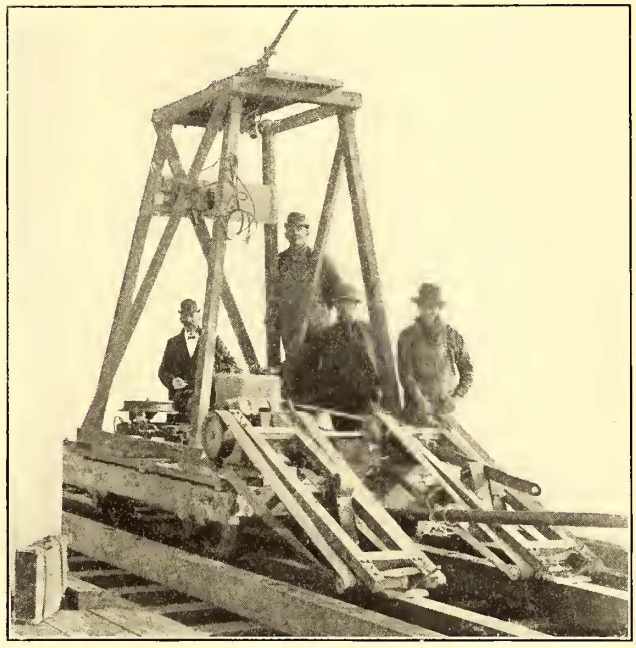
The Port Morris and the Yonkers power stations will be tied together, so that in the event of any part of the generating equipment at one station being disabled the other station will assist in carrying the load. The transmission lines from the Port Morris station are partly underground and partly overhead. Eight sub-stations will be eventually equipped, any one of which may be fed from either generating station. The circuits are so disposed that no ordinary accident can cut off a sub-station from its source of supply. The overhead transmission lines are supported by latticed steel poles set in concrete foundations, and the conductors are either 0000 bare stranded wire cable or of aluminum stranded cables spaced 36 ins. apart on yellow pine cross-arms. All the overhead lines are protected by lightning arresters. At points where the lines change from overhead to underground, cable towers of pleasing architectural design are provided to enclose the connections. Lightning arresters and disconnecting switches are also provided in these towers. The underground cables have three conductors of 0000 stranded copper, with paper insulation and lead sheathing. The duct lines are of vitrified tile covered with waterproofing and laid in concrete. The manholes are designed with regard to the best manner of handling and supporting the cables. Each cable lies on a removable shelving of concrete supported on iron pins. Through the Park Avenue tunnel and along the viaduct, the conductors are carried in 3½-in. steel pipes supported by brackets. The sub-station equipment will be described in a subsequent issue.

The Rockford, Beloit & Janesville Interurban Company, of Janesville, Wis., has granted a one-cent an hour increase to all motormen and conductors who have been with the company more than six months.

ELECTRIC TIMBER PLANING DEVICE FOR OAKLAND PIER

An ingenious use of ready-at-hand machinery and material to accomplish an otherwise tedious task was that made by the mechanical staff of the San Francisco, Oakland & San Jose Railroad Company on its pier on the Oakland side of San Francisco Bay. It was found after the timber guard rails were installed on the pier that they were a little too high to permit the smooth and safe operation of the electric Key Route trains. As the idea of planing them down by hand was a task hardly to be thought of, the arrangement illustrated in the accompanying picture was devised.

The outfit consisted in mounting on a four-wheel truck a



ELECTRIC TIMBER PLANER IN SERVICE

standard railway motor, which was used to drive a planer knife on each guard rail. As may be noted from the illustration, the motor was belted to a jack shaft at the rear of the car. Extending behind the car and over each guard rail was a frame carrying at its lower end an ordinary planer head. Each set of planer knives was driven by two belts from the jack shaft, special springs and weights being added to the frame to keep the knives on the work.

The car was pushed along the pier by a regular work car, and received current for its own planer motor direct from the trolley by means of an arm and tower.

With this arrangement the company was able to complete the work of planing the entire six miles of track on the pier in about three weeks, and the task was accomplished with a minimum of expense and, moreover, very satisfactorily. Credit for the arrangement is due to J. Q. Brown, assistant general manager and chief engineer; George St. Pierre, master mechanic, and John R. Scott, foreman, the latter two gentlemen being shown at the left of the picture.

That the transportation of troops by trolley to and from the State muster field at South Framingham, Mass., was a success is shown by the following extract from the report of Adjt.-Gen. James F. Frye:

"The transportation of troops to and from Camp Bancroft was, except in case of one or two companies, accomplished entirely over the lines of the Boston & Worcester. I consider that the experience of this tour shows that transportation of troops and baggage by trolley lines is entirely satisfactory."

THE EMPLOYMENT OF TRAINMEN BY THE UNITED RAILWAYS, ST. LOUIS

Motormen and conductors are practically the only employees of the railway coming in contact with the passengers, and it is, therefore, of the greatest advantage to have them of the highest type of manhood obtainable for the wages paid. The larger a street railway system the more difficult it is to maintain a high standard and the greater is the necessity of exercising extreme care in the employment department. The

UNITED RAILWAYS COMPANY
OF ST. LOUIS.

St. Louis, Mo., _____ 19

Mr. _____

Dear Sir:

Mr. _____ giving his address as _____ has made application for position as _____ with this Company and names you as one of his references.

Will you therefore kindly reply to the inquiries below, and return this communication in the enclosed envelope?

Yours very truly, J. F. Davidson

CONFIDENTIAL.

QUESTIONS.	ANSWERS.
1. How long have you known applicant?	1.
2. Is he of good moral habits?	2.
3. Do you consider him a reliable and responsible person, and one who could be placed in a position of trust?	3.
4. If ever in your employ,	4.
a. In what capacity?	a.
b. For what period?	b.
c. Why did he leave?	c.
d. Is he temperate?	d.
5. Has he ever to your knowledge had any Street Railroad experience.	5.

Remarks: _____

Date _____ 19 Signature _____

BLANK SENT TO PARTIES GIVEN AS REFERENCES

method of employing trainmen and the system developed to keep individual records of them by the United Railways of St. Louis is of special interest and shows with what importance the employment of trainmen is regarded by the railway company.

The employment department is in charge of J. F. Davidson, assistant general superintendent of the road, and the system now in use has been generally developed during Mr. Davidson's connection with the department. All applicants for positions report at 12:30 p. m. and are assembled in a room next to that of Mr. Davidson. They are received in his office one at a time. He acquaints them with the responsibilities and duties of the position applied for, asks them general questions concerning themselves, observes their demeanor and in short sizes them up in general. Those men making a favorable impression and still wishing to join the company are sent into an adjoining room. Those that do not stand this first inspection or who, after being more thoroughly acquainted with the work, do not wish to continue further are sent out through a door leading to the street.

After all the applicants have passed through the office, Mr. Davidson enters the room with those selected and explains to them in detail the responsibilities of the work, what the company expects of them and the routine necessary before they are accepted. Each is given an application blank containing the customary queries, and then the whole form is gone over. Instructions are given in detail as to how the several blanks are to be filled out, but especial attention is given to the clauses in the agreement. These are gone over very carefully and the full import of each is impressed on the applicant. The agreement which the applicant must sign is no doubt one of the most carefully prepared in use by any company. Among other demands is that of total abstinence from intoxicating liquors. Another unusual clause is that which compels the applicant to have four photographs taken of himself, two in civilian's clothes and two in uniform. The agreement reads as follows:—

In case I am employed by the United Railways Company of St. Louis, as a conductor, I..... hereby agree that I will totally abstain from the use of intoxicating liquors, and will at all times be strictly temperate: that I will faithfully observe all the rules and regulations governing employees which the management may from time to time establish; and willingly perform all duties assigned me; that any wages earned by, or owing me, shall not be due and payable until the regular pay day of the said company; that if for any reason I shall be suspended from employment of said company, I shall not be entitled to any compensation during such suspension; that when my employment with said company ceases, I will at once return to said company all badges or other property of said company in my possession, or pay for the same at a price fixed

UNITED RAILWAYS COMPANY

St. Louis, _____ 19

Mr. _____ Sup't. _____ Division:

Place bearer _____ on with competent instructors;

to be taught the duties of _____ in compliance with the rules of this Company.

Signature of Applicant: _____ J. F. Davidson, Ass't Gen'l Sup't.

St. Louis, _____

Mr. _____ Sup't:

Bearer _____ was under instructions with the undersigned for the number of days set opposite their names; he is familiar with all the rules and regulations and with the streets along this route and the various branches and transfer points connecting with this Division; he is also familiar with all the switches, curves and turnouts about station. I recommend him as competent to discharge the duties assigned to him.

	FROM	TO	
On with			days
"			"
"			"
"			"
"			"

Assigned to Line No. _____ Foreman.

Approved: _____ Sup't.

BADGE No. _____ ISSUED

BLANK SENT TO DIVISION SUPERINTENDENT REQUESTING THAT BEARER BE ASSIGNED FOR INSTRUCTIONS

by the company. That I will have four photographs taken of myself, two in civilian's clothes, and two in full regulation uniform, of such size as may be required, and will deposit same with the company. Said photographs are to become and remain the absolute property of the United Railways Company of St. Louis, whether my application for employment be granted or not.

I am informed as to the character of the work for which I am an applicant, its conditions and requirements and rate of wages, and I am in earnest in my desire to enter and remain in the company's service, and as evidence that I am not trifling with the question or uselessly consuming the time of the company's officials in considering my application, I agree that if I volun-

tarily leave the company's service within ninety days after the date of my employment the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I have made truthful answer to every question in my application, as a guarantee of which I hereby agree that if at any time it develops that any written answer I have made is untrue I will accept discharge from the company's service without protest, and the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I promise to deal honestly with the company, and if at any time in the performance of the duty of conductor I fail or neglect to register fares collected, whether the fares be cash, transfers, passes, tickets or other evidence of passage, I agree in the event of such failure to accept discharge without protest, and the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I have read all of the above, I understand it, and sign it knowingly and voluntarily.

.....
(Sign your name in full.)
Witness.....
Address.....
Forty dollars ($40.00) in cash will be necessary for the purchase of uniform and living expenses until wages are earned. Have you that amount?....

(DO NOT FILL THIS OUT.)

No.....

APPLICATION OF

.....

For employment as CONDUCTOR.

.....190....

APPLICANT EMPLOYED.

.....190....

Recommended by

.....

In case of accident or death notify

.....

Age.....
Weight.....
Height.....
Color Eyes.....
Color Hair.....
Color Mustache.....
Color Beard.....
Complexion.....
Marks.....

.....

.....

Receipt No.....

No.....

UNITED RAILWAYS COMPANY
OF ST. LOUIS.

APPLICATION FOR EMPLOYMENT.

(Must be filled out in INK and be plainly and neatly written.)

St. Louis, Mo.,.....*190*....

TO UNITED RAILWAYS COMPANY OF ST. LOUIS.

GENTLEMEN:

I, the undersigned, respectfully make application for a position as CONDUCTOR and therefore state;

1. My name in full (no initials).....
2. I was born in.....County.....State, on the.....day of.....18....
3. My general appearance is as follows; Height .....feet.....inches. Weight.....pounds. Color of hair.....
   Color of eyes ..... Complexion..... Face..... Nose..... Build.....
   Marks.....
4. Present address.....(City address.)
5. Previous address.....(P. O. address.)
   I lived there from.....to.....
6. I have lived in St. Louis since.....(month).....(year.)
7. I am a {Single / Married} man and have to support myself and.....Housekeeping or Boarding?.....
8. My trade, or occupation, is.....I was last employed by.....
   ..... Give their post office address .....
   as.....(occupation) For.....(years).....(months.)
9. My reason for leaving was (State fully).....
   .....Date of leaving .....
10. Do you use intoxicating liquors? (State fully).....
    .....
11. How long have you been out of employment? .....
12. Do you belong to any Secret, or Labor, Organization?.....If so give name.....
13. Have you any defect whatever in Sight, Hearing, or Speech? .....
14. Are you in any way crippled or deformed?.....
15. Have you ever been injured?.....
16. Have you ever been DISCHARGED OR SUSPENDED from any position? If so, state particulars, when and where and for what reason?.....
    .....
17. Have you any relations in the employ of the United Railways Company? If so give their names and position.....
    .....
18. Have you ever been in the employ of any Street Railway Company in the City of St. Louis at any time or in any capacity? If so, state when, on what Division.....on what line .....
    Cause of leaving.....
19. Have you ever been employed by any other Steam, Street or Electric Railroad Company? If so give full particulars why you left them.
    .....
    .....
    .....
20. Give dates of your employment during the past four years. Also the names of your employers and their addresses during that time.

Name of employer.	Address.	Your occupation.	Date you entered service.	Date you left service.	Reason for Leaving.

21. I refer you for recommendations as to my character, ability and integrity to

NAMES.	POST OFFICE ADDRESS.

(You must name five references)

22. I hereby warrant the truthfulness of the above Statements, And Certify that I can read and write the English language and that I personally filled out this application, and enter into the following
(Read every word of this carefully as you will be held to a faithful performance of the conditions set forth.)

AGREEMENT.

In case I am employed by the United Railways Company of St. Louis, as a CONDUCTOR, I .....
..... hereby agree that I will totally abstain from the use of intoxicating liquors, and will at all times be strictly temperate: that I will faithfully observe all the rules and regulations governing employes which the management may from time to time establish; and willingly perform all duties assigned me; that any wages earned by, or owing me, shall not be due and payable until the regular pay day of the said Company; that if for any reason I shall be suspended from employment of said Company, I shall not be entitled to any compensation during such suspension; that when my employment with said Company ceases, I will at once return to said Company all badges or other property of said Company in my possession, or pay for the same at a price fixed by the Company. That I will have four photographs taken of myself, two in civilians clothes, and two in full regulation uniform, of such size as may be required, and will deposit same with the Company. Said photographs are to become and remain the absolute property of the United Railways Company of St. Louis, whether my application for employment be granted or not.

I am informed as to the character of the work for which I am an applicant, its conditions and requirements and rate of wages, and I am in earnest in my desire to enter and remain in the Company's service, and as evidence that I am not trifling with the question or uselessly consuming the time of the Company's officials in considering my application, I agree that if I voluntarily leave the Company's service within ninety days after the date of my employment the Company shall retain as liquidated damages the five dollars ($5.00) deposited by me upon entering the Company's service.

I have made truthful answer to every question in my application, as a guarantee of which I hereby agree that if at any time it develops that any written answer I have made is untrue I will accept discharge from the Company's service without protest and the Company shall retain as liquidated damages the Five Dollars ($5.00) deposited by me upon entering the Company's service.

I promise to deal honestly with the Company, and if at any time in the performance of the duty of Conductor I fail or neglect to register fares collected, whether the fares be cash, tronefers, passes, tickets or other evidence of passage, I agree in the event of such failure to accept discharge without protest and the Company shall retain as liquidated damages the Five Dollars (5.00) deposited by me upon entering the Company's service.

I have read all of the above, I understand it, and sign it knowingly and voluntarily.

.....
(Sign your name in full.)

Witness.....

Address.....

Forty dollars ($40.00) in cash will be necessary for the purchase of uniform, and living expenses until wages are earned

Have you that amount? .....

FAC-SIMILE OF APPLICATION BLANK USED BY THE UNITED RAILWAYS COMPANY, OF ST. LOUIS

After a talk of probably an hour the men are told where to have their photographs taken and where to obtain the physical examination. They are also acquainted with the facts regarding vaccination.

The photographs are taken by a photographer in the neighborhood of the offices. They are cabinet size and unmounted and are not retouched or finished. A uniform alters the appearance of a man to such an extent that it is deemed advisable to have photographs taken both with and without uniform. A front and side view with civilian's clothes and with the uniform are obtained.

The physical examination to which the applicant is subjected is given by the company's physician. It includes an examination of the heart, lungs, spine and other parts of the body and a test of the urine. The eyes are tested for color blindness and acuity and the hearing is also tested. The applicant is also compelled to get a certificate of vaccination from the city health department. If he has never been vaccinated he must have it done before his application will be considered further.

After the application has been filled out, the settings for the photographs made, the physical examination submitted to, and the certificate of vaccination obtained, the prospective employee returns the application to the office. If the application has been filled satisfactorily, and the other regulations

complied with he signs the application in the presence of a witness and he is then sent to one of the division superintendents and is given necessary instructions in the details of his new duties. If a motorman he is given a general idea with regard to the apparatus on the car, how to cut the motors out and is taught how to care for many of the emergencies that may arise due to faulty apparatus. The greater portion of his instruction, however, consists in operating the car on the road under the charge of the better motormen of the division. In order that one motorman may not teach false ideas, the new man is put successively under several different men. The conductors are put on the road under the more competent of the older men. The duration of this preliminary training depends on the aptitude of the applicant. When he shows himself competent to assume duties he is returned to the general office.

During the time he is under the charge of the division superintendent the references named in his application blank are being followed up and any credentials he may have presented are being investigated. To those firms or persons offered for reference as to character and ability, a blank form is sent, the questions upon which are mainly concerned with the applicant's habits and general reputation. Other credentials or letters of recommendation offered are followed up and investigated in a similar manner. At the same time the four photographs of the applicant are sent successively to all the division superintendents. This is done to guard against the

APPLICATION No.

ST. LOUIS, 190

Mr.

DIVISION SUPERINTENDENT.

Mr. Motorman / Conductor No. has passed the necessary examination, been furnished a Badge and is ready to be assigned.

Yours truly,

ST. LOUIS, 190

I have received of The St. Louis Transit Company, a Motorman's / Conductor's Badge No., also a Ticket Punch and Pocket Book, all of which is the property of The St. Louis Transit Company, and which I agree to surrender on my leaving the employ of said Company. I have also been furnished with a printed copy of the rules and regulations governing Conductors and Motormen of this Company, have carefully read same and agree to cheerfully comply with all of said rules, regulations and conditions contained therein. I further agree to comply with all additional rules hereafter made to be observed by employes.

Mr.

FOREMAN

Please assign Mr. to a place on the extra list.

SUPERINTENDENT.

The above party reported for duty 190, and was assigned to Line.

FOREMAN.

MR. J. F. DAVIDSON, ASSISTANT GEN'L SUPT.

Dear Sir:

Mr. having reported and been assigned for duty, I return herewith this blank properly filled out.

Yours truly,

SUPERINTENDENT.

Present address of applicant:

Division.

TRAINMAN'S RECEIPT FOR BADGE AND ASSIGNMENT FOR DUTY

re-employment of men who have previously been discharged for dishonesty or incapability. Attempts to obtain employment again are very frequent. A total of 11,000 men have been discharged for one reason or another or have resigned since 1900. It would be impossible for one person to remember all of them, but after the four photographs have been inspected by all of the division superintendents and their foremen without recognition, it is reasonable to presume that the man under consideration has never been in the employ of the company.

On being returned to the general office after having served several days on the car, the applicant, if a motorman, is questioned closely on all points concerning car equipment and the handling of the car, and if a conductor, on the route, schedule, names of streets, transfer points and concerning other details, a knowledge of which is necessary for the proper fulfillment of his duties. If the examination is passed successfully he is furnished badge and, if a conductor, with a ticket punch and pocketbook in addition. He is then sent to a division superintendent who is instructed to put him on the extra list. If in the meantime the investigation of his references brings to light anything derogatory to his character he is discharged and not considered further.

The routine followed in employing a man requires the use of several forms and receipts in addition to the application and photographs. It is of the utmost importance that such papers and other information concerning each man be kept where they can be gotten at readily. A card system has been developed for this purpose, by means of which ready access is obtained to all the papers and information concerning any one of the 2400 trainmen employed or of the 11,000 who have resigned or have been discharged.

Two sets of card indexes or files are kept, the live files for the men employed and the dead files for former employees. The cards are kept in the drawers in alphabetical order, and

PHYSICAL EXAMINATION OF EMPLOYES
FOR THE
UNITED RAILWAYS COMPANY
OF ST. LOUIS

St. Louis, 190

Mr. Sent for Physical Examination by SUPERINTENDENT

Signature of Applicant No.

Height ft. in. Age Weight lbs.

Lungs	
Heart	
Spine	
Is there a rupture?	
Are there varicose veins?	Examination of Urine. Specific gravity Reaction Albumin. Sugar.
When where you last ill?	
What are your habits in regard to the use of ardent spirits, wine and malt liquors?	
Do you use tobacco, and how much daily?	
General physical condition	

Applicant has passed required examination.

M.D.
MEDICAL EXAMINER

	SIGHT			HEARING		
	ACUITY	FIELD	Color Perception		WATCH	VOICE
Right,				Right,		
Left,				Left,		

Applicant has passed required examination.

OCULIST

REMARKS

BLANK FILLED OUT BY THE EXAMINING PHYSICIAN

refer by number to envelopes containing papers relating to the applicant for whom the card is made out. The card files, together with the envelope files to which the cards refer, are kept in a fire-proof vault. The card measures 4 ins. x 6 ins. and is large enough to carry the more important items of the information on the application blank. It also has a blank space for the date of discharge or resignation of the employee and another for the cause of the discharge. The specific cause of the discharge is written on the card in a way understood by those who have access to the record. The back of the index card is reserved for a general record of the employee. Any breach of the rules, improper conduct when on or off duty, and accidents to passengers, whether or not the

employee is at fault, are noted on the back of the card. A frequent notation is that of passengers falling when entering or leaving the car. This, as a general rule, is not the direct fault of the motorman or conductor but if it occurs with unusual frequency on any one man's car, it may rightfully be presumed that he is indirectly at fault. The reports entered on the back of the cards are obtained on blank forms from the division superintendent and foremen. The envelopes containing all the papers of applicants are of heavy manilla and measure 5½ ins. x 10½ ins. They are kept in vertical files about 100 to each drawer.

L 16

No ..... St. Louis, Mo., ... 19...

J. F Davidson,
No. 3869 Park Ave., City,

Dear Sir:-

Please enter on the record of {Conductor / Motorman}

Badge No ..... on ..... Line

On account of .....

Disciplined
Suspended
Discharged
Resigned

Put check mark opposite cause for which report is made.

Supt.

Foreman

REPORT OF DIVISION SUPERINTENDENT ON CONDUCT CAR MEN

In promoting men where other things are equal preference is given to those longest in the employ of the company. When a man is accepted, to avoid possible confusion, record is made of the minute and hour he is employed, as well as the day. A separate card file is kept with the cards arranged with reference to date of employment, and this facilitates finding the next men on the list. When a trainman leaves or is discharged his card is changed to the "dead" file. His letters of reference and any other of his papers in the company's possession are returned and he is compelled to sign a receipt for them. His application and photographs are retained in the envelope in the file with other papers. Attempt is made to keep track of all the former employees, as frequently their services are demanded by the claim department years after they have been discharged. Information as to their whereabouts is obtained in various ways and is recorded on the card in the "dead" file.

In order to locate a man when a complaint against him mentioning only his badge number comes to the office, a record with badge numbers in numerical order and the name of the employee opposite is kept. A deposit of $5 is required on the badge and a receipt for this amount is given by the treasurer. Throughout the whole system a color scheme is employed to distinguish motormen's cards, application blanks and other forms from those of conductors, yellow being used for motormen and blue for conductors.

Although the system of files and records was developed for the convenience of the employment department alone, it is used extensively by all other departments and especially by the claim department. As the cards contain a record of all suits filed, and a note of every accident or mishap they are often of assistance to the claim department in making investigations, and frequently also if this department wants to get into communication with a former employee his address can usually be obtained by reference to the records.

One advantage of the system is that the routine necessary to be gone through before employment can be obtained is such as to discourage the irresponsible applicant who merely wants a few days or a few weeks' work. A man who will go through all of it is usually one who is in earnest and will take an interest in his work.

The system has another advantage in that the wandering conductor who is in the habit of obtaining employment first in one city and then in another, merely for the purpose of robbing the companies by pocketing fares, is rather reluctant to having his photograph taken and submitting to the examinations. And when men of this class do apply it is very sel-

L 12.

Name ..... Badge No. .....

Div. ..... No. .....

Employed ..... 19 ..... O'clock. Got Badge ..... 19 .....

Height ..... feet ..... inches. Weight ..... pounds. Hair ..... Eyes .....

Resides at .....

Single. Married. Born at ..... Age .....

Occupation ..... Last employed by .....

At .....

Recommended by .....

Previous Railroad Experience .....

DISCHARGED } 19 For .....
RESIGNED }

(OVER)

CARD FOR FILING EMPLOYEE'S RECORD IS WRITTEN ON THE OTHER SIDE

dom that they are able to pass through, as the investigation of their references and credentials usually shows them up in their true light.

ELECTRICAL EQUIPMENT FOR THE HUDSON COMPANY'S TUNNELS

The twin tunnels of the Hudson Company, connecting Jersey City with New York under the North River, were described in the STREET RAILWAY JOURNAL for Nov. 25, 1905. Construction work on two of these tunnels has been completed, and work on the electrification will begin at once. Fifty electric cars will be operated in trains by the Sprague-General Electric multiple-unit system and third rail. Each car will be equipped with two GE-76 (160-hp) railway motors. Power for this new development will be supplied from a large station on the New Jersey side, located between Jersey City and Newark. Curtis steam turbines will be employed; initial equipments including two 3000-kw, 11,000-volt machines and two 6000-kw, 11,000-volt machines. The total power so generated will be distributed at high voltage to three sub-stations where the alternating current will be stepped down to 650 volts direct current through transformers and rotary converters. These sub-stations will be located as follows: Sub-station No. 1, Greenwich and Christopher Streets, New York, containing five 1500-kw rotary converters and fifteen step-down transformers; sub-station No. 2, Washington and First Streets, Jersey City, containing four 1500-kw rotary converters and twelve step-down transformers; and sub-station No. 3, Cortlandt and Church Streets, New York City, containing two 1500-kw rotary converters and six step-down transformers. Each sub-station will, in addition, contain one spare 1500-kw transformer.

The peach crop on the Marblehead peninsula, which is traversed from end to end by the Toledo, Port Clinton & Lakeside, will reach a million bushels, and the traction line is getting more of this business than it can handle. Cars are loaded at Fort Clinton and other places and the baskets loaded into the Toledo freight terminal station. Then at night after the city cars have stopped running they are taken direct to market and unloaded for morning sales.

QUARTERLY MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

The first quarterly meeting of the Street Railway Association of the State of New York, since the annual meeting at Saratoga last June, was held at the Fort Orange Club, Albany, N. Y., on Wednesday, Sept. 19, 1906. President J. N. Shannahan, of Gloversville, called the meeting to order at 11:45 o'clock. He announced that the meeting was to be devoted especially to a discussion of the question of braking, and of the proper height of car step. This was done at the request of Commissioner Baker, of the New York State Board of Railroad Commissioners, who had agreed to be present. Mr. Shannahan then called upon G. C. Graham, superintendent of car equipment of the International Railway Company, of Buffalo, and H. S. Williams, assistant electrical engineer of the Utica & Mohawk Valley Railway Company, to read their papers on this subject. These papers are published on pages 475 and 476 of this issue.

After the presentation of these papers the president asked Mr. Barnes and Mr. Baker, of the State Railroad Commission, if they would address the meeting on the subject. He said he understood that owing to the failure of the brakes on certain occasions, the question had been brought prominently before the Board and that was the reason why a discussion on the subject had been requested..

Mr. Barnes, in replying, said that he wished first to correct an impression which might possibly have been given by the chairman. It was not owing to accidents in New York State that this question of braking was taken up by the Railroad Commission, but on account of the number of accidents occurring outside of the State, and he wished to congratulate the managers assembled in Albany on the few accidents that had happened on their roads from the failure of brakes or other causes. Some years ago, in the early days of electric railroading, Mr. Barnes said, the question of safety of operation was quite a serious one, and the Commission decided at that time, and has since held, that safety of operation on heavy grades, on city and suburban lines, required the double-chain brake, and a number, if not nearly all the railways of this State, had their cars so equipped. The Board has continued that recommendation to the railway companies, until recently it found that several roads had discontinued the use of the double-chain brake on account of defects which were developed by the idle chain. He wished to get at the facts in the case and the value or undesirability of the double chain. He then cited a suburban railroad, operating to a summer resort with a heavy grade and running cars on 2 minutes' headway, whose cars were equipped with a single-chain brake. The possibility of accident in such case as that with a broken brake chain, Mr. Barnes thought, was very great, as the conductor might be in the center of the car and wedged in where he could not get to the rear platform, and the motorman would be practically helpless. The experience of the Board is that there is not one accident out of ten in which the motorman does not claim that he tried to control the car with his reverse, but was unable to do so. Recognizing the ability and practical experience represented in the membership of the New York State Street Railway Association, the Board thought it was a subject which properly could be brought before the association, and some methods of additional security recommended in the cases mentioned, that is, the operation of cars, city and suburban, on heavy grades. The Commission, Mr. Barnes said, is at present of the opinion that the single chain is not sufficient security for the proper control of cars under such circumstances, but is open to conviction that the single brake chain is desirable.

John A. Hanf, of Buffalo, said that from an operating standpoint the air brakes are a Godsend on trolley cars, but from a mechanical standpoint we sometimes wish He had not sent them. On interurban lines Mr. Hanf did not see how it would be possible to get along without them. It would certainly not be possible to make a short stop, on a high-speed line, with the old-time method. The trouble with air brakes is that they are misused by motormen. It is no harder to throw on the emergency than it is to apply part of the air. With the hand brake it takes manual power to apply the emergency, and it is safe to say that the emergency is not applied unless the motorman finds himself in a very tight place. His own way of testing air brakes is to take a car on a good rail, get it up to full speed, and then throw his hand on to the emergency. The car wheels should then skid 4 ft. or 5 ft., just before the car comes to a stop. This was found to work very satisfactorily until the motorman or others got to monkeying with the air reservoirs. A car will be sent out of the shop, say with 60 lbs. of air, and three or four weeks later it may come back with 70 or 80 lbs. This has frequently been found to be the case, and it is sure to make trouble for the mechanical department and mean many dollars out of the company's treasury to pay for the flat wheel nuisance. The brakes, however, are not the only cause for flat wheels. The sand car should also be considered. While not wishing to divert attention from the discussion on brakes, he hoped before the session was concluded that the subject of sand and sand cars would be discussed .

The president asked Mr. Hanf what his experience had been with the double chain.

Mr. Hanf replied that the double chain got sticky, especially in winter weather, and had not been so satisfactory as the single chain. He had had, however, very good results with a hand brake which winds up a single chain on a drum. This drum starts in with a circumference of perhaps 4½ ins. at the top and winds up at the bottom with perhaps a 2-in. circumference. The further down one goes the more power he gets. The speaker considered this brake the best on the market for a hand brake.

A delegate asked Mr. Hanf how many broken brake chains he had had in a year.

Mr. Hanf referred this question to Mr. Graham, who said he had never known of a broken brake chain or of an accident which had occurred through a brake chain breaking. One of the speakers had referred to trouble caused by the motorman trying to use his reverse to avoid accident. This occurs frequently where the motormen are not accustomed to the process. With the circuit breaker over his head a man will naturally throw his controller on the fifth point in making an emergency stop. If he is operating a four-motor car and going at fair speed, he ought to pull the reverse lever and never mind the controller. The car will then check itself. But the minute the motorman throws the power on, he blows the circuit breaker. The chains are differently wound in modern brakes than formerly; they are not held by ⅜-in. bolts, but are wrapped on a drum. This gives better results, as formerly the whole strain used to come on the bolt. The double nut is always used, but the bolt was the main means of support.

Mr. Fassett, of Albany, said that he also had had no broken chains. The Albany cars are rather light, but they operate on very heavy grades. As the chains become worn they are taken off and new ones are put on. This is due to the thorough inspection which the cars have. The grades are frequent and as high as 9 per cent. The company has a few cars equipped with air brakes, but all the cars operated on the hill have a hand brake, and in addition an emergency

brake. If the car is going up the hill the emergency brake can be applied to prevent the car from dropping back down the hill. In case of any breakage of any part of the operating mechanism of the car, in going down hill, the instruction to the motorman is to reverse his power and get the car moving as slowly as possible, and then drop the emergency brake for the purpose of holding the car. This has been done on numerous occasions when brake rods and other things have given out. As stated, if the reserve is properly used it is all right, but the Albany Company has had such bad experiences with the reversing of cars to prevent accidents, it is now the company's rule never to reverse the car at any time except when the braking apparatus is out of order. The company has found by making tests as to the stopping of the car by reversing that it cannot be stopped more quickly than with the usual application of the brake, and in most cases the circuit breaker was thrown and the car rendered helpless, and the motorman had to begin all over again with the hand brake.

Mr. McDonald, of Montreal, thought that the double brake chain originated with the horse-car systems, where the double chain, or second chain, was the only auxiliary available in the case of the breaking of the main brake-chain. The up-to-date car has an air brake, a hand brake, and the possibility of the reversing of the car, so that the necessity for that second brake-chain is considerably diminished. Of course, the reversing of the power, as has very properly been said, is often the occasion of the blowing of the circuit, but there is still the further auxiliary, which is not so positive, but which works on about 90 per cent of the grades in Montreal, and that is putting the motors in opposition. Even after the power or circuit has been blown, this will still hold the car on the grade almost as effectively as the air brake or any other braking mechanism which can be put on the car. Mr. McDonald had no data at hand at the moment, but felt very safe in stating that his company had not had any failures of brake-chains for the last three years. This fact made it still clearer, to his mind, that the second chain is becoming more and more unnecessary, and there is really no good reason for its use. The Montreal standard car to-day has an air brake and a hand brake, and has still the further auxiliary on the latest type of cars of having the conductor at all times on the rear platform, which does away with the possibility of the conductor being wedged in the middle of the car, as was described by Mr. Barnes. It did not seem possible to him, therefore, that these five different methods, the principal methods and the auxiliary methods, which the company has of stopping the car would all give out at the same time.

Mr. Barnes then said that he did not want any one to get a wrong impression of the attitude of the Railroad Commission toward the question of the double-brake chain. It was represented at the convention to secure information, and was not wedded to any one form of device. It wished the convention to consider if any means of additional safety, any additional safeguard, is necessary on cars operated on heavy grades, and if so, what? As he had stated before, the electric railways in the State had been quite free from accidents caused by the failure of the braking apparatus, but there had been accidents where the cars could not be properly controlled, and they showed the possibility of accidents occurring under heavy traffic conditions and on heavy grades. Did the convention consider air brakes or emergency brakes of some kind necessary?

T. W. Wilson, of Buffalo, thought the selection of the proper type of brake depends upon the size of the car. Thus a 21-ft., 23-ft., or a 24-ft. car does not need an air brake. Such a car can be controlled by the hand brake successfully, and have the assistance of the motors operating in opposition to each other, in case the brake gives out. This gives two means of stopping the car. When the length of the car is, say, 27 ft. and over, it should have some sort of power brake, and his experience has shown that the straight air brake is the most successful. The Buffalo Company has quite a number of cars equipped with electric brakes, but the trouble with the electric brake is that when the car comes to a stop on the hill the brake releases until the car gathers a certain momentum again. He agreed with the other speakers that the double chain is not an additional safeguard, but considers it rather the reverse, and thinks it defeats the very object for which it was designed.

D. F. Carver, of Rochester, being called upon, confirmed the statements made by the other delegates about the second brake-chain clogging. He thought that the second chain is of little value, and that it causes considerable trouble, especially in winter. Last winter he took the second chain off the Rochester cars and turned the special feature of the winding post down to a straight post, and the cars are now running with the one chain only. These cars are wired up, so that it makes no difference whether the pole is on or not or the circuit breaker is in or out, if the motorman properly handles his car he can bring it to a stop with that one brake-chain. The experience in Rochester has been that the point of breakage is not nearly so likely to be in the chain as in the foot of the post, and that the double chain is not really the safeguard it is intended to be, because there still exists the liability of failure of an important part of the brake rod, by striking against something. This is especially the case where the car body has been kept low and where there is little room between the floor of the car and the motors. For this reason Mr. Carver suggested that more attention should be given both to the pulling lever and the brake rod rather than to the chains themselves.

A. H. Stanley, of the Public Service Corporation of New Jersey, said that his company was equipping all of its double-truck cars with the stored air system. It has never had an accident since his connection with the company, covering a period of some six or seven years, which has been due to any fault or defect in the stored air brake system, but the company has had accidents with cars equipped with the automatic air-brake system. In the case of the 150 cars which the company now has, which are equipped with the motor-driven system, the pumps are being removed and the stored air system is being installed. In so far as the chain is concerned, the company uses the double chain and has had no accidents in which there was any justifiable criticism of the double chain. Perhaps the company's winter conditions are more favorable than those of the other companies represented. The sun generally shines in New Jersey, and there is not much snow. This milder climate may make some difference. His personal judgment is that a double chain is not absolutely essential. The braking apparatus still has a vital weakness in the rods, and this no double chain, or six chains, will prevent. Where there are so many auxiliaries, particularly in the use of reverse, he did not see that there was much chance for an accident. For light cars he was convinced the hand brake was sufficient even for heavy grades. He was interested to learn, however, the experience of others with emergency brakes.

Mr. Barnes remarked that if emergency brakes were used they would have to be tried frequently and thus kept in working order to be efficient.

The president then called on W. H. Collins, master mechanic of the Fonda, Johnstown & Gloversville Railway, to describe his experience with magnetic track brakes.

Mr. Collins said that on the Hagaman division of his line, in the city of Amsterdam, there is a 14-per-cent grade on which the company operates single-truck cars, equipped with the magnetic traction brake and the ordinary hand brake. He saw no benefit to be derived from the use of the double chain. The company took off the ordinary straight link chain formerly used on its cars, and equipped them with a heavy twisted link chain. The hand brake is employed as an auxiliary. The magnetic traction brake is used as an operating brake, up and down the hill, and in alternately using the hand brake and the electro-magnetic brake, the company has experienced no trouble whatever in operating the cars satisfactorily. Mr. Collins thought an important point was what to do when the rods break. Then a hand brake or an air brake is practically useless. To overcome this objection on his long cars equipped with air brakes, he said that where the cylinder levers go through the guide, instead of running them on top of the ordinary guide they were made double and a block was put in, allowing sufficient room for the piston to travel the ordinary length. Then in case of the rod breaking the lever on the opposite end comes against this block and gives a brake on one truck, and this will hold the car on any grade on which these cars are run. This was quite desirable, as the cars are equipped with the type-M controller.

In reply to an inquiry from Mr. Barnes, Mr. Collins said that he would not consider it an additional element of safety to have the cars on the Market Street hill equipped with air. The wheels can be brought to the sliding point with the hand brake, and that is all that could possibly be accomplished with air brakes. He thought that these cars should be equipped with an emergency brake, and considered the magnetic brake the best emergency brake with which he was acquainted. These cars, as stated, are single-truck cars, weighing from 12,000 lbs. to 13,000 lbs., and are 27 ft. over the buffers.

L. L. Smith, of Schenectady, in reply to an inquiry as to whether air brakes had been applied successfully to single-truck cars on his line, said they had equipped one of their single-truck cars with air, within two or three weeks, as an experiment. So far as the working of the brake mechanically or pneumatically is concerned it is a big success. The only question is whether it is necessary or desirable to equip such a small car with an air brake. So far as making emergency stops with cars equipped with the type-M controller is concerned, the conditions are a little different than with the type-K controller. With the type-M there is quite a large frame box containing the reverser and weighing perhaps 100 lbs. If in an emergency the fuse should go out in an operating circuit, the reverse acts, and if it is possible to get at it, it can be thrown in. When the cars of the Schenectady Railway were originally equipped, these reversers were hung under the car, but the reverser has now been put inside the car under the seat in the corner of the car, and is quite a safety device. If through any means the hand brake or air brake is inoperative, the reverser can be thrown quickly and the car can be stopped by the current.

Nelson Graburn, of Montreal, said that the Montreal company uses the double brake chains on all the cars, and has not had any trouble with them. The lower chain is one link longer than the upper, and is hung loose. The top chain is always in service. The company uses both double chains and air brakes, and considers the double brake-chain is essential. The line contains many heavy grades and the company must have emergency brakes on its cars, especially on the Guy Street hill, which has a 13-per-cent grade and is about a quarter of a mile in extent. The cars which run on the bad grades are also equipped with a screw brake which works through the center of the car and has at its ends two prongs of 3-in. bar steel which go down on each side of the rail. This is the only emergency brake which will stand on that hill. These brakes are somewhat similar to those used in Cincinnati, and are very satisfactory.

Mr. Stanley said in regard to an inquiry as to the use of air brakes on single-truck cars that the Detroit United Railway had all its cars, both single and double-truck cars, equipped with air, as a city ordinance requires all cars to be equipped with power brakes. He believed that the use of air brakes on these city cars has increased the number of accidents materially, as the tendency of the motorman is to make "grand-stand" stops. The simplicity of the application of the power, and the enormous power back of them, have encouraged the men to take chances unnecessarily, which they would not do with the hand brake, and have prevented them from appreciating the condition of affairs and the liability of accidents at different points along the line. They cannot feel the power exerted by the brakes, when applied, with the air brake as they can with the hand brake, and they are prone to take undue chances with the air brake on the small cars.

In reply to an inquiry as to the proportion of the cars in Detroit which were single-truck cars, Mr. Stanley said that up to four years ago the system operated approximately 1300 cars, and of these 1300 cars only 100 were double-truck cars. The single-truck cars have an 8-ft. wheel base, and are quite heavy; he did not remember the exact weight. The company did not oppose equipment of the double-truck cars with power brakes, but it did object to equipping the single-truck cars with air brakes. The courts, however, declared the ordinance legal, and under it all the cars were so equipped. He did not consider that the experience at Detroit with air brakes was in favor of their use on single-truck cars.

In reply to another inquiry Mr. Stanley said that his experience showed that air brakes were undesirable upon any car used principally for city service, whether single-truck or double-truck. The results in New Jersey, where the company is equipping some 2000 cars with air, showed that the accidents have increased in the case of the city double-truck cars with the use of air brakes. In fact, the motormen in that part of the system where the company is equipping its double-truck city cars with a good hand brake preferred that brake rather than the air brake, as a matter of protection to themselves. They use the air more as a matter of emergency. With suburban or interurban cars the case is different. Here it is desirable to use air, because of the excessive weight of the car and the wear on the motorman in handling such a heavy car, and for no other reason; not that they have a greater braking power, but because of the wear on the motorman.

Fred DuBois, of Syracuse, was called upon, and said that they had used double chains in Syracuse and had had the same experience as that reported in Buffalo and Rochester. They were not satisfactory in freezing weather. The company is now operating its cars with hand brakes, but uses air brakes on heavy grades, but there for auxiliary purposes entirely. The hand brake is not depended upon for emergency stops, but for ordinary stops only. The company has not had any experience with broken brake-chains, and conducts a very careful inspection. Of course, chains have broken, but they are usually broken through inspection. He agreed with the remarks of Mr. Collins in regard to the rods.

A delegate asked Mr. Smith if with the type-M control it would be possible to work the reverser by means of a system of levers operated from the motorman's cab in case of an emergency.

Mr. Smith said that that matter was considered a number of years ago, and a car was equipped with a system of levers to accomplish that purpose, but nothing further was done, as it was decided better to put the reverser in the car, as already described.

Mr. Barnes said that the opinions expressed seemed to be very general that the double chain was unnecessary, and he wished to know whether that was the sense of the meeting.

Mr. Wilson then offered a resolution, to test the opinions of the delegates, that it was the sense of the association that the double chain on the brake was not an additional safeguard. Mr. Wilson's resolution was put to vote and carried.

PROPER HEIGHT OF CAR STEP

The president then announced that the next business in order was the report of the committee on "proper height of car steps." He added that this question came up at this time because of various complaints which had reached the Board of Railroad Commissioners, and it was their desire that the association should take this question up. Mr. Peck, general manager of the Schenectady Railway Company, then presented the report of the committee.

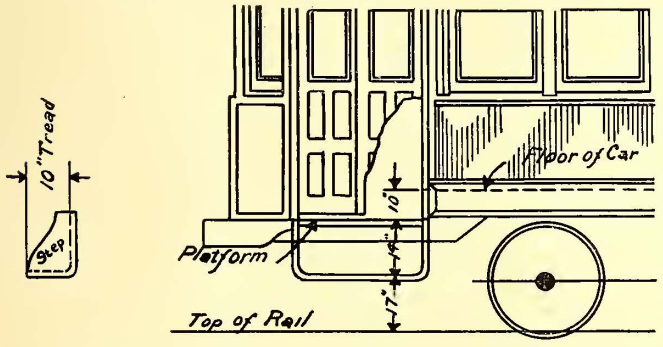
REPORT OF COMMITTEE ON THE PROPER HEIGHT OF CAR STEPS

The committee appointed by you to take up the question of the proper height of car steps beg to report as follows:

It is recommended that the maximum height between the top of rail and first step of all passenger cars of the box type with 33-in. wheels be 18 ins., with a minimum height of 14 ins.

That the maximum distance between the first step and platform of car be 15 ins., with a minimum distance of 12 ins.

That the maximum distance between platform of car and top of floor of car be 10 ins., with a minimum distance of 8 ins.



It is the opinion of the committee that an ideal condition would call for a height of 17 ins. from top of rail to the first step, and from the first step to the platform 14 ins., and from the platform to the floor of car 10 ins., making a total distance from top of rail to floor of car 41 ins. It is also recommended that the tread of all steps be not less than 10 ins.

A sketch showing these conditions is herewith attached.

After reading the report Mr. Peck said that it was signed by two members of the committee. Mr. Millen, the third member, had been unable to join in the conference, but the following letter from him had been received.

LETTER FROM THOMAS MILLEN, GENERAL MASTER MECHANIC OF THE NEW YORK CITY RAILWAY COMPANY

I am in receipt of your favor of Sept. 13, relative to the meeting in New York. I am very sorry that I was unable to attend this meeting.

I notice the height of the first step 17 ins., the second step 14 ins., and the platform of car 10 ins., I do not see how you could get them much less, where you use the 33-in. wheel. Of course in New York, where we use the 30-in. wheel, we have our first step 14 ins., second step 12 ins. and platform 9 ins.

It will be impossible for me to attend the meeting in Albany on the 19th, owing to a previous engagement out of the city.

The secretary suggested that the committee state whether its report was intended to cover two-step cars, and also whether it included the running board of open cars.

Mr. Hanf, in explanation, said the committee found the platforms of box cars to be all the way from 26 ins. to 34 ins. or 35 ins. from the top of the rail to the platform. He thought 32 ins. from the platform to the top of the rail should be the maximum. In this case it would be best to make the first step 18 ins., the second step 14 ins., and the step from the platform to the car 10 ins. This would do for interurban cars. For city cars this distance can be dropped one inch, that is, make it 31 ins. from the top of the platform to the top of the rail. That makes the first step 17 ins. It would be very hard to make this change on old cars. It will be necessary to drop the platform on some of them. On the Falls line, in Buffalo, the first step is 19½ ins., while the second step is only 12¾ ins. That second step could be dropped to 14 ins. very nicely, and this would reduce the first step to about 17½ ins. The step from the platform down should be 14 ins. in all cases. In open cars it is pretty hard to get a two-step. To get down low enough the first step would have to be 19 ins. high. That is too high. The only way to overcome that is to have three steps, the first one perhaps 14 ins. and the other two 12 ins. deep. Where maximum traction trucks are used it would be possible to get along without three steps by making the first step 18 ins. and the second step 16 ins. The Buffalo company has fifty cars running with that kind of step, and there does not seem to be any complaint about them; but with the fourteen-bench open cars, where larger trucks are used, the cars are a little high, and he saw no way of overcoming the trouble except by the use of three steps.

J. H. Pardee, of Canandaigua, thought 14 ins too high. His line had tried cars with two steps, each 14 ins. high, and there had been complaint about them.

The president asked the opinion of Mr. Barnes on the report.

Mr. Barnes complimented the committee on its work. Nevertheless he thought that the height of the riser into the car might be made 10 ins., and this would allow a lower step. It had been suggested that 14 ins. or 17 ins., as the committee has reported, is a pretty high step, and if possible it should be reduced. He thought that the second step is a great deal easier than the first, because the person has the benefit of the grab handle, and is part way up into the car. If the conditions were reversed, that is, if the first step was 14 ins. from the ground and the second one was 17 ins. in height, it might be better.

Mr. Fassett pointed out that the trouble with the three-step car is that the person steps on the third step with the wrong foot—he cannot help it. The Albany company has had a great deal of trouble in that respect. Five years ago it equipped all of its open cars with a folding double step. The first of this year ten were so equipped, but many persons in getting off the car seemed to stumble. They came down with the left foot, then with the right, and then with the left again, and that is the trouble with the three-step car. For the two-step city car, he did not see how it would be possible to get away from the high step, or a 16-in. step at any rate, as the cars are up over the wheels 33 ins. Of course, in the case of suburban service, like steam service, a pair of stairs can be constructed leading into the car if that should seem desirable.

Mr. Barnes asked if Mr. Fassett did not think it would be easier if the rise from the ground to the first step was 14 ins. and to the second step 17 ins.

Mr. Fassett replied that he did not think it would. The first step is a variable quantity and depends on the load on the car and the conditions of the springs.

Mr. McDonald, of Montreal, said that in that city 16 ins. are allowed for the first step, 12 ins. for the second, and 9 ins.

for the third step or riser from the platform to the car. The company has had no complaints against the 16-in. step, but he feared they might have some objections if they made the first step 17 ins. Sixteen inches seems to be the average gage of the ordinary passenger's step that can be taken without much effort. The reason for the second step being so much less is that then the passenger gets into stairway conditions, that is, a comfortable stairway has steps not over 8 ins. or 9 ins. in height. He did not believe it possible to get down to 14 ins. for the first step unless by making three steps to the car platform and another one into the car. The Montreal company has several cars so equipped, and has found them very slow and that it takes a long time for passengers to board and leave the car.

Mr. Barnes asked what the committee thought of making the first step 16 ins. and the one from the platform into the car 11 ins.

Mr. Hanf thought that might be possible on single-truck cars but not on double-truck cars. The best that could be done on double-truck cars is 31 ins. from the platform to the top of the rail, and that must be divided into two steps or three steps, and then from the platform into the car floor 10 ins. On interurban lines, where larger wheels are used, the minimum height is 1 in. more, that is, 32 ins. from the platform to the top of the rail. He did not see any way to overcome the trouble except by going to a single-truck car.

Mr. Carver said that the Rochester company had given a great deal of attention during the last four years to trying to get the car step down lower. The company built an experimental car for this purpose and made the first step 15 ins. from the ground, the next 13 ins., and the next one 10 ins. It made a nice car to get into, but brought the car platform too close to the springs, if ordinary springs were used, as the springs would strike the floor of the car. Stiffer springs were inserted, but then the car was found to be very hard riding. The company then raised the bolsters, but made the step about 16 ins.; 15 ins., he thought, makes an almost ideal step, but he did not think this height possible with 33-in. wheels unless such stiff springs were used on the trucks as to make the car uncomfortable to ride in.

Mr. Barnes then said that the Board of Railroad Commissioners did not expect railway managers to do the impossible, and that he was very glad to hear this expression of opinion. His suggestions that the first step be lower were made principally to learn whether it could be brought about or not. From the evidence presented it seemed to be impossible.

Mr. Hanf explained that the figures given in the report were for a 33-in. wheel, and that with a 30-in. wheel the step could be dropped 1½ ins. lower.

Mr. Fassett then moved that the report of the committee be accepted. Carried.

FARE COLLECTING IN MONTREAL

Mr. McDonald, of Montreal, at the request of the president, then described the pay-as-you-enter car recently adopted in Montreal. The previous method of collecting fares, he said, was with a portable fare box which was subjected to the same deficiencies in collecting as the usual register system; that is, it depends altogether on the accuracy of the diagram that the conductor can keep in his mind during ten hours a day of the distribution of his passengers, those who have paid and those who have not paid, and depended also on the willingness of the public and on the efficiency of the conductor and his good will and zeal in getting fares, whether the company got its receipts in their entirety or not. The pay-as-you-enter car was devised after considering all the different systems of collecting fares, and after reaching the conclusion that the positive method, as employed on the elevated railways and subways in New York, was about the surest means extant of getting the receipts in their entirety. With that idea in view the company went to work and applied the elevated and subway system as nearly as possible to the surface cars. To do that, the first thing necessary was to make the rear platform the paying office of the car; that is, that all fares should be collected on the platform. This also had the advantage of keeping the conductor at all times on the rear platform where he could be fully cognizant of what he was doing in starting the car, at which time, Mr. McDonald said, most of the accidents on street railways occur. The system so far has worked very well, and the increased revenue derived from that car, compared to other cars running on the same line on the same days, has varied anywhere from 8 to 15 per cent. This increase is net profit. There was some little opposition in Montreal to the introduction of the system at first, as is the case with all new propositions, and possibly the better an invention is the more opposition develops, but this trouble has now disappeared. In the original car the rear platform was 7 ft. long. In the latest car this dimension has been increased to 9 ft. The 2 ft. extra are greatly appreciated by smokers, and as 90 per cent of the male passengers are smokers it is enjoyed by a large percentage of the patrons. The car is speedy because of the two exits and wide entrance, and the stopping times have been reduced almost by half. Thus if ten people are getting off a car and ten people waiting to get on, ordinarily those getting on have to wait until the ten people are off before they can start to get on, but with this new system the moment the car stops the getting on and getting off begins at the same time. The platforms in question, 9 ft., can accommodate at a rush anywhere from twenty-five to thirty-five persons. The average number of people taken on at each stop will probably not exceed ten persons. In rush hours there may be groups of twenty-five, or perhaps thirty-five, but the latter would be a very rare occurrence in cities of say 400,000 or 500,000 inhabitants. At special corners in very large cities there might be a few more, but in that event the conductor can begin to work at the front and work back and still apply this system of paying-as-you-enter and he will be sure of getting all the fares. There are also moral advantages to the system under consideration, which cannot be properly appreciated except through actual experience, but which indicate that the collection of fares should be made as absolutely certain as possible, so that conductors may not be in doubt as to whether they have received fares from passengers. There is no other system in which conductors do not enter the cars and search for their fares—that is part of their duties. Managers and superintendents of street railway systems have often been under the painful necessity of calling in conductors for "missing" fares. That accusation is a doubtful one. Perhaps the conductor has missed the fares two or three days previous to the time he is called into the office, and cannot remember anything about it. Many managers feel the hardship involved in this matter, knowing at heart the task that they have imposed upon the employee is almost impossible of accomplishment. Even the best of conductors miss fares daily, and the reason that they miss fares is because they have not been provided with a systematic way of securing the fares, and the company should apply all of its energies to furnishing them with a proper method of avoiding this trouble. Two of the cars described will be on exhibition at the Columbus meeting, and the company will also have conductors who have been working on the system there to explain the method of operation fully. As far as the employees are concerned, Mr. McDonald said he could vouch for the fact that all of the conductors are exceedingly anxious to get on a "pay-as-you-enter" car, because it eliminates all contention between them and the public

and cuts out the necessity for the mental diagram which the conductor must make of the passengers in his car, those who have paid and those who have not paid, which is very taxing in a well-loaded car. With all the effort which the conductor may make to discharge his duty honestly in that direction, and with the utmost striving on his part to preserve a true mental record of whether the passengers have or have not paid their fares, it is still impossible for him to accomplish the task now imposed upon him correctly in all respects.

Mr. Fassett then said that he thought that all in attendance greatly appreciated the presence of Messrs. Baker, Barnes and Kennedy of the Railroad Commission, and he suggested that it would be a very good thing for the association in the future to endeavor to have its meetings at such times and in such places as would insure the attendance of one or more of the Board of Railroad Commissioners, or their employees. He then moved that in the case of future meetings of the association, both quarterly and annual, that the executive committee invite the members of the Board of Railroad Commissioners to send representatives, and that so far as possible they make the date and place of meeting such as will coincide with the engagements of the members of the Railroad Commissioners, so that they can be represented.

Motion seconded by Mr. Carver and carried.

BRAKE-SHOES

The discussion then turned to the subject of the cost of brake-shoes per 1000 car-miles. The figures quoted were all based on double-truck cars using eight shoes. Some of the figures given were: 40 cents, 43 cents, 56 cents, 57 cents, 80 cents and $1.10. One member called attention to these widely varying figures, which he thought were due largely to different local conditions. He had found that the weight of the car, the speed of the car, and the number of stops and the number of grades enter very largely into the extent of brake-shoe consumption. Another member called attention to the great difference in wear depending upon whether the shoes were on the motor trucks or on on the trailer trucks.

As regards scrapping, one delegate puts on brake-shoes at 38 lbs., and throws them away as scrap at about 11 lbs. Another puts them on at 24 lbs., and the weight when removed averages 12½ lbs.

SANDING AND SAND CARS

The president then referred to the subject of sand cars, which had been mentioned previously in the discussion, and asked Mr. Hanf what he had in mind when he had referred to them.

Mr. Hanf said that he wished to learn the sense of the association on the value of sand cars, sand on the cars, or both. The Buffalo Company had quite a little trouble last year with flat wheels, which increased just 50 per cent over the winter previous, with the same number of cars. When he looked up the sand records, he found that the sand cars had used 50 per cent more sand than the winter before.

Mr. Fassett said that he believed in sand cars. One of his lines has an 8 or 9 per cent grade for about a mile. This grade is taken care of by men during twenty-four hours in the day, 365 days in the year, and the rails are kept as clean and sweet as a rail can possibly be kept. For the balance of the road, the company tried the sand on the cars, but was always having trouble. The sand boxes were not properly filled at the time they should be filled, and the cars would be taken in off the line to have the sand boxes filled. Finally the company adopted sand cars. The rails of the entire system are sanded on a time table exactly the same as the schedule on which the equipment for the cleaning of snow and ice is operated. The snow plows and sweepers operate on a schedule the same as an ordinary car. The company has snow plows enough to cover the entire system in an hour and a half, and enough sweepers to do the same thing, so that with the worst kind of storms it is possible to get over the entire system in three-quarters of an hour, and it is done on a regular time schedule. The snow plow is supposed to get back to the house at a certain time, and if it does not return at that time it is hunted up. The snow is cleaned from the tracks by starting the sweepers and plows at the time that snow begins to fall, and they are kept going continuously until the snow stops falling. The sanding is done in the same way. When sanding is required the entire city is sanded. Clean beach sand is used; it contains no loam. The sand which is put on is good in the Albany climate for at least five hours under the worst conditions of rail that can occur, so that if the sand cars go over the system twice a day it is possible to keep the rails in very good shape. The sand is dried as thoroughly as possible, but it is impossible to keep it dry because it absorbs moisture when piled up. The only way to do is to put it in a large space and take it as it falls down. Care is taken to put enough salt in the sand to keep the rail in good shape. If ordinary loam sand is used, either in sand boxes or on the cars or in sand cars, the third or fourth car which goes over the rail puts the rail in worse shape than it was before. Since using the present quality of sand in its sand cars the company has not had the same proportion of flat wheels as when the men dumped the sand and then slid the wheels on it. The sand cars are run quite regularly from the 1st of November to the 1st of March whenever the inspectors think them necessary. It is exceptional if the rail is not sanded every day. The sanding of the track is one of the large accounts of the Albany company, greater than the snow and ice removal account, but the hilly condition of the city is such that it pays in helping the company out on Account No. 33. When double-truck cars with air brakes were first put in operation on the Albany line the cars were equipped with individual sand boxes, but these boxes were removed after an experience of about a year.

A delegate asked Mr. Hanf if the weather conditions were not abnormal during the winter when he found a 50 per cent increase in the consumption of sand and a corresponding increase in the number of flat wheels.

Mr. Hanf replied that, on the contrary, last winter was comparatively mild, and he did not see any cause for an increase of 50 per cent in the consumption of sand over the previous winter.

Mr. McDonald said that the Montreal company had never tried the sand car. Sand boxes are used on the cars, and the company has special men for all the heavy grades. There is a large number of heavy grades on the system, varying from 5 to 10 per cent, and on each of these grades the company keeps a sand man for twenty-four hours a day during the bad season, and for about fifteen hours a day during the summer. This was considered the safest thing to do. Not so much reliance is placed upon the sand boxes for the hills as on the men who sand the hills. These men generally keep the hills in order, and the motormen seldom need to use the sand box on the car to sand the grades. The sand box on the car comes into use on the level, in case of an emergency on a slippery day.

SNOW REMOVAL

A delegate asked the Montreal representatives to describe their appliances for snow fighting and the organization of their snow-fighting force.

Mr. McDonald in reply said that for the last twenty-five years the average snowfall in Montreal had been 120 ins. per year. Notwithstanding this large volume of snow the company had not experienced any stoppage of its service for the

past three or four years on any part of its lines, with the exception of some interurban lines, which generally got stalled when the plows got stuck. For its city service the company follows a practice somewhat along the lines which Mr. Fassett had described in regard to Albany. They have a schedule by which a sweeper gets around about every forty minutes, and where the sweeper equipment is sufficient to do this there is little danger of snow blockades. This refers to the track in the city where the streets are built up, with an open space here and there, but no fields. The only thing which the company has found competent to do the business on the interurban lines is the rotary plow. It has some four-motor rotary plows in use now which have given very good satisfaction with the suburban service, and since the inauguration of double-truck rotary plows, with something like 200 hp in power capacity, the company has had no absolute sticking, but the speed of the plows has been greatly reduced at times. In city service the great need in fighting the snow is to start early and gage the probabilities for a coming storm. When the storm arrives, the snow service is started and is increased as occasion may require. If it is a light storm the plows or sweepers get around every hour and twenty minutes, or the number of trips over the road can be increased to any necessary extent. The company takes no chances on snow. It spends somewhere from $150,000 to $200,000 a year for snow cleaning, and finds it pays to be liberal in the allowance for snow fighting, so as to avoid any tying up of the lines. The company is allowed by the city police to use salt on switches and on grades, and as the switches and grades in Montreal are very numerous, this permission means that the company is allowed to use salt almost everywhere. The company has a large number of employees who do not delight in anything as much as fighting a snowstorm, and very little difficulty is experienced in getting them out and getting them to stick at it for as long as seventy-five or eighty hours at a time. During that time the company boards them and feeds them liberally, and while the company has had very little difficulty in contending with a large amount of snow, it has to arrange its plan for fighting the snow with considerable care and at a great deal of expense.

Mr. Fassett said that in fighting snow his company had only one rule—begin early and stay late; begin with the storm and stay with it, and the Albany lines have never been closed on account of snow. He thought the system in Albany of running the sweepers and plows on an absolute time table was quite essential, because then the superintendent or division superintendent knows all the time where this or that plow is. If the plows do not come around in time there are enough others to send out to get them all again on time, but the plows run on a regular time schedule. The company has twelve plows and twelve sweepers for 85 miles of track, and in addition several levelers. Where the streets are wide these levelers are attached to four horses each.

Mr. McDonald said that the Montreal system had a sweeper for every 5 or 6 miles of track. They can go over the entire system in forty minutes.

The secretary called attention to some compilations made last winter from which it developed that the average for all the roads in New York State is 8 miles to a sweeper or a plow, and that sweepers do more effective work than the plows until the snow gets to be 2 ins. or a little over in depth.

Mr. Fassett said that in addition to using the sweepers and plows during the time that snow is actually falling, and immediately after, it is the practice in Albany to run a sweeper over the entire line every night during the winter to sweep out the slush and other stuff that accumulates on the track during the day.

A delegate asked if any company had experienced any trouble on interurban lines with snow in the center of the track after running the snow plow over, and if anything could be done in the way of flanging out the center, as on the steam roads.

Mr. McDonald said that in Montreal an ice-cutter is used for that purpose. It consists of a bent steel bar, which goes under the rear part of the rear truck of a double-truck car. This bar is equipped with teeth set ½-in. apart or so, and this arrangement keeps the centers in good order all the time. This cutter can be set to any height. It is left on the back of the rear truck all winter, and keeps the road in good shape all the time. It is hung on springs, with the teeth made of 5-in. tool steel, with the teeth set in.

Mr. Collins said that his company uses a flanging device on its snow plows which takes care of this snow. This device throws all the snow and ice out into the roadway.

Mr. Graburn in further explanation of the Montreal cutter said that when ice accumulates after a snow storm the company tries to arrange each car so that the teeth on one car will cut out what the preceding car leaves. With fifteen or twenty cars equipped on any line with these bars it was possible to keep the line in good order all winter. No attempt is made to take the loose ice out.

Mr. Graham said that in Buffalo considerable trouble was experienced with the high snow centers, until the company got two ice-cutting machines, each with a row of diamond-shaped teeth. These cutters were applied to the bottoms of some trucks and four horses would take a trip over the lines and cut out the high ice centers.

BRAKE TESTS

Mr. McDonald said that he thought it would be very useful for the association to determine the distance within which a car could be stopped under favorable conditions, and what distance would be considered was a good stop. Such information would be very valuable in accident cases. The subject might also be considered by the American Association.

Mr. Fassett said that in 1896 he had made some tests on that point. He took a car and ran it at 8 m. p. h., and the best stop he could make was 45 ft. He then had every motorman on the lines of the Albany Railway Company make a test stop, and recorded the results, and for ten years has not had any trouble. Every motorman in court who said what he could do was confronted with what he had done under the most favorable conditions. The Railroad Commissioners also made a series of tests. Their report is published and shows practically the same results as reached in Albany. Mr. Fassett thought that the best method of convincing people with what they could do was a demonstration of the length of time in seconds it took them to go through the motions of stopping a car. With a car running 8 m. p. h. or going 12 ft. a second, about 4½ seconds was the very best they could do before the court in showing what motions they had to go through in order to stop the car, throwing off the power, etc. By following this plan with all of his men he has practically eliminated from negligence cases any erroneous testimony which may be given by expert ex-motormen. The tests referred to were made with a single-truck car both with reversing and with brakes, but it was after this series of experiments had been made that the company changed its rules and did not allow the men to reverse the car at any time to avoid an accident, except in cases of a breakage of the braking apparatus. When the car got up to a speed of 12 m. p. h. the gears would come out in reversing, and in one case where the car was running 20 m. p. h. the bottom of the car was taken out. The track on which the tests were made

was practically level, that is, it had a grade of only 3 ins. in 100 ft. Mr. Fassett said that he did not believe a man making a stop with an emergency application could beat the stop which can be made on a single-truck hand-brake car by more than 5 ft.

Mr. McDonald suggested that tests be made with different weights of car, speed, grade, and under all conditions which are likely to occur.

Mr. Peck moved that the matter be referred to the committee to be appointed on brakes and braking and that a report be presented at the next meeting. Carried.

CONCLUSION

After a vote of thanks to the United Traction Company, of Albany, and General Manager Fassett, who were the hosts, the meeting adjourned.

BRAKING FOR ELECTRIC CARS *

BY GEORGE C. GRAHAM,
Superintendent of Car Equipment, International Railway Co., Buffalo

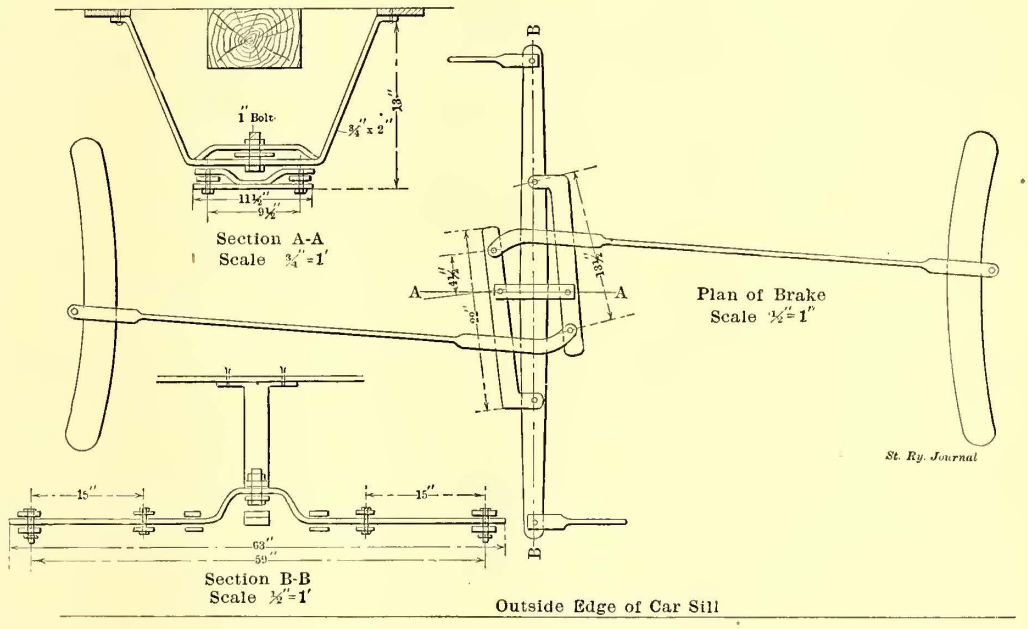
The question of what is the proper system of brakes to be used and how to apply them on the heavy four-motor cars that are being built to-day for both city and interurban service, and principally operated as single cars, is one of great importance and is worthy of the attention of all street railway companies. During the evolution of the street car brake, as in the case of nearly every mechanical appliance, much has been learned respecting its operation, and the strong or weak points gradually discovered. Practice would seem to demonstrate that up to this time no system of braking has yet been devised which can properly be compared with "straight air" for cars operated through city streets.

This system gives the motorman a quick, safe and easy control of the car without any exertion on his part, and his preference for this system can easily be seen where hand, electric and air-brake cars are operated over the same lines. I have known motormen who would invariably turn in either a hand or an electric brake car, reporting some imaginary trouble, if they thought there was any possibility of getting a car equipped with air brakes to replace it. Where the lighter cars equipped with hand brakes are operated over the same line as cars equipped with air, it is absolutely necessary that the hand brakes be kept in the best possible condition, to allow the motorman to make his stops properly without much labor on his part, and still keep out of the way of cars which are being operated with air brakes. In this we are greatly assisted by the use of the gear drum or eccentric wind-brake staff, which not only makes it easier for the motorman, but is quicker and safer than the old method of bolting the chain through the bottom of the staff, which was the practice some few years ago.

* Paper presented at the Albany meeting of the New York State Street Railway Association, Sept. 19, 1906.

At present we are operating over the different lines of the International Railway Company, in the city of Buffalo, cars equipped with hand, hand and electric, and hand and straight air brakes. On cars equipped with both electric and hand brakes the electric brake is used exclusively; on cars equipped with air and hand brakes the air brake is used exclusively, except between the hours of 10 and 11 a. m., during which time the motormen have orders of operate hand brakes. This not only gives the motorman an opportunity to ascertain the condition of these brakes and report thereon, but also keeps the staffs and gears from rusting and clogging up with dirt, preventing them from being set up and releasing properly. The high-speed cars in interurban service have designated stops to make daily with the hand brake.

Our largest car operated with the aid of hand brakes only is 34 ft. long, weighing approximately 11 tons, with a seating capacity of 34 persons. These cars were originally equipped with double chains with ⅜-in. links, connecting ¾-in. brake rods, and attached to brake lever through reinforced ends by ¾-in. key bolts. The chains wound on sprocket by gear on brake staff would, at times, on some of our lines, clog up with ice during the winter months, making it impossible to set the brakes, or when set, very difficult to release them without getting off the car. To overcome this trouble we



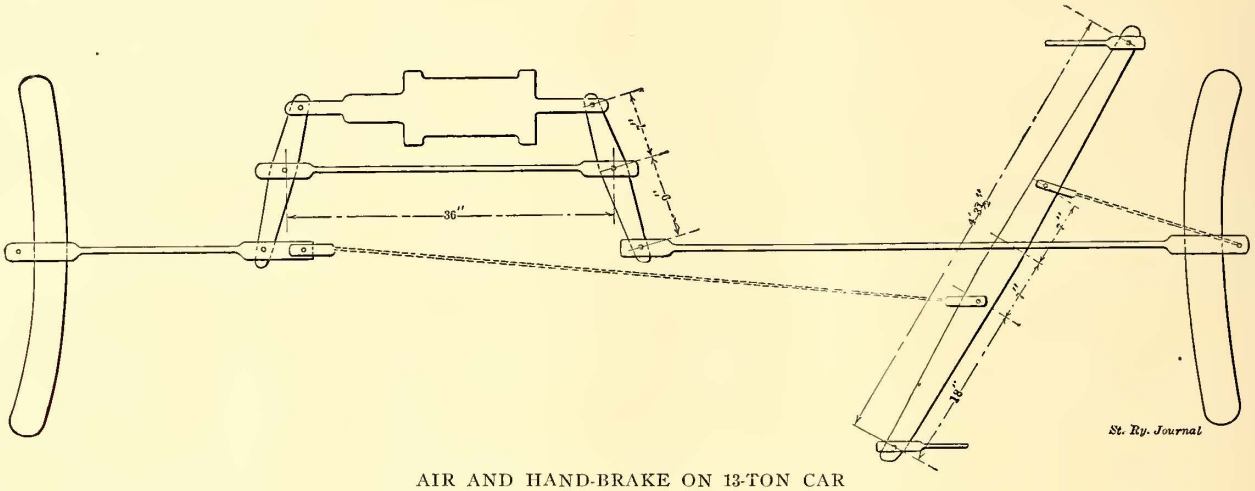
EQUALIZING BRAKE IN USE WITH BRILL M. T. TRUCK

have discarded one chain on this type of wind on these cars. The results of this plan have been very gratifying, and we have never known of an accident due to the breaking of the brake chain. This brake rigging is giving good satisfaction, but on account of the use of maximum traction trucks there are times, owing to weather conditions, when the brakes are set up, that the wheels of the rear truck will slide somewhat, not only causing numerous flat wheels but also rendering cars rather difficult to control. This is mostly eliminated, however, by an equalizing device, installed by a former employee, which is illustrated herewith and has proven very efficient. This device not only does away with flat wheels, but also facilitates the control of the car by the working of brakes simultaneously on both trucks at all times. We have several cars equipped with this equalizer, which have been in service over four years, and we have yet to find a flat wheel on any of them.

The cars equipped with electric brakes are 39 ft. over all,

weigh about 14 tons, and have a seating capacity of 40 persons. We have always found this type of brake reliable in stopping car, but it is the cause of more motor trouble than the same equipment operated with air brakes. It has also been found the source of many protests from the patrons of the road, due to the disagreeable jerking of the car when making an ordinary service stop. This trouble has been considerably lessened by changing from ribbon to gridiron rheostats, for by the use of these rheostats better results have been secured and only half the number is required. These cars are operated over several 4 per cent grades and the hand brakes are in use continuously in stopping and holding cars while operating thereover.

The city cars equipped with air brakes vary in weight from 13 tons to 25 tons, and range in length from 36 ft. to 45 ft., having a seating capacity of 30, 40 and 44 passengers. The hand brakes on these cars are attached to a gear drum with an eccentric wind at the brake staff by the use of single flat



AIR AND HAND-BRAKE ON 13-TON CAR

chain with 7-16-in. link. The rods running back to floating lever, which is independent of air brakes, are ¾ ins., straightened out at bends necessary to avoid motors, from ¾ ins. round to 1½ ins. x ½ in. flat; these rods connect at lever by ¾-in. key bolts. The 13-ton cars carry from 45 to 55 lbs. of air, and the 18-ton cars, which at times are operated with trailers, carry from 50 to 65 lbs. of air.

Our interurban high-speed cars are 44 ft. over all, weigh approximately 27 tons, and have a seating capacity of forty-eight persons. These cars are run at a speed of 50 miles per hour and make a great many stops. When some of the older type trucks were first put in service we experienced more or less trouble on account of the breaking of brake rods where they go through the brake beam, due to the pull not being in a direct line; and this was also found to be partly the cause of the shoes not wearing true on the wheels. It was found that trouble from this source could be eliminated altogether by removing the adjusting bolts on the release springs, running the springs through slots in the brake-head, upsetting the clip that fastens the brake rods to the brake beam and bolting same on the under side, giving the rod a straight pull and allowing the brake-shoes to bear true on the face of the wheels. The working of the hand brakes on these cars is practically the same as on the heavy city cars, but on account of being operated in three-car trains during the heavy travel, should there be necessity for additional braking, in case of air giving out, the motorman can, by a signal from his whistle, notify the conductor to set up hand brakes on all the rear cars. The air pressure on these cars cuts in at 55 lbs. and out at 70 lbs., being controlled by train line governor with balance wire connecting governor on all cars. During the three years that these cars have been in operation we have never experienced any difficulties other than that mentioned. Close inspection, of course, must be given to hose connections, key bolts in brake lever, and minor parts. On cars equipped with multiple control, the air hose couplings, owing to their high position on vestibule front to allow cars to curve, have considerable wear close to the elbow, and if not closely watched are liable to burst. The key bolts show more evidence of wear than any other part of the brake rigging, and often when the bolt is apparently in good condition it will be found, upon examination, to be almost sheared in three pieces.

Great benefit is derived from the practice of sparing no time or trouble in instructing motormen regarding the proper use of all brakes. By adherence to this method the life of equipment is materially lengthened, and the traveling public is afforded a smooth and pleasant ride.

There is a bad practice prevalent among new motormen—one in which they seem to delight—but which cannot be discouraged too quickly, of causing air brakes to exhaust constantly. While making an ordinary service stop these men will manipulate the air handle from the emergency position to the release, thus keeping the air compressor constantly in operation.

Another point which should be firmly impressed upon the minds of motormen is the manner of making an emergency stop by throwing the controller into the reverse position in the event of the operating brakes giving out. It has been found that motormen thoroughly familiar with their duties experience little trouble in retaining control of their car by either the air or hand brakes, or reverse lever, should one or the other fail to operate from any cause.

DIFFERENT SYSTEMS OF BRAKES *

BY H. S. WILLIAMS,
Assistant Electrical Engineer Utica & Mohawk Valley Railway Company

With the growth of electric traction, the question of brakes has become a matter of deep importance, and as the present development tends toward the equipment of electric cars with multiple-unit control which will allow them to be operated either singly or in trains of any length, this paper will be devoted almost exclusively to a description of the systems of air brakes adaptable to this class of service. The conditions to be met in train operation are varied, due to local requirements, and several different systems of air brakes have been

* Paper presented at the Albany meeting of the New York State Street Railway Association, Sept. 19, 1906.

developed to meet these conditions. The principal requirements are reliability and ease of operation, simplicity of parts, economy in the use of air, ability to make repeated application and release in rapid succession and still be in condition to meet an emergency. The brakes should respond quickly to the controlling mechanism and the release be graduated in such a manner as to make a smooth stop possible.

The first system to be considered is the operation of two-car trains, one car being equipped with motors and the other a trailer which is used only during hours of heavy traffic. To meet this condition a modification of the familiar straight air system is used. This modification consists in arranging the system so that in event of a break in the air pipes or similar accident the brakes will be applied automatically, and in an emergency a quicker setting of the brakes can be secured than would be possible by use of straight air alone. To accomplish this, a small triple valve and a second train line with the necessary hose couplings is added to each car. This triple valve operates only in case of emergency. The method of operation of this system is as follows: The main reservoir pressure is maintained in the slide valve chamber of the triple valve and its position is held in such a manner that it will not travel without a material difference between the pressure on one side and that on the other. The motorman's brake valve is so designed that under ordinary conditions application and release are made in the same manner as with plain straight air, and in service applications no reduction of pressure is made in the second train line. In an emergency, however, or with a rupture of the train line, the pressure is reduced sufficiently to operate the triple valve, thereby setting the brakes quickly by means of pressure in the second train line. A second advantage gained in the use of this system is preventing the motorman from wasting air by using the emergency for ordinary stops. In case of his doing so, it would require so long to get a release of the brakes that he would soon give up the practice.

Another phase of train operation is found in two-car trains having a motor car and trailer but differing from the operation just described in that the trailer is run continuously as part of the train. As there are but two cars, it is possible to use a type of automatic air which has the straight air release and a quick recharge feature in the triple valve which allows the application to be made in rapid succession without too great a decrease of pressure in the auxiliary reservoir. In this type of brake no graduation is made at the triple valve, but this is accomplished by piping the exhaust from the brake cylinder of the motor car to the brake valve. This brake valve differs from the ordinary type in having two distinct release positions, motor car release and trailer release. In making a stop, air is applied to the brake cylinders (as in any type of automatic brake) by a decrease of pressure in the train line. To effect a release the brake valve handle is moved to release position, which recharges the brake pipe and auxiliary reservoirs and sends the triples to release position, thereby discharging the brake cylinders on both cars, but as the exhaust from the motor car brake cylinder is piped back to the motorman's valve, pressure is retained in this cylinder. Now by moving the brake valve handle to its second release position this pressure is allowed to exhaust into the atmosphere and the release may be graduated as with straight air. With this system, in order to accomplish a smooth braking, the motor car must be given a relatively higher braking power than that given the trailer, so that when the brakes are applied any slack that may exist between the motor car and trailer will be taken up and the consequent easing up necessary to make a smooth stop will not cause any "chucking" between the cars.

The next system is one which is applicable to two or three-car trains consisting of either all motor cars or motor cars and trailers. This is a condition met in multiple-unit equipment. For such use an automatic system is essential. With it the graduation of application and release are made at the triple valve through the medium of a slide-valve graduating valve. To obtain prompt response of the brakes, feed-valve pressure rather than main reservoir pressure is maintained on top of the rotary valve, quick recharge triple valves are used and reservoirs of rather small volume employed. The maintaining of feed-valve pressure on top of the rotary valve also has the advantage of preventing an overcharge of the train line. While the triple valve used has the feature of allowing a quick recharge of the auxiliary reservoir, it is not strictly a quick-action triple. With this system the exhaust from the brake cylinder on the first car of the train can be piped to the brake valve as previously described and the feature of straight air release on the head car thus obtained. This point is desirable in case cars are to be operated in single units as well as in trains. For a train line, either one or two pipes can be employed. With a one-pipe system the compressors work entirely independent of one another and the labor is very evenly divided between them. If a mixed train of motor cars and trailers is used, a second or control pipe should be added to equalize the labor between the compressors and provide a source of air supply in case the compressor in the front car fails. With a single train line, a failure on the part of the compressor on the head car would force the motorman to go back to the next car having a pump in order to operate his brakes.

The next system to be taken up is the handling of trains composed of four or more cars. As the length of the train increases so does the necessity of a quick-acting triple, owing to the relatively slow flow of air through a long train line. A graduated release and quick recharge are also important items. This system is similar to that used on steam roads, but owing to the fact that the motor cars in the train are complete units in themselves, a smoother operating brake and a more flexible system may be obtained than is possible where the main reservoir and pump are located on the head car only. With this equipment, straight air release may be secured on the head car, if desired, in the same manner as previously described. A refinement has been recently added to this system called the "quick-service feature," which is an improvement on the quick-action triple. This is an arrangement of the triple valve ports in such a way as to combine brake pipe pressure with the auxiliary reservoir pressure and so accomplish a quicker changing of the brake cylinder and consequently quicker application of brakes. This method has heretofore been used only for the emergency application, but with its use in service application the time of serial action of the brakes throughout the train has been reduced about one-half. This permits a smoother handling of long trains. For reasons previously mentioned this system can be operated with a single train line or a double line consisting of brake pipe and control pipe.

Another condition, though one less frequently encountered in electric service, is in handling trains by one motor car or an electric locomotive. This is found in the handling of freight cars or non-motor passenger cars. Under such conditions the compressor, brake valves and main reservoir are on the motor car. On the trailer cars the only equipment needed is a single train line and the usual auxiliary reservoir, brake cylinder and quick-action triple, the brakes being operated in the customary automatic way, and the chief feature distinguishing this from the other systems being an

arrangement of a second motorman's valve whereby the brakes on the motor car may be operated together with the train brakes or independent of them.

The most recently developed system and the most interesting one from an electrical standpoint is known as the "Electro-pneumatic System." This is not essentially a braking system, but rather an improvement in the method of operation of air brake valves, and may be adapted to any of the braking systems described. It is not designed to do away with pneumatic operation of the brakes, but is a refinement supplementing this method of control. The apparatus needed to accomplish this is a number of electric contacts arranged on the motorman's brake valve, electrically operated application and release valves, switches for cutting out the current used in the operation of the magnets, a two-line electric circuit through the car with necessary sockets and flexible couplings to connect with other cars, and a rheostat of sufficient resistance to allow a flow of about one ampere of current to be used for the opening and closing of the electric valves. The electric portion of the brake valve is a series of electric contacts used in the pneumatic release position and does not interfere with the operation of the equipment by means of air. Thus, if the electrically-operated devices fail, the train can be handled by means of the automatic brakes and without interruption. In other words, the pneumatic side of this equipment is left intact and is in reserve for immediate use. The operation of this device in connection with automatic brakes is as follows: The electric contacts on the brake valve being operated in the pneumatic release position, as stated before, the triple valves are therefore in release position, the auxiliary reservoir charged, and the triple valve exhaust open to the atmosphere through the electric release valve. Upon making an application, the first point reached completes an electrical connection through the release magnet energizing it and thus closing the brake cylinder exhaust. The second movement of the handle closes another connection which operates the magnet on the application valve, opening this valve. This operation allows air to flow from the auxiliary reservoir through the triple valve exhaust into the brake cylinder. As long as the handle is held in this position air will flow into the brake cylinder. To stop this flow it is necessary to move the handle back slightly, breaking the circuit which holds the application valve open, thus closing it. This forms a lap or holding position. Moving the handle back to its original position allows the release valve to open, exhausting the air pressure from the brake cylinder. During all the movements of the electric operation, the brake valve is in the pneumatic release position. Consequently the recharge of the auxiliary reservoir goes on continually. So it will be seen that successive application and release may be made without depleting the auxiliary, and any desired fineness of graduation obtained. With this style of equipment no movement of the triple is necessary and the operation is practically that of straight air on each car. As the valves are operated by electricity, the time element, which is such a prominent factor in automatic air brakes, is done away with and the brakes on all the cars work simultaneously. This system is not only simple and efficient, but is very economical in regard to quantity of air used, owing to the fact that it is not necessary to partially exhaust and recharge a train line.

This type of equipment has been given a thorough service trial, and the results are such as to warrant its further adoption. In fact it would seem that the electro-pneumatic system is the best ever developed for electrical railway service where train operation is contemplated, and its extensive adoption for this class of service can be only a matter of time.

DIMENSIONS OF CAR BODIES FOR CITY SERVICE*

BY H. GERON,
Manager of the Cologne Tramways Company, in Liquidation

City car bodies must be designed not only with the purpose of providing for the comfort of passengers during transportation, but also for facilitating their rapid entrance and exit. In this respect city car design differs from both interurban and steam railroad car design, where the former factor is more important and the entrance and exit of passengers is less continuous. To secure this latter object it is not sufficient simply to have large platforms and large doors, the aisles should also be wide, especially near the doors. Who has not had the disagreeable experience, when boarding and leaving a car, especially in wet weather, of being obliged to push through a narrow aisle, crowding against the knees and squeezing past the umbrellas of seated passengers? When operated by horses the speed of street cars was so slow that the question of length of the stops did not constitute so important a factor in operation. Moreover, the cars were very much smaller and there were fewer people to crowd the entrances at stops.

The replies (108 in number) from members of the association to the questions submitted by the writer indicate that the width of the cars in most cases is set by the municipal authorities, but that the length, height and other dimensions are usually left to the company. The replies from the city roads proper show that the greatest width permitted varies from 2 to 2.2 meters (6 ft. 6¾ ins to 7 ft. 2½ ins), that in some cases a width of only 1.95 m (6 ft. 4¾ ins.) and even of 1.9 m (6 ft. 2¾ ins.) has been allowed, while in other cases, especially where the question of cross seats and other conditions were at stake, a width was authorized of 2.35 m (7 ft. 8½ ins.), and even of 2.40 m (7 ft. 10½ ins.). Practically all of the companies state that the maximum widths mentioned were imposed by the authorities on account of the narrow streets and to interfere as little as possible with the general traffic circulation in those streets.

The maximum widths usually permitted are 2 m, 2.1 m and 2.2 m. It might be remarked here that this difference of 10 cm to 20 cm. (4 ins. to 8 ins.) between these dimensions has very little effect upon increasing or diminishing the vehicular capacity of the street, but is of the greatest importance so far as car design is concerned. These narrow widths explain the general arrangement in city cars of longitudinal seats, while later tramway companies, which have secured the right to employ a wider car, have installed cross seats. The replies also indicate that the companies generally prefer cross seats if they are permitted by the width of the car, and that such seats are more popular with the public, especially for long rides.

The aisle has generally a width of 800 mm (31½ ins.) in case of longitudinal seats and 500 mm. (19¾ ins.) in the case of cross seats. In practice this width varies between 800 mm and 1 m (31½ ins. to 39¼ ins.) for the longitudinal, and between 450 mm and 600 mm (17¾ ins. to 23½ ins.) for the cross-seated cars. In this connection some interesting information contained in the replies will be quoted.

The exterior width of the cars of the Grosse Berliner Strassenbahn is 2 m (6 ft. 6¾ ins.) except for open cars with running board, where the extreme width is 2.2 m (7 ft. 2½ ins.), and for cross-seated convertible cars, where the width is 2.15 m (7 ft. 1½ ins.). The aisle varies between 800 mm and 830 mm (31½ ins. and 32½ ins.) for longitudinal seated cars and between 500 mm and 520 mm (19¾ ins. and

* Paper presented at the Milan meeting of the International Street and Interurban Railway Association, Sept. 17-22, 1906.

20½ ins.) for cross-seated cars. Wider dimensions could not be secured without increasing the space between the tracks, as otherwise the cars would hit on curves. In Brussels the maximum width permitted is 2.2 mm (7 ft. 2½ ins.), including the running board on the open cars. The width of aisle with cross seats is 450 mm (17¾ ins.). The longitudinal-seated cars are 2.05 m (6 ft. 8½ ins.) wide and have an aisle 785 mm (31 ins.). In Cologne the width is 2.10 m (7 ft, ½ in.), with an aisle 840 mm (33 ins.) and 510 mm (20 ins.), according as the cars have longitudinal or cross seats. Other widths are: Riga, 2.10 m (6 ft. 10½ ins.); Dresden, 2.15 m (7 ft. ½ in.); Amsterdam, 2.08 m (6 ft. 9½ ins.); Frankfort, 2.06 m (6 ft. 9 ins.); Antwerp, 2.20 m (7 ft. 2½ ins. While most of the companies would like to have a wider car they are not able to do so on account of the narrow distance between the tracks.

In conclusion the writer recommends that in the case of new lines every effort be made to secure widths of at least 2.10 m (6 ft. 10½ ins.), and that streets which do not permit this width be avoided except in case of absolute necessity. Where the width of the car is absolutely obliged to be limited to 2 m (6 ft. 6¾ ins.), every effort should be made to utilize to its fullest extent the available interior width of the car, by cutting down outside and inside projections such as steps on the outside, moldings, etc.

POWER-GAS PRODUCERS IN STREET AND INTERURBAN RAILWAY WORK*

BY E. A. ZIFFER,
President of the Bukowina Railway Company

Gas producers can be divided into three classes, viz: pressure producers, or those in which a gas mixture is pumped into the producer by an injector or centrifugal blower; suction producers, or those in which the motor sucks the gas from the producer and then, due to the pressure, new mixture is drawn into the producer; and combined pressure and suction producers.

The suction gas producer does not require a steam boiler, a gas regulator nor a gas meter; it takes up less space than the pressure type, it runs without noise, it cannot explode, and is absolutely odorless. For the above reasons the author considers it alone in his report.

Questions addressed to the members of the association were answered by forty-three companies; twenty-one did not use power gas with the suction producer; the remaining twenty-two answered by sending descriptive booklets of their plants.

The composition of standard power gas is given as follows:

	Volumes
Carbon dioxide CO_2	5 to 7
Carbon monoxide CO	20 to 26
Hydrogen H	17 to 20
Nitrogen N	47 to 53
Hydro carbons C^mH^n	1 to 3

One kilogram of combustible, according to its quality, should produce from 4.5 to 5 cubic meters of gas having a heating value of from 1100 to 1350 calories per cubic meter. This amount of gas will require from 1 to 2 kilograms of steam.

The efficiency of the combustible is given as about 80 per cent; the thermal efficiency, according to Dowson, is given as about 30 per cent, and the efficiency of the producer is given as 90 per cent; the corresponding efficiencies for the steam boiler are only 15 and 70 per cent.

A table comparing the annual operating expense of different kinds of power is given, as follows:

	25 hp-year $	25 hp-year %	100 hp-year $	100 hp-year %
Electric motor: power 2 cents per kw-hour; efficiency 98 per cent; interest and depreciation 7.5 per cent.	1,050	100	4,170	100
High speed engine: 2.25 kg coal per hp-hour; coal $3 per ton; 18 liters per hp-hour at 5 cents per 1000 liters; wages $4.80 per week; interest and depreciation 10 per cent..	868	82.7	2,490	59.6
Gas motor: 0.46 cu. m illuminating gas per hp-hour at $1.86 per cu. m; interest and depreciation.....	694	66.1	2,320	55.6
Gas motor (Dowson gas): 0.45 kg coal per hp-hour at 4 cents per cu. m; wages $1.26 per week; interest and depreciation 10 per cent.....	347	33.1	1,194	28.6

The advantages of power gas installations are: low fuel consumption, simplicity of operation, complete utilization of the fuel, high calorific power, production of power at a cost of less than 40 per cent of that produced by the best steam engines.

At the end of his report the author mentions the Diesel motor, and gives the following advantages: requires no gas producer; burns cheap liquid fuel, such as crude naphtha, petroleum residue, crude alcohol; is always ready to start; requires no fuel when not in use; is perfectly safe; is easily attended; is durable, noiseless, odorless; has no sparking apparatus; is automatic and very economical (0.48 cents per hp-hour).

In an appendix is given a bibliography and a list of the electric railway companies which are operating their power houses with power gas.

* Abstract of paper presented at the Milan meeting of the International Street and Interurban Railway Association, Sept. 17-22, 1906.

MAXIMUM SPEEDS ON CITY AND INTERURBAN RAILWAYS*

BY E. KRASA,
General Inspector of the Bukowina Railway Company

Sixty-one interurban railways, operated mostly by steam, replied to the inquiries addressed them. Of these, thirty-seven with a combined length of 2800 km (1750 miles), had a standard gage, and twenty-four with a combined length of 3709 km (2318 miles) had narrow gage. Many of these interurban lines are used largely for light freight. The speeds are usually fixed by the Government. Thus, in Italy no interurban road can run cars at a higher speed than 30 km (19 miles) per hour, unless all the cars are braked. The Swiss law is the same, except that the maximum speed permitted is 40 km (25 miles) per hour. In most of the other countries the limit is 30 km.

Fifty-nine tramways with a total length of 2181 km (1363 miles) replied to the inquiry. Of these, twenty-seven with a length of 1391 km (870 miles), had standard gage, and thirty-two with a length of 790 km (490 miles) had narrow gage.

The conclusions of the author for interurban speeds are:

1. On a right of way 30 km to 40 km (19 to 25 miles) per hour, increased under favorable conditions to 50 km (32 miles) per hour.

2. In open country 30 km to 35 km (19 to 22 miles) per hour.

3. On fairly open highways 15 km to 20 km (8 to 12½ miles) per hour.

4. In congested streets 10 km to 15 km (6¼ to 8 miles) per hour.

For tramways the writer recommends as maximum speeds:

* Abstract of paper presented at the Milan meeting of the International Street and Interurban Railway Association, Sept. 17-22, 1906.

1. On right of way 30 km to 40 km (19 to 25 miles) per hour.

2. In open country 25 km to 30 km (15½ to 19 miles) per hour.

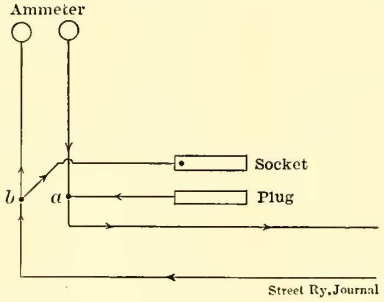
3. On fairly open highways 15 km to 20 km (8 to 12½ miles) per hour.

4. In congested streets 10 km to 20 km (6¼ to 12½ miles) per hour.

PRACTICAL SHUNTING KINK

BY HENRY SCHLEGEL

Having occasion to run watt-hour absorption tests on a 200-hp railway motor equipment, with voltmeter and ammeter, and the largest capacity of ammeter available being a 400 amp. Weston instrument, it was necessary to temporarily increase the current indicating capacity by means of an improvised shunt. The resistance of the meter was only .00063 ohm, so that the cross-section of conductor required to by-path the meter alone would have been unwieldy and the adjustment impracticable with the facilities at hand. The successful plan adopted was as follows: Two pieces of No. 4 B. & S. flexible cable, each 4 ft. long, were tapped at their middle points as indicated in the diagram. Both ends of the tapped cables were trimmed and tinned; one end of each cable was connected to the ammeter. To the free end of the *a* cable was soldered 8 ins. of ¾-in. brass rod, which was to serve as a plug; to the free end of the *b* cable, was soldered 8 ins. of ¾-in. seamless brass tubing to serve as a socket.



ARRANGEMENT OF SHUNT TO ADD TO AMMETER RANGE

The plug and socket telescoped each other snugly, but both were thoroughly cleaned and tinned to insure a perfect contact at the sliding joint. The resulting fit was so good as to require a small hole to be drilled in the tube before the plug could be inserted against the resulting air cushion. As the 4 ft. of cable leading to the meter was just electrically balanced by the 4 ft. of cable in the shunt, the duty of the sliding joint in the shunt was to admit an adjustment that would just balance the meter resistance and to serve as a switch for opening and closing the shunt circuit to note its effect on the ammeter reading.

The adjustment was tedious, as it was made on a railway circuit of very changeable voltage; it was effected as follows: The plug was run into the socket as far as it would go; the current through shunt and meter was then regulated until the meter reading was approximately 150 amps. on withdrawing the plug, the meter reading increased to approximately 300 amps. The final adjustment consisted in so proportioning the amount of engagement between the plug and socket, that withdrawing the plug would double the meter reading and inserting the plug would halve the reading; this condition secured, the indicating capacity of the instrument would be doubled and the total current flowing at any time would be twice the meter reading. After considerable trial and patience, three readings were obtained—one on withdrawing, one on reinserting, and the third on again withdrawing the plug from the socket—this set of three readings being taken to insure that the current did not change in value during the final adjustment. A higher reading ammeter, two ammeters in parallel or a wattmeter would have saved much trouble, but none of these was available within the time limit prescribed.

The adjustment was checked with a high-reading meter after the test had been run and found to be sufficiently close for the purpose in hand. It was not absolutely necessary that the multiplying power of the shunt should be a whole number 2, but by taking a little more trouble to have the multiplier a whole number, much calculation labor was saved in the subsequent handling of the 1200 current readings taken. It may be remarked that two ammeters in parallel will not indicate current equal to the sum of their capacities unless the resistances of the meters have the inverse ratio of their capacities; of course they can be made to share current in any desired ratio by manipulation of their binding posts, but with heavy currents flowing more than a short while, this is not recommended.

THE REMOVAL OF CAR WHEELS

BY JAMES ANDREWS

In considering the subject of the accidental diseases of car wheels, it is essential that the causes for the removal of these parts should be watched with the utmost care else defects due to bad adjustment or operation may be hidden beneath the data of otherwise good results. For example, there may be a chronic condition of defect on a certain line of cars that is productive of sharp flanges or flat spots, yet the average mileage made by all the wheels in use may be high enough to satisfy the management. It should be borne in mind, then, that these things do not happen without due cause, and that a painstaking investigation will eventually get at the root of the matter and the remedy will be suggested.

An illustration of this is afforded by the experience of a large road that was afflicted with flat wheels to an alarming extent. In fact, a car without a flat wheel was an exception to the rule. Casual inspection detected nothing out of the way, but an investigation developed the fact that the foreman of each house was a law unto himself in the matter of brake leverages, and when the cars were delivered from the main shops the first complaint of a motorman as to bad braking qualities caused a change to be made that would render the skidding of the wheels not only very easy to accomplish but very difficult to avoid. The standardization of the brake rigging and the issuing of order prohibiting any changes in it at the car house put an effectual stop to the production of flat wheels; and, while under the former conditions the shops were crowded with the removal and grinding of slid-flat wheels, months now frequently pass without a single one being reported.

An examination of the records of this same road shows that, for cast-iron wheels, there are practically but two causes for removals: worn out and chipped flanges. This latter is so common on all roads and has been so frequently alluded to in these columns that the reader will at once attribute the difficulty to the true cause, the riding of the cars on the flanges at the special work. Here the road department is profiting at the expense of the equipment, but it is quite evident that the stockholders are not profiting to the same extent, for, from the same pocket into which the special work savings are placed must be paid the extra cost of chipped flanges. Now, whether there is a saving left after these payments have been made is an exceedingly difficult question

to answer, and can only be settled after a long investigation; for chipped flanges are produced by other causes than riding over special work, and there is no known means of ascertaining how it is caused from an examination of the wheel.

Possibly a solution of the trouble might be found by cutting the Gordian knot instead of attempting to untie it, and so using steel wheels that do not chip in the flange even though they are called upon to carry the whole weight of the car and be subjected to the inevitable blows at special work crossings.

From what has been said it would appear that on one road, at least, wheel troubles have been reduced to exceedingly narrow limits when removals are made solely because the wheels are either worn out or have chipped flanges. The first is inevitable and must come in time to the very best of wheels, and the veriest tyro can diagnose the cause for the latter.

If, then, a large road operating thousands of cars over hundreds of miles of track, with all sorts and conditions of rails, crossings and switches, can reduce wheel removals to this point, it does seem that other roads of the same or smaller proportions could go and do likewise.

If we turn to the records of the steel wheel removals, we find another set of conditions prevailing. The chipped flange has given way to the sharp flange. This is a more insidious trouble and proportionately more difficult to analyze because it may be the result of a number of causes. In fact, it may even happen that a flange runs sharp on one wheel when the cause is not in itself or its mate but in the other pair in the same truck.

A sharp flange is really about the most expensive thing that can happen to a steel wheel because it is the direct cause of a loss of metal out of all proportion to the mileage and the normal wear.

A wheel may be quite true on the tread and evenly matched with its mate and yet need to be turned smaller by from ⅜ in. to ¾ in. in diameter, in order to build up the standard flange again. This is a waste pure and simple and emphasizes the desirability of closely inspecting wheels for sharp flanges and not allowing them to run too long, as the amount of metal to be removed increases with the degree of sharpness that has been attained. In the case of fifteen wheels recently examined at random that had been turned for sharp flanges, the loss of metal due to turning averaged 0.85 in. per wheel in diameter, while that due to wear was 0.93 in. This 0.93 in. of wear represented an estimated average mileage of 37,396 made in an average of 207 days each. Assuming the rate of wear for the turned-off metal to be equal to that actually worn, the normal life of the wheel is divided almost in half, and if the thickness of the tire is such that 3½ ins. of diameter can be removed before scrapping, such a wheel, by a repetition of the sharp flange, it would have its life cut down to 73,670 miles made in 408 running days instead of 140,500 miles made in 779 days as might reasonably be expected. To this loss of material and service must be added the cost of wheel removals and turning and that of the car earnings while idle, so that, upon the whole, it is easy to realize that sharp flanges on steel wheels are an expensive luxury.

It may be said that, in any discussion, by a careful selection of the items given in the statistics available, almost any point in a controversy can be proven. So, in the case of wheel removals, it may readily be made to appear that the cast-iron wheel of to-day is a very inferior article to that of a dozen years ago. It may be true that a longer life and a greater mileage was obtained then than now, but it is well known that the requirements of the service are more severe now. It may be that a better wheel than is now being furnished can be made at a higher price, and it is patent to all that cost is increased by the use of an inferior wheel. At the same time we are gaining in knowledge all of the time and are better prepared to care for the wheels that are used and get the highest possible mileage out of them.

As an example of this improvement in running conditions, though the comparison is admissedly not exactly fair, though to which road it is unfair it would be difficult to say, take the table of the causes of a few wheel removals published in the STREET RAILWAY JOURNAL for May and August, 1895. In one case 28 per cent of all wheels removed were for sharp flanges, and in another 6 per cent slid flats were 10 and 46 per cent, respectively. Chipped and broken flanges were 6.8 and 26 per cent, while the worn out were but 6.8 and 3 per cent respectively.

Now, if on a given type of car and truck the wheels removed can be classified as worn out or chipped flange and that the two stand in the relationship of 63.33 per cent of the former and 36.67 per cent for the latter, as has been done, it certainly looks as though somebody had learned a trick or two in the matter of wheel preservation that would be worth the while of the rest of the community to look into.

A point that must be borne in mind in this connection is that to study the conditions of one road and apply the remedies effective there on another may be of no avail. In one case, for example, flat wheels may be due to excessive brake pressures, while on another it may be due to a lavish use of sand, or an improperly hung brake beam. So, while suggestions from our neighbors are always in order, each must be a law and an investigating committee unto himself.

To show how far-reaching this individuality extends, take a month's record of cast wheel removals on maximum traction tracks. There were 379 removals of the large wheels and 209 of the small. Of these, 139 large wheels were removed for chipped flanges and 97 of the small. In this it appears that, though the speed of rotation of the small wheel was 1.65 times as fast as that of the large one, the wear was only about 0.46 as much, as evidenced by the comparative number of worn-out wheels removed, which was 240 of the large and 112 of the small. This is probably due to the fact that the weight on the small wheel was but 0.47 per cent of the weight on the large one. There is a remarkable coincidence in these figures which may be nothing more than a coincidence as far as available data is concerned, but it does seem to show that there is something in the stresses to which the wheels are subjected that has a direct and immediate effect upon their life, though the slipping of the large wheel under the influence of the motor is undoubtedly an important factor in this relative difference of wear.

The same statement regarding the effects of weight holds in the matter of chipped flanges. Those of the small wheels were but 70 per cent as many as those of the large. The difference here must have been due to the difference in the weights carried and the force of the blow delivered, for the motor is rarely working when the wheels strike the crossings of special work and the conditions of operation of the large and small wheels was practically the same. It is hardly to be expected that that Utopian condition will ever be reached when 100 per cent of all wheels removed will be because they have been worn out in legitimate service and have received no unfair treatment; but it is safe to say that a much nearer approach to this can be attained on the majority of roads than they now enjoy if they will but institute an investigation as to the real causes of their present wheel troubles. It may, perhaps, be added as a profitable suggestion that the investigation should be made by a disinterested party

and one who will not feel that it devolves upon him to put the responsibility upon the track, trucks, wheels or cars according to the personal interests of himself or his friends. That this is too often done is a lamentable fact, and only serves to establish the truth of the old statement that anything can be proven by statistics.

NEW CARS FOR INTERURBAN TRAVEL OUT OF PITTSBURG

One of the most interesting of the many interurban lines running out of Pittsburg is the Pittsburg, McKeesport & Greensburg Railway, the scenic line between Trafford City, Irwin, Jeannette, Greensburg, Mount Pleasant, Scottdale, Connellsville and Uniontown. All cars connect at Trafford City with the Pittsburg Railways for points in greater Pittsburg and surrounding towns, and all points south on the West Penn system. All the towns mentioned, as well as many others along the route, have seen an almost unprecedented growth since this territory was electrified. A large portion of the traffic handled consists of employees of the various coke companies whose ovens are thickly scattered throughout the entire distance, and at night the illuminations from these ovens with their snake-like formation present an exceedingly grotesque and novel appearance. The scenic features met with are extensively advertised by the company, the mountains forming a very pleasing background to the landscape. The grades encountered in this mountainous region are exceedingly heavy and the system of braking employed on the cars is very complete. The gage of the track is 5 ft. 2 ins. and is composed of girder rails of 75 to 95 lbs., and 70-lb. T-rails laid on oak and chestnut ties with 24-in. centers. Many railways claim for the pleasure parks they own scenic beauties and attractions surpassing those of any other, but in advertising Oakford Park, midway between Greensburg and Jeannette, as the most popular pleasure park between Harrisburg and Pittsburg, the management is well justified. The park is also one of the largest, and it is the sense of freedom and invigoration which fairly breathes in the photographs accompanying this article which has made Oakford Park the healthful and natural playground that it is. The receipts of the company average about $875 per day and the business is conducted on about 40 per cent of gross; last year the net surplus which showed over operating expense and interest charge, amounted to $32,250, and this year the net surplus

CHILDREN'S PLAYGROUND IN OAKFORD PARK

ONE OF THE BIG PITTSBURG, McKEESPORT & GREENSBURG CARS ENTERING OAKFORD PARK

A LINE OF CARS ENTERING OAKFORD PARK

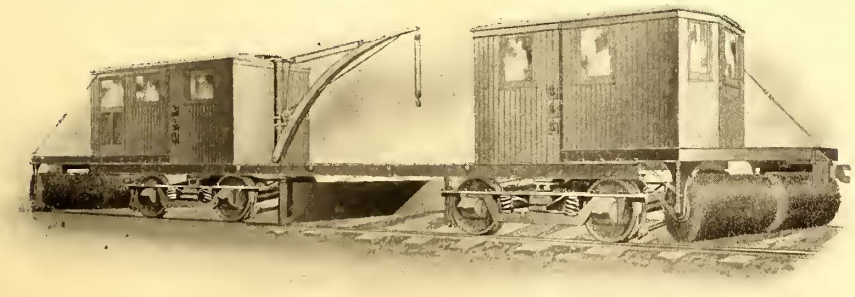
over operating expenses and interest will approximate $75,000.

The car shown in the illustration as just leaving the park is one of five cars which have lately been put on the lines; they were built by the G. C. Kuhlman Car Company, of Cleveland. It measures 44 ft. 4 ins. over the vestibule sheathing, the length over end panels being 33 ft. 4 ins.; width over the sills, including the plates, is 8 ft. 7½ ins. and over the posts at the belt 8 ft. 9 ins.; height from the floor to the ceiling 8 ft. 4⅜ ins. and from the track to the under side of the sills 2 ft. 9⅛ ins.; height from the under side of the sills over the trolley board 9 ft. 3½ ins. and from the track to the platform step 1 ft. 4½ ins.; size of the side sills 4 ins. x 7¾ ins.; the end sills measure 5¼ ins. x 6⅞ ins. The bright interiors, large windows, wide seats and commodious aisles are the result of using a car having the grooveless post semi-convertible feature. A heater is placed at one end of the car and the continuous basket racks fitted with coat hangers are comforts not always provided by railway managements. The trucks are of the M. C. B. type, No. 23-A, built by the American Car Company; the wheel base is 6 ft. Four motors of 55-hp capacity each were installed to enable the cars to overcome the severe grades and maintain the very fast schedule provided.

A COMBINATION SNOW-SWEEPER, DERRICK AND WORK CAR

The accompanying illustration shows the latest type of combination double-truck, steel-frame snow-sweeper, derrick, work car and locomotive which has just been put on the market by the McGuire-Cummings Manufacturing Company, of Chicago. This car combines a number of advantages that will be most appreciated by managers of city and interurban lines.

The trucks are of the M-C-B locomotive type, with 33-in. wheels, 4¼-in. journals, and are built to carry motors of the heaviest type. The main steel frame is built of angles and channels, thoroughly braced and riveted in the most approved manner, so as to prevent buckling of the frames. The broom extension arms, which carry all the cleaning apparatus, are constructed of 8-in. channels, and are thoroughly braced, the outer end being supported by a truss, as shown in cut. These broom frames can be removed from the car by releasing a few bolts, thus leaving the main car ready for work on construction purposes during the summer months. Two cabs—one at each end of the car—hold the



COMBINED WORK CAR AND SNOW-PLOW

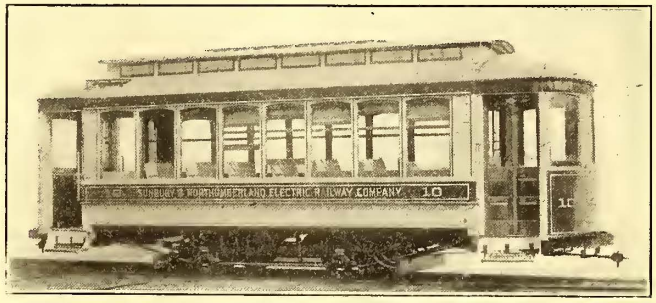
broom driving motors, also the rope drums, etc., for operating the derrick.

The derrick is of 5 tons capacity, with a 12-ft. boom, and will operate through an arc of 180 degs. The derrick is so arranged that it can be operated either by hand or by electric power. Large wrought steel hoops are placed on each side of both cabs for the carrying of poles, rails and other material. Stake pockets are provided between the two cabs, so that sideboards can be used for carrying ballast, etc.

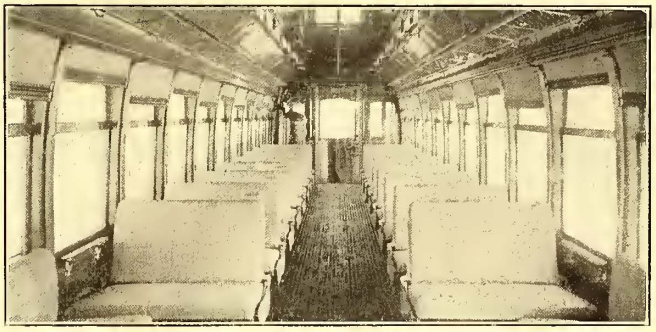
The great advantage in a car of this class is that the operating manager has no idle capital tied up during the summer season, such as is at present represented by the purchase of sweepers with fixed brooms, and therefore this car will prove to be one of the best investments that an operating manager can make for his line. The builder of this machine has already booked a number of orders for same. A machine of this class, for the West Pennsylvania Company, will be on exhibit at the Columbus Convention in October.

NEW CARS FOR THE SUNBURY & NORTHUMBERLAND ELECTRIC RAILWAY

That a short line if properly managed can show excellent returns in comparison to roads of much greater length is exemplified in the Sunbury & Northumberland Electric Railway, which has just added to its lines a number of semi-convertible grooveless post cars to take care of increasing travel. The termini at Market Square in Sunbury and Sixth Street in Northumberland are only 3 miles apart, but between these points traffic at times is exceedingly heavy, and during the month of July of this year 100,000 passengers were carried, an excellent showing in view of the length of the line and the number of cars operated, the latter numbering eleven.



SINGLE-TRUCK CAR FOR THE SUNBURY & NORTHUMBERLAND ELECTRIC RAILWAY



INTERIOR OF SUNBURY & NORTHUMBERLAND CAR, SHOWING SEATING ARRANGEMENT

Island Park, which lies midway between the termini and situated on Packer's Island, is the destination of a majority of the passengers, and the coming season the company expects to make substantial improvements to this resort and will erect a larger theater, build a scenic railway and create other amuse-

ments likely to make Island Park more popular than ever. The lines in Sunbury are now being extended to Bainbridge, one mile distant, Bainbridge being only 3 miles from York Haven, and good returns are looked for when this hitherto unemployed territory is electrified. In the spring it is the company's intention to add 2 more miles to the circuit in Sunbury. Four different roads are expected to make connection with Sunbury within the next two years, and everything points to the town becoming an important street railway center in the very near future.

A car mounted on a single truck and containing the Brill semi-convertible feature makes an exceedingly neat and attractive conveyance, and the general manager of the road, C. J. Callahan, is very well satisfied with the results already obtained from this type, which is new with this railway. The No. 21-E truck on which these cars are mounted has the advantage of carrying the car body 2 ins. lower than any other single truck; the wheel base is 7 ft. 6 ins. and the cars have 40-hp motors. The length over the end panels is 21 ft. 4 ins., and over the vestibules 30 ft. 4 ins.; width over the sills, 7 ft. 10½ ins., and over the posts at the belt, 8 ft. 2 ins.; height from the rail over the trolley board, 11 ft. 9¼ ins.; size of the side sills, 5 ins. x 8 ins.; end sills measure 4½ ins. x 8 ins.; length of the seats, 36 ins.; width of the aisle, 22 ins. Sand boxes, alarm and signal bells, angle-iron bumpers and radial draw-bars are all of the car builder's manufacture, as well as the system of vestibule door control.

VITRIFIED BRICK FOR PAVING

As in other engineering matters, the proper selection of a paving material hinges on many other factors besides that of first cost. The day of the cobblestone is past despite its cheapness, but among the purveyors and users of modern paving materials it is still a matter of dispute as to which of them is the best from the additional standpoints of maintenance, cleanliness and noiselessness. The opponents of asphalt point out its special unsuitability for streets with heavy traffic, owing to the apparent ease with which holes are formed in it (wheel marks being plainly visible when asphalt has softened under heat), with the attendant annoyance and expense of frequent repairs. Granite blocks are too noisy and not as close fitting as up-to-date communities demand, so that the choice would appear to lie between treated wood blocks and vitrified bricks. The characteristics of the former have already been referred to in this journal, so that only those of the latter need be mentioned here.

A type of vitrified brick embodying many good points is that made by the Mack Manufacturing Company, of Philadelphia. It is made of a clay composed of 71.73 per cent silica, 20.43 per cent alumina, 0.67 per cent oxide of iron, 0.46 per cent calcium sulfate, 0.87 per cent alkalies and undetermined, and 5.84 per cent water of hydration. This composition was declared by an eminent chemist to be the best for the manufacture of paving bricks and sewer pipe. The bricks are burned at a very high heat, which causes the iron, lime, magnesia and potash to combine chemically with the silica and alumina, forming a tough vitrified brick impervious to chemical changes in service.

A point that must appeal with special force to street railways is the facility with which pavement of this brick can be taken up and replaced whenever the track must be disturbed for repairs or bonding. Good brick paving once laid requires little attention, and such repairs as may be needed can be carried out without the use of road rollers and street furnaces.

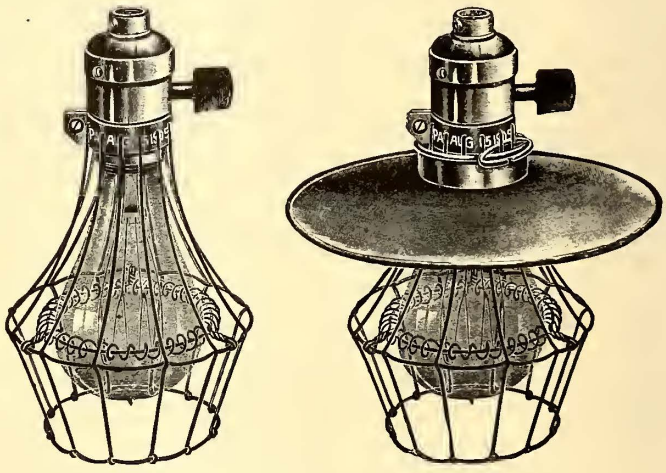
Combining toughness with vitrifaction, this brick is able to withstand with no perceptible wear the striking of horses' shoes and the impact of rolling loads. The irregularities of the surface in granite blocks causes great wear by a loaded wheel rising and falling in its passage over it. As vitrified brick forms a regular surface, this condition is absent, and in ability to stand heavy traffic this brick is second only to granite.

Owing to its great density, this brick does not absorb outside liquid impurities or retain any on its smooth surface. Slipperiness is also absent from this material, as the many joints in a brick pavement afford an excellent foothold for horses. Dust is a particularly unpleasant thing for the equipment under a car, but it may be reduced to the minimum by using this brick, which is too hard to disintegrate into powder and too smooth to retain large amounts of street litter. Noiselessness is another feature demanded of modern paving material. This also is satisfied by vitrified brick, which reduces the noise from traffic as effectually as asphalt.

AN EFFECTIVE LAMP GUARD

The illustrations shown herewith give a good idea of the construction and advantages of the Hold Fast Lamp Guard, made by the Hold Fast Lamp Guard Company, of St. Louis. The scientific manner in which this device is constructed, the absolute protection it gives to the lamp against breakage, and the fact that it never allows the lamp to come any closer than one inch to inflammable objects, should give it a wide sale wherever a good lamp guard is needed.

Fig. 1 shows the guard on a socket with the lamp inside. The large air space secured, which prevents any chance of



FIGS. 1 AND 2.—TWO TYPES OF GUARDED LAMPS

fire, has been endorsed by many fire insurance men who have seen this guard. For bench work it has two special advantages. It will stand on end like an oil lamp, and the downward rays of light are not obstructed. Another great advantage is that it acts as a shade holder, as shown in Fig. 2. Any standard size shade will fit over it. This is a great convenience and saving. The opening at the bottom permits its removal or replacing with ease.

The center spreading ring meets with all the impact upon the guard. Its rigid construction and outward extension form a positive point for impact that prevents any distortion or dislocation of any part of the guard when subject to severe usage. The spiral cushion counteracts the effect of any jar or vibration of the lamp caused by impact upon the guard, and assures safety to the lamp under all circumstances.

The manufacturers of this guard have a test that they recommend for trying its efficiency and which they claim no

other guard will stand. It consists of rigging up a drop-cord, 6 ft. to 10 ft. long and about 2 ft. or 3 ft. from a solid wall (brick or stone preferred). Attach the guard to the socket, put in the lamp and dash the guard and lamp against the wall with force. Despite this test the lamp will remain intact.

HIGH-GRADE INSULATION FOR DELTABESTON COILS

Although Deltabeston magnet wire is used by a great many manufacturers of armature and field coils, their finished product is by no means uniform. Aside from the degree of care in making up the coils, the greatest variations in service are due to the different kinds of covering, and insulating materials used. For example, some are tempted on the score of cheapness to use the poorer cotton or linen coverings which are incapable of standing high temperatures without charring, instead of employing the more expensive but far superior asbestos tapes.

When the F. P. Harrison Electric & Manufacturing Company, of New York, built a special plant to undertake the manufacture of Deltabeston armature and field coils, it felt that the severe conditions of railway service demanded nothing but the best. In line with this idea, the company covers all of its coils with a high-grade insulation capable of withstanding temperatures as high as 550 deg. F. In fact, coils covered with this insulation can be put in a blow-torch flame with impunity. The methods specified by the D. & W. Fuse Company, the manufacturers of Deltabeston wire, are followed so faithfully that the guarantees of the said company will be applied to all work of this character done by the Harrison Company.

After the coils have been wound and taped, they are placed in a specially built oven where they are thoroughly dried out by being subjected to a temperature of 450 deg. F. The coils are then taken out, dipped in a special insulating compound and placed in another oven and baked to 360 deg. F. They are redried and rebaked several times after being impregnated with a secret composition to fill up all possible air gaps. After the fifth immersion in this special insulating compound, copper water shields are then put on the terminals of the field coils and micanite placed over them. The coils are again baked in another special compound for the sixth and last time, after which they are water-proofed and thus completed for service. All the coils manufactured by this company are guaranteed for one year from damage by heat or moisture. Every coil manufactured is tested and thoroughly inspected before being shipped to the consumer.

A. E. Meixwell, vice-president and general manager of the company, who has had an experience ranging from the railway pit to the higher office of manager of several railways, gives his personal attention to the output of Deltabeston products. In addition to making new coils, the company does all kinds of repair work and is also sales agent for Kalamazoo wheels, railway specialties and Electros insulation. It does a general railway supply business, and carries almost everything that is used by an electric railway. The company announces that it will have a complete exhibit at Columbus.

ATLANTIC CITY & SHORE RAILROAD COMPANY

The Atlantic City & Shore Railroad Company is a new road which has been put in operation at Atlantic City, N. J.

The company owns the Central Passenger Railway in Atlantic City, which operates a short loop in Atlantic City between South Carolina Avenue, Virginia Avenue and the Boardwalk. This line operates in the summer five single-truck double motor cars with power supplied by the West Jersey & Seashore Company.

The Atlantic City & Shore Railroad has a steam-road franchise, and extends from a junction with the Central Passenger Railway at Adriatic and Virginia Avenues, on a private right of way through the northwestern section of Atlantic City, crosses the tracks of the Pennsylvania and the Reading Railroads, then extends via the West Jersey & Seashore third-rail Newfield Branch as far as Pleasantville. From Pleasantville to Somers Point the company operates by lease over the old Somers Point Branch. A line is also building across Great Egg Harbor to Ocean City. From the junction at Adriatic and Virginia avenues to the drawbridge, overhead center-pole suspension is used. From the drawbridge to Pleasantville third rail, and from Pleasantville to Somers Point overhead catenary suspension is used.

The equipment consists on the Shore Line of twenty 36-ft vestibule Brill semi-convertible cars, Brill trucks, M. C. B. wheels; four GE-87 60-hp motors under each car, G. E. multiple-unit system, using trolley and third-rail shoe. The line was opened up to Somers Point on Aug. 25, 1906. The run from Boardwalk and Virginia Avenue to Somers Point, including stops, is being made in thirty-five minutes. A large amusement park is contemplated at Somers Point. The company has its own sub-station at Somers Point, but gets current from the West Jersey & Seashore power station at Westville, N. J. The president of the road is W. A. Stern, of the firm of Stern & Silverman. The other officers are Chas. Evans, vice-president; A. H. Melton, secretary; M. J. Greenbaum, treasurer; S. S. Neff, Atlantic City, superintendent.

OPERATING STATISTICS FOR ROADS IN NEW YORK STATE

For several years H. M. Beardsley, secretary and treasurer of the Elmira Water, Light & Railroad Company, has compiled for the Street Railway Association of the State of New York a set of tables showing the detailed expenses and receipts per car-mile for the different members in the association with the exception of the companies in New York City. The bases of these figures are the reports filed by the different companies with the Board of Railroad Commissioners. The figures for the year ending June 30, 1905, were published in the Street Railway Journal for July 15, 1905. Mr Beardsley's figures for the year ending June 30, 1906, are presented herewith.

LARGE GENERATORS FOR THE MONTREAL LIGHT, HEAT & POWER COMPANY

The Montreal Light, Heat & Power Company has recently contracted with the Canadian Westinghouse Company, Ltd., for a large addition to its power equipment. The apparatus contracted for is for the company's new Soulanges Canal power station on the St. Lawrence River. The equipment consists of three Westinghouse 3750-kw revolving field, alternating current, two-bearing generators connected to water turbines. These generators are 7200 alternations, 4000 volts, three-phase, operating at 225 r. p. m. There are also two 150-kw, direct-current 125-volt exciter units. Oil-insulated, water-cooled transformers of 2500 kw and to the number of thirteen are also an important part of the equipment. Seven of these transformers will be used for raising the voltage at their generating station from 4000 to 44,000 volts, and six of them will be used at the lowering end of the transmission line, stepping down the voltage from 44,000 to 12,000. This contract is among the largest recently placed in the Canadian field.

Income and Operating Expenses. Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.

Compiled by H. M. BEARDSLEY, Elmira, N. Y.

City	ALBANY		ALBANY		AUBURN		BINGHAMTON		BUFFALO		CANANDAIGUA		CORTLAND		ELMIRA		FISHKILL	
Company	Albany & Hudson		United Traction Co.		Auburn & Syracuse Co.		Binghamton Ry. Co.		International Tr. Co.		Rochester & Eastern		Cortland Co. Traction		E. W., L. & R. R. Co.		Cit. Ry., L. & P. Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	704,060		7,672,842		1,068,830		1,286,067		14,682,630		762,586		214,125		1,212,066		171,574	
Income From Operation	$200.671 65	28.50	$1,714,848 82	22.35	$268,507 78	25.12	$258,819 85	20.14	$3,694,339 01	25.16	$212,668 51	27.88	$49.139 86	22.95	$192,921 47	16.06	$41,474 56	24.17
1. Maintenance track and roadway	11,612 87	1.63	63,246 60	.82	18.190 65	1.70	5,137 76	.40	130,646 98	.89	10,631 94	1.39	4,608 39	2.15	11,387 42	.94	3,320 90	1.94
2. " electric line	1.684 01	.24	16.129 02	.21	7,600 41	.71	1.712 56	.13	23,299 63	.16	2.427 54	.32	651 68	.31	2,814 38	.23	216 81	.12
3. " buildings	1.075 21	.15	6,707 61	.09	513 17	.05	465 18	.04	10,720 44	.07	300 84	.04	36 76	.01	468 35	.04	202 99	.12
4. " steam plant	2,636 08	.36	3,244 17	.04	1.800-13	.17	1,641 35	.12	7,126 30	.05	668 24	.09	169 48	.08				
5. " electric plant	238 78	.03	1,379 64	.02	230 19	.02	117 78	.01	13.882 59	.09	186 93	.02	128 82	.06				
6. " cars	9.899 23	1.42	31,990 72	.42	7,244 89	.68	6,951 46	.54	103,736 01	.70	9.385 39	1.23	1,631 54	.72	7,083 63	.68	1,755 79	1.02
7. " electrical equipment of cars	6,967 13	.99	27,672 96	.36	4,496 90	.42	9.317 83	.72	74,760 70	.51	3.239 99	.42	907 92	.43	5.837 00	.48	1,886 51	1.10
8. " miscellaneous equipment	481 90	.06	2,460 37	.03	344 46	.03	511 96	.04	5,201 99	.04	573 48	.08	36 59	.01	24 10		236 68	.13
9. Miscellaneous shop expenses	881 66	.12	5.083 19	.06	704 57	.07	1,161 91	.09	9.643 91	.06	1.614 97	.21	185 31	.08	140 77	.02		
Total Maintenance	35,276 87	5.01	157.914 28	2.06	41.125 37	3.85	26,917 79	2.09	379.018 55	2.57	29.029 32	3.80	8,256 49	3.85	27,755 65	2.29	7,619 68	4.43
10. Power plant wages	7.902 82	1.12	11,804 26	.15	14,5.6 47	1.37	6,306 30	.49	31,864 35	.22	9,086 20	1.19	1,566 41	.73				
11. Fuel	21.358 34	3.04	4,518 42	.06	17.226 02	1.61	15,799 64	1.23	23.626 22	.16	23,175 21	3.04	4.664 60	2.17				
12. Water			Cr. 1.615 87	.02	250 50	.02			1.467 23	.01	182 88	.02						
13. Oil and waste	1.442 64	.21	657 00	.01	726 81	.07	819 92	.06	2.352 74	.02	1,009 00	.13	156 12	.07				
14. Miscellaneous expenses of power plant	222 71	.03	1,109 14	.01	Cr. 7 64		275 37	.02	2,458 70	.02	431 42	.06	87 91	.04				
15. Hired power			150.900 75	1.97					217.829 70	1.48					26,673 99	2.20	5.796 00	3.38
16. Supt. of transportation	4,882 21	.69	47.942 24	.63	908 32	.09	1.271 26	.10	33.583 97	.23	2,328 60	.31	1,070 00	.50	1,468 60	.12		
17. Wages of conductors	13.222 09	1.87	201,284 58	2.62	17.569 13	1.64	27,349 62	2.13	347,830 85	2.37	10.943 04	1.40	4,506 63	2.11	25,188 41	2.08	3,733 52	2.18
18. Wages of motormen	14,580 10	2.07	200,853 44	2.62	17,569 22	1.64	28,475 90	2.22	341,515 95	2.32	10.568 61	1.39	4,223 62	1.98	24.348 43	2.01	4.478 60	2.61
19. Wages other car service employees	11,484 18	1.63	22.393 05	.29	231 25	.02	2.124 04	.16	59,607 34	.41	5,928 40	78	360 00	.17	1,174 70	.10		
20. Wages car house employees	4,655 88	.66	24,086 78	.31	8,987 66	.84	4,032 42	.31	71,745 30	.49	3.915 95	.52	713 12	.33	3,633 60	.30	643 75	.37
21. Car service supplies	1,179 21	.17	4,748 37	.06	1.220 33	.11	958 76	.07	14,444 97	.10	1,410 44	.20	152 69	.07	1,159 10	.09	482 03	.28
22. Miscellaneous car service expenses	5.682 90	.81	19,163 59	.25	2.118 65	.20	174 76	02	39.619 55	.27	5,466 02	72	571 59	.26	2.042 31	.17		
22a. Hired equipment or express			32.299 13	.42					722 89									
23. Cleaning and sanding track			21.576 65	.28	243 62	.02	633 24	.05	11,584 26	.08	171 38	.02	96 80	.04	1.366 15	.11	149 63	.09
24. Removal of snow and ice	1,632 25	.23	5,668 70	.08	1.382 75	.13	701 35	.06	32.399 84	.22	1,664 92	.22	311 78	.14	868 73	.07	536 83	.31
Total Operating	88,245 33	12.53	747,590 29	9.74	83,003 09	7.76	88.922 58	6.92	1,232.653 86	8.40	76.282 07	10.00	18,471 47	8.61	87.913 92	7.25	15,820 36	9.22
25. Salaries of general officers	4,453 75	.63	19,076 73	.25	1,648 39	.15	4,500 00	.35	41,047 89	.28	3,233 85	.42	1,535 00	72	3,367 50	.28	1,918 00	1.12
26. Salaries of clerks	3,594 16	.51	19,117 13	.25	3.680 07	.35	2,139 87	16	23.612 08	.16	4.239 79	.56	914 50	.43	1,178 31	.10		
27. Printing and stationery	1,097 30	.17	4.200 40	.05	378 32	.03	410 91	.03	4.652 60	.03	1,702 41	.23	85 04	.04	51 25		21 50	.01
28. Miscellaneous expenses	369 80	.05	6.686 21	.08	1,996 25	.19	350 91	.03	5,202 83	.04	377 09	.05	384 00	18	727 49	.06	278 53	.17
29. Store room expenses	519 88	.07	2,243 10	.03	10 50				7.959 26	.05	488 47	.06						
30. Stable expenses			7.242 27	.09	859 97	.08	671 43	.05	5,143 60	.04			304 75	.14				
31. Advertising and attractions	7,269 48	1.03	737 94	.01	3,524 57	.33	7,345 06	.57	6.421 97	.04	2.011 53	.25	616 84	.28	1,150 12	.09	124 57	.07
32. Miscellaneous general expenses	2,434 92	.35	7.887 57	.12	2,366 38	.22	1,541 39	.12	21.615 92	.15	1,438 20	.19	542 71	.26	1,197 59	.10	34 90	.02
33. Damages	1,292 09	.18	40,611 82	.53	8,026 82	.75	1,464 63	.12	203.024 69	1.38	22,370 57	2.93	183 47	.09	3,892 39	.32	42 06	.02
34. Legal expenses in connection with damages	836 03	.12	11,665 88	.15			56 27		10,132 99	.07	1,174 31	.15						
35. Other legal expenses			5.746 53	.07	250 00	.02	150 00	.01	16.321 46	.11	170 84	.02			875 00	.07	27 50	.01
36. Rent of land and building	371 88	.05	1,181 49	.01	742 50	.07			12.606 62	.08	1,635 02	.22			855 10	.07		
37. Rent of track and terminals	4.600 00	.65	43.283 73	.57	12,055 68	1.13			600 00		11.270 97	1.48			363 28	.03		
38. Insurance	2.400 00	.34	18.526 52	.24	26.19 80	.25	2.400 00	.19	43,562 44	.30			1,235 44	.58	1,488 66	.12	890 45	.52
39. Express																		
Total General	29,239 29	4.15	188,207 32	2.45	38,167 25	3.57	21,021 47	1.63	401,904 35	2.73	50,113 05	6.57	5,801 75	2.71	16,146 74	1.24	3.337 51	1.94
Total Operating Expenses	152.761 49	21.69	1,093,711 89	14.24	162,295 71	15.18	135,861 84	10.64	2,012,576 76	13.70	156.424 44	20.37	32,629 71	15.17	130,816 31	10.78	26,774 55	15.59
Taxes	18.400 00	2.61	84.892 00	1.11	11,375 60	1.06	7,500 00	.59	175.990 10	1.20	7.665 86	.99	1,899 34	.89	10,016 46	.83	1,290 00	.75
Total Expenses and Taxes		24.30		16.35		16.24		11.23		14.90		21.36		16.06		11.61		16.34

Income and Operating Expenses Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.

Compiled by H. M. BEARDSLEY, Elmira.

City	FREDONIA		GLENS FALLS		HORNELLSVILLE		ITHACA		KINGSTON		NEWBURGH		OGDENSBURG.		ONEIDA		ONEONTA	
Company	Dunkirk & Fredonia		Hudson Valley Ry. Co.		Hornell Elec. Ry.		Ithaca St. Ry. Co.		King. Consol. R. R. Co.		Orange Co. Trac. Co.		Ogdensburg St. Ry. Co.		Oneida Railway Co.		O. C. & R. S. Ry. Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	165,163		1,927,473		181,870		386,026		535,527		595,099		278,460		146,674		650,308	
Income From Operation	$44,457 88	26.92	$499,148 09	25.89	$16,919 70	9.30	$91,817 90	23.21	$123,632 92	23.08	$119,270 85	20.04	$27,240 09	9.78	$13,528 65	9.22	$103,862 05	15.97
1. Maintenance track and roadway	3,527 74	2.14	30,723 50	1.59	767 23	.42	1,519 93	.38	4,305 70	.81	4,943 07	.83	650 53	.23	11 35	.01	6,390 59	.98
2. " electric line	488 78	.30	7,946 25	.41	46 57	.02	662 27	.17	883 69	.16	1,615 97	.27	193 96	.07	44 11	.03	1,076 30	.17
3. " buildings	757 11	.46	1,375 63	.07	579 26	.32	799 78	.20	380 99	.07	577 47	.10	295 28	.11	2 25		1,199 40	.18
4. " steam plant	2,025 07	1.23	3,998 75	.21			6 56		394 56	.07	72 28	.01					611 85	.10
5. " electric plant	217 60	.13	3,036 45	.16					13 40		1,070 00	.18			44 82	.03	2,902 26	.45
6. " cars	2,453 56	1.48	8,866 22	.46	1,370 40	.75	2,652 88	.68	6,003 49	1.12	4,123 16	.69	3,235 73	1.16	393 34	.27	5,378 98	.82
7. " electrical equipment of cars	1,633 99	.99	15,978 38	.83	1,344 86	.75	2,357 08	.60	3,824 49	.72	4,601 83	.77			368 48	.25	6,527 73	1.00
8. " miscellaneous equipment	57 71	.03	906 54	.05			14 37		195 33	.03	327 15	.06			13 47	.01	628 88	.10
9. Miscellaneous shop expenses			2,669 12	.14			659 74	.17	1,991 91	.37	328 80	.06			810 67	.55	457 11	.07
Total Maintenance	11,161 56	6.76	75,500 84	3.92	4,108 32	2.26	8,672 61	2.20	17,993 56	3.35	17,659 73	2.97	4,375 50	1.57	1,688 49	1.15	25,173 70	3.87
10. Power plant wages	1,840 58	1.11	14,321 44	.74			4,920 89	1.27	3,537 89	.66	3,313 56	.56	1,307 50	.47			5,829 55	.90
11. Fuel	6,953 17	4.22	5,388 47	.28			17,010 36	4.41	8,168 12	1.53	9,900 38	1.66	2,206 58	.79			13,230 64	2.03
12. Water	120 00	.07	98 05								200 04	.04	223 87	.08				
13. Oil and waste	303 36	.18	631 39	.04					618 43	.12	246 65	.04					1,443 64	.22
14. Miscellaneous expenses of power plant	150 00	.09	1,193 62	.06			65 00	.02	282 50	.05	375 74	.06			6 91	.01	331 31	.05
15. Hired power	1,030 00	.62	29,949 86	1.56	3,370 09	1.86									3,830 38	2.61		
16. Supt. of transportation			9,208 47	.48													1,972 62	.30
17. Wages of conductors	5,228 87	3.17	33,211 54	1.72	3,241 57	1.78	9,564 82	2.47	11,637 97	2.17	12,240 71	2.06	9,184 65	3.30	2,670 85	1.82	5,401 55	.83
18. Wages of motormen			33,496 26	1.73	3,230 30	1.78	9,341 29	2.42	13,023 64	2.43	13,567 27	2.28			2,671 25	1.82	6,254 67	.96
19. Wages other car service employees			4,145 68	.22			885 14	.23			1,924 96	.32	29 80	.01	435 57	.30	2,217 64	.34
20. Wages car house employees			7,019 53	.36	362 13	.20	1,145 78	.30	2,032 53	.38	1,992 91	.34			177 71	.12	1,950 60	.30
21. Car service supplies			2,923 45	.16			516 26	.13	378 29	.07	656 67	.11			86 15	.06	1,616 54	.25
22. Miscellaneous car service expenses	594 71	.36	7,443 44	.38			93 75	.02	451 60	.08	1,270 18	.21			97 12	.07	946 74	.15
22a. Hired equipment or express			27,140 16	1.41														
23. Cleaning and sanding track	15 10	.01	9[illegible] 52	.05			828 11	.22	1,013 48	.19	488 11	.08			4 50		4 50	
24. Removal of snow and ice	1,202 13	.73	6,630 22	.29	74 59	.04	194 60	.05	684 74	.11	1,052 11	.18	473 05	.17	163 46	.11	3,893 02	.60
Total Operating	17,437 92	10.56	182,779 10	9.48	10,278 68	5.65	44,566 00	11.54	41,729 19	7.79	47,229 29	7.94	13,425 45	4.82	10,143 90	6.92	45,093 02	6.93
25. Salaries of general officers	650 00	.39	10,191 42	.53	732 90	.42	2,683 87	.70	4,600 00	.84	4,700 04	.79	1,314 68	.47			1,937 01	.30
26. Salaries of clerks	656 43	.40	8,384 10	.43					938 50	.18	2,489 39	.42	740 00	.27	353 00	.24	2,996 50	.46
27. Printing and stationery			832 70	.04			167 85	.04	140 80	.03	687 00	.12	25 00	.01	28 45	.02	288 67	.04
28. Miscellaneous expenses	179 77	.11	1,234 02	.06	9 58		381 85	.10	220 76	.04	227 49	.04	685 84	.25	140 99	.09	203 31	.03
29. Store room expenses			873 99	.05													485 93	.07
30. Stable expenses			739 30	.04			40 31	.01	370 17	.07								
31. Advertising and attractions	3,188 55	1.93	485 42	.03			4,223 01	1.09	3,700 71	.69	2,779 33	.46					277 93	.04
32. Miscellaneous general expenses	438 97	.27	2,640 29	.14	352 73	.19	1,027 07	.26	777 23	.15	2,201 54	.37			121 22	.08	1,395 21	.22
33. Damages	400 00	.24	20,444 32	1.06	55 50	.03			542 12	.10	2,843 90	.48			541 14	.37	668 85	.10
34. Legal expenses in connection with damages			1,961 97	.10	6 25		4,200 00	1.09	645 69	.12	225 50	.04	205 00	.07				
35. Other legal expenses			3,293 97	.17					194 44	.03	1,039 27	.17					359 17	.06
36. Rent of land and building	300 00	.18	2,650 47	.14							548 01	.09			200 04	.14	809 08	.13
37. Rent of track and terminals			16,026 35	.83					1 00									
38. Insurance	566 19	.34	6,600 00	.34	155 49	.08	925 54	.24	1,630 77	.30	1,712 40	.29	234 75	.08	613 81	.42	2,782 12	.43
39. Express																		
Total General	6,379 91	3.86	76,358 32	3.96	1,312 45	.72	13,649 50	3.53	13,662 19	2.55	19,453 87	3.27	3,205 27	1.15	1,998 65	1.36	12,208 78	1 88
Total Operating Expenses	34,979 39	21.18	334,638 26	17.36	15,699 45	8.63	66,888 11	17.27	73,384 94	13.69	84,342 89	14.18	21,006 22	7.54	13,831 04	9.43	82,475 50	12.78
Taxes	2,297 78	1.39	14,877 10	.77	779 80	.43	2,308 74	.60	4,697 96	.88	7,200 00	1.21	892 17	.32	855 29	.58	6,787 67	1.04
Total Expenses and Taxes		22.67		18.13		9.06		17.87		14.57	91,542 89	15.39	21,898 39	7.86	14,686 33	10.01	89,263 17	13.82

Income and Operating Expenses Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.
Compiled by H. M. BEARDSLEY, Elmira.

City	PEEKSKILL		PLATTSBURGH		POUGHKEEPSIE		ROCHESTER		SCHENECTADY		SYRACUSE		SYRACUSE		UTICA		TOTAL	
Company	Peekskill L. & Ry. Co.		Plattsburgh Trac. Co.		Pough. Cy. & W. Falls		Rochester Ry. Co.		Schenectady Ry. Co.		Syracuse Rap. Transit		Syracuse & Suburban		Utica & Mohawk Valley			
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	306,129		128,763		482,704		6,991,775		3,286,537		4,011635		453,820		3,389,069		51,690,802	
Income From Operation	$52,766 03	17.24	$21,577 73	16.76	$102,350 35	21.20	$1,726,073 75	24.69	$699,720 65	21.29	$888,750 15	22.15	$92,103 26	20.30	$795,033 76	23.45	$12,051,645 32	23.31
1. Maintenance track and roadway	1,200 00	.39	766 93	.60	1,627 67	.32	35,132 88	.50	18,495 28	.56	27,141 20	.68	6,464 35	1.42	33,585 23	.99	435,836 89	.84
2. " electric line	180 00	.06	170 56	.13	968 05	.20	18,070 73	.26	11,381 97	.35	7,638 28	.19	815 59	.18	8,857 27	.26	117,576 39	.23
3. " buildings	144 00	.05	73 44	.06	210 43	.04	3,634 72	.05	3,884 50	.12	2,633 24	.06	207 90	.05	1,756 83	.06	38,902 78	.07
4. " steam plant	70				875 43	.18	3,076 39	.04	644 21	.02	15,170 40	38	605 30	.13	16 38		44,583 63	.09
5. " electric plant	729 00	.24			399 71	.08	373 16	.01	877 79	.03	3,910 50	.10	120 58	.03	467 26	.01	30,327 25	.06
6. " cars	1,200 00	.39	520 48	.40	4,615 03	.96	45,629 39	.65	34,025 45	1.04	25,588 66	.64	2,010 28	.44	24,681 63	.73	352,327 34	.68
7. " electrical equipment of cars	600 00	.20	335 22	.26	2,776 50	.58	42,410 74	.61	23,101 03	.70	19,193 43	.48			28,222 83	.83	288,363 53	.56
8. " miscellaneous equipment	71 51	.02			350 00	.07	2,766 23	.04	2,345 99	.07	1,423 79	.03	2,159 59	.48	2,810 47	.08	23,942 56	.04
9. Miscellaneous shop expenses					7 08		6,143 19	.09	6,704 64	.17	3,188 54	.08	1,323 43	.29	8,650 70	.26	51,351 82	.10
Total Maintenance	4,125 21	1.35	1,866 63	1.45	11,729 90	2.43	157,237 42	2.25	100,460 86	3.06	105,788 04	2.64	13,707 02	3.02	109,048 60	3.22	1,383,211 99	2.67
10. Power plant wages					3,326 95	.67	8,918 48	.13	10,855 06	.33	11,953 72	.30	1,806 30	.40	9,416 37	.28	164,455 10	.32
11. Fuel					9,589 32	1.99	19,283 15	.27			64,666 36	1.61	1,985 34	.44	60 00		268,800 44	.52
12. Water							52 74				1,856 11	.05					2,935 56	.01
13. Oil and waste					1,026 89	.22	402 73	.01	166 17		2,036 09	.05			98 15		14,037 73	.03
14. Miscellaneous expenses of power plant					1 25		140 37		2,151 90	.06	615 94	.02	80 39	.02	572 97	.02	10,538 60	.02
15. Hired power	7,617 62	2.49	1,931 43	1.60			197,722 16	2.83	74,866 34	2.27					130,494 05	3.85	852,012 37	1.65
16. Supt. of transportation	1,111 20	.36	673 67	.44			12,054 82	.17	10,558 01	.32	3,877 50	.10			3,477 50	.10	136,288 89	.26
17. Wages of conductors	6,410 63	2.09	2,030 65	1.58	8,906 47	1.85	166,282 20	2.38	69,198 31	2.10	90,443 87	2.25	7,048 11	1.55	59,255 04	1.75	1,153,588 58	2.23
18. Wages of motormen	6,441 24	2.10	2,037 86	1.58	11,098 88	2.30	181,564 80	2.60	71,597 91	2.18	95,117 88	2.37	7,258 31	1.60	59,508 18	1.76	1,162,823 61	2.25
19. Wages other car service employees			440 00	.34	6,271 87	1.09	18,537 65	.26	6,878 03	.21	6,402 12	.16			6,346 10	.16	155,817 42	.30
20. Wages car house employees	646 30	.21	469 22	.37	6,268 22	1.30	19,962 58	.28	25,305 93	.77	10,296 48	.26	4,556 56	1.00	17,390 54	.51	221,991 38	.43
21. Car service supplies	179 13	.06	192 89	.15	97 76	.02	17,325 91	.25	6,812 96	.20	5,727 08	.14	185 42	.04	6,793 25	.20	69,247 46	.13
22. Miscellaneous car service expenses	290 05	.10	260 25	.20	225 90	.06	22,830 14	.33	18,379 35	.66	5,423 28	.13	642 70	.12	6,883 24	.20	140,571 82	.27
22a. Hired equipment or express																	60,162 18	.12
23. Cleaning and sanding track	117 52	.04	51 30	.04	52 71	.01	3,676 12	.05	3,979 55	.12	4,540 48	.11	237 95	.05	2,016 32	.06	53,815 60	.10
24. Removal of snow and ice	398 44	.13	107 75	.09	1,072 25	.22	17,084 52	.25	5,036 14	.15	6,254 30	.13	672 45	.13	7,367 81	.22	95,528 73	.18
Total Operating	23 212 13	7.58	8,099 62	6.29	46,938 47	9.72	685,838 27	9.81	305,785 66	9.27	308,211 21	7.68	24,273 63	6.35	308,679 62	9.11	4,562,615 47	8.82
25. Salaries of general officers	1,500 00	.49	1,600 00	1.17	6,775 00	1.40	13,399 96	.19	4,596 02	.14	11,333 67	.28	3,560 00	.78	9,719 96	.29	159,902 64	.31
26. Salaries of clerks	703 00	.23			4,042 62	.84	11,351 45	.16	10,206 77	.31	4,350 87	.11	1,604 62	.35	6,042 05	.18	113,326 21	.22
27. Printing and stationery	66 55	.02	109 35	.08	249 68	.05	520 76	.01	1,792 56	.05	428 84	.01	48 85	.01	1,315 38	.04	19,302 17	.03
28. Miscellaneous expenses	157 47	.06	48 11	.04	296 61	.06	5,681 23	.08	1,729 38	.05	687 28	.02	1,569 12	.35	980 03	.03	30,805 85	.06
29. Store room expenses							2,465 00	.04	2,719 21	.08	526 67	.01			1,030 35	.03	19,322 26	.03
30. Stable expenses					578 48	.12	6,069 43	.09	3,352 25	.10	2,373 02	.06	194 38	.04	2,006 17	.06	29,934 63	.06
31. Advertising and attractions	689 76	.22	414 70	.32	8 76	.01	8,926 48	.13	3,859 60	.12	3,355 89	.08	1,124 71	.26	3,381 08	.09	65,616 90	.12
32. Miscellaneous general expenses	446 79	.15	458 00	.36	343 06	.07	12,438 23	.18	4,971 86	.16	8,641 26	.22	3,045 99	.67	7,100 94	.21	85,459 97	.16
33. Damages	53 00	.02	1,077 79	.84	6,114 88	1.06	49,755 97	.71	39,012 65	1.19	60,698 51	1.26	1,088 07	.24	31,797 12	.94	485,002 26	.94
34. Legal expenses in connection with damages					1,886 11	.39	4,500 00	.06			10,090 93	.25	101 75	.02	2,131 76	.06	49,819 26	.10
35. Other legal expenses							2,121 03	.03	1,540 84	.05	882 18	.02	702 42	.15	2,063 80	.06	36,737 92	.07
36. Rent of land and building	167 50	.06	125 00	.09			1,500 00	.02	1,417 15	.04	1,531 28	.04	1,070 08	.24	1,295 64	.04	29,006 76	.06
37. Rent of track and terminals									3,000 00	.09							91,201 01	.18
38. Insurance	3,723 31	1.21	195 91	.16	1,511 65	.31	8,929 33	.13	11,665 05	.36	4,800 00	.12	157 06	.04	8,898 18	.26	128,224 86	.25
39. Express											782 60	.02			25,248 49	.76	26,031 09	.05
Total General	7,507 38	2.46	3,928 86	3.05	20,806 74	4.31	127,647 87	1.83	89,863 14	2.73	100,482 90	2.50	14,267 04	3.14	103,009 86	3.04	1,368,693 87	2.64
Total Operating Expenses	34,844 72	11.38	13,895 01	10.79	79,475 11	16.46	970,723 66	13.89	496,109 66	15.06	514,482 15	12.82	52,247 69	11.61	520,737 97	15.37	7,314,521 33	14.13
Taxes	3,265 92	1.06	1,195 39	.93	11,671 46	2.42	89,126 69	1.28	31,439 46	.95	36,000 00	.90	4,868 26	1.07	25,950 34	.77	563,132 27	1.09
Total Expenses and Taxes	38,100 64	12.44	15,090 40	11.72	91,146 67	18.88	1,069,850 15	15.17	627,549 12	16.01	550,482 15	13.72	67,115 95	12 58	646,688 31	16.14	7,877,654 60	15.22

FINANCIAL INTELLIGENCE

WALL STREET, Sept. 26, 1906.

The Money Market

Notwithstanding the heavy gain in cash by the New York City banks resulting largely from the importation of gold from Europe, the local money market continues to rule firm during the past week, rates for time loans extending from ninety days to six months, commanding 6 per cent and a commission, bringing the total charge to the borrower for such accommodation up to 7 and 7½ per cent. The inquiry for money in connection with stock speculation has not been as urgent as heretofore, but the continued demand from the inland cities for money to carry on the enormous volume of business in all branches of trade, and for crop moving, has drawn heavily upon the resources of the banks. In addition to the drain from this source, provision must also be made during the week for the Oct. 1 interest and dividend disbursements, which are estimated at about $60,000,000, and for the withdrawal by the trust companies of $10,000,000 for reserve requirements. The heavy demands upon the resources of the banks has produced a situation that makes further relief by the Treasury Department desirable. Up to the present time no intimation as to Secretary Shaw's intention has been received, but in banking circles the belief is quite general that at the proper time the Secretary of the Treasury will use a considerable part of the $75,000,000 Government funds now at his disposal to relieve the urgent demand for money. This may be accomplished by depositing substantial sums with the national banks in cities outside of New York, or by purchasing the 4-per-cent Government bonds maturing next year at a price that will be attractive to bondholders, and at the same time save to the Government part of the interest between now and maturity of the issue. The advances by the Federal Treasury on gold engaged for import from Sept. 10 to Sept. 26, inclusive, amount to $35,505,000, and while further engagements of the yellow metal are announced from time to time, the movement in this direction is believed to be near an end. The attitude of the Bank of England toward further withdrawals of gold for shipment to this side was clearly shown during the week, by an advance of ½ to 1 per cent above the minimum discount rate to other than the bank's regular customers. This action was doubtless taken to check the inroads being made upon that institution's supply of gold, and which have proved effective. Cotton and grain bills are appearing in the foreign exchange market in increasing volume, and unless the supply of these bills assumed proportions large enough to depress exchange rates to a point which will enable local bankers to overcome the obstacles placed in the way of obtaining further supplies of gold by the Bank of England, our bankers will be compelled to depend entirely upon the open market supplies at London and Paris.

The bank statement published on Saturday last was extremely favorable, the increase in cash amounting to $12,220,500. The reserve required was $4,440,975 more than in the previous week, which, deducted from the gain in cash, resulted in an increase in the surplus reserve of $7,779,535. The surplus now stands at $11,315,925 and compares favorably with those in the corresponding periods of recent years. In 1905 the surplus was $5,235,050; in 1904, $26,251,025; in 1903, $11,569,300; in 1902, $3,235,625; in 1901, $16,552,325, and in 1900, $16,552,328.

The Stock Market

The stock market during the past week was dominated by the monetary situation, and this was reflected in a selling movement which resulted in a moderately lower level of prices. Price fluctuations were wide, but the average change was confined to less than 3 points, and it was obvious that the speculative situation is well under control. The bulls had counted upon large gold imports to stimulate an upward movement in stocks, but while the engagements since the Treasury order went into effect on the 10th, aggregate about $35,500,000, the demand for money has been such that commercial borrowers have been compelled to pay what may be considered exorbitant rates. The belief is general that Secretary Shaw will relieve the situation by depositing substantial amounts of money in the national banks outside New York, in order to supply funds for the movement of grain and cotton, and it is expected that such Treasury action will be taken before the close of the current week. Unless something of the kind is done there is every probability of another flurry in call money rates at the end of the month, and speculative interests may take advantage of the situation to bring about such an advance in order to depress prices for stocks. So far as fundamental conditions are concerned, there is no basis for pessimism. From all sections of the country the reports are of the most encouraging character, and there could not be better evidence of the legitimate demand for money than these very reports. Grain is moving freely, the iron and steel trades are rushed with orders for early and late delivery; new cotton is moving in liberal volume, and all commercial conditions indicate a larger demand for financial accommodation. August exports demonstrated that our foreign trade is heavy, and the ruling low price for cotton should stimulate an outward movement of that staple, with a consequent increase in our foreign credit balances.

The speculation just now is governed by rumor more than by actual developments. The "ore deal" is much discussed, but no new facts in connection with it have come to light, and official announcement is likely to be delayed; increased dividends are a potent influence, and there is expectation that such action will be taken by the directors of the Pennsylvania, Norfolk & Western, Chesapeake & Ohio, United States Steel, the Copper stocks, Atchison, and possibly a few other stocks. The reactionary influence is the political situation. While this is largely local, it nevertheless has an important bearing on the general situation. Recent sales of New York City securities have brought low prices and this is a matter of importance to leading bankers. New stock issues announced during the week include $29,839,560 by the New York Central, being part of the $100,000,000 authorized by the stockholders in April last, and which will be issued at par; $10,000,000 by the Cleveland, Cincinnati, Chicago & St. Louis; $20,000,000 by the Tennessee Coal & Iron Company. In addition to the above, rumor has it that the Southern Pacific will issue a large amount of preferred stock.

The local traction shares were under pressure, based upon possible political developments at Buffalo and Saratoga. It was claimed that the selection of the Democratic convention would be a bear argument on all public utility properties, as the candidate is on record as being in favor of municipal ownership. The reports of the local traction companies show that during the past year they have done very well, and that the development work on the Brooklyn Rapid Transit system will add materially to the net earnings of that company. The State Railroad Commission has authorized the Manhattan Railway Company to issue $4,800,000 new stock for construction and equipment. The New York & Queens County Railway Company has been granted permission to issue a mortgage for $10,000,000, but only $8,000,000 can be issued at this time. Of this amount, $2,000,000 will be used for refunding existing mortgages, and the remainder will be used for new power houses, equipment, etc.

Philadelphia

Trading in the local traction issues was fairly active during the past week, and although prices displayed more or less irregularity, the general tone of the market was strong. Philadelphia Rapid Transit, although considerably less animated than last week, was the active feature of the trading, about 17,000 shares changing hands at from 30 to 29¼ and back to 29¾. Union Traction displayed considerable strength early in the week, the price rising to 65¼, but subsequently there was a reaction to 64¾. Upwards of 700 shares were dealt in. Philadelphia Company common was more active, 1800 shares changing hands at prices ranging from 49½ to 50½, the final transaction taking place at 50. Odd lots of the preferred sold at 48½. American Railways showed strength, 500 shares selling at from 51¾ to 52¼. Consolidated Traction of New Jersey sold at 78 for odd lots. Other transactions included Lehigh Valley Transportation common at 10¼, the preferred at 20; Philadelphia Traction at 98¾ to 98½, and United Traction of Pittsburg preferred at 50 to 50¼.

Baltimore

The market for tractions at Baltimore was extremely quiet and irregular. United Railway issues furnished the bulk of the business. The 4 per cent bonds opened at 89¼ and on purchases of about $25,000 advanced to 89½. The certificates representing income bonds deposited opened at 70⅜ and ran off to 69⅝ on sales of $26,000. The funding 5s were firm, $16,000 changing hands at 89⅝ to 89. Sales of United Railway free stock were made at 15. Lexington Street Railway 5s were decidedly strong, $6,000 selling at 101½ to 102½. Washington City & Suburban 5s sold at 103½, and Norfolk Railway & Light 5s brought 99½. Announcement was made by the Maryland Trust Company that the income bonds of the United Railways & Electric Company deposited under the funding agreement amounted to $12,510,000. It was also stated that holders of substantial amounts of the bonds have asked for an extension of time and have promised to deposit their holdings under the agreement before Nov. 15.

Other Traction Securities

The feature of the Boston market was the unusual activity in Boston Elevated, which was accompanied by a sharp advance in the price of the stock. Opening at 154, the price dropped 2 points, but subsequently there was an advance to 156, the highest price attained by this stock for a long while. Upwards of 1300 shares were dealt in. Massachusetts Electric issues were extremely quiet and somewhat lower, about 400 shares of the common changing hands from 20¼ to 19¾, while the preferred declined from 72½ to 72. Boston & Worcester preferred sold at 81½, and Boston & Suburban common brought 15. West End common sold at 97 and the preferred at 108½ to 108¾. The Chicago market was practically at a standstill. Metropolitan Elevated common sold at 27 and the preferred at 67½. It is now said that the management of the Metropolitan Elevated Railroad Company will carry out the general financial plan before beginning dividend payments on the preferred stock. The bondholders committee of the North Chicago Street Railway Company formed for the purpose of protecting the interests of the refunding 4½ per cent gold bonds met this week and organized by electing N. W. Harris, chairman, and H. A. Dow, secretary. In addition to the above named, the committee is composed of G. P. Hover, Allen B. Forbes, D. M. Cummings and E. K. Boisot.

Cincinnati, Newport & Covington common stock has been very active in Cincinnati. There are new rumors that the Schoepf syndicate is negotiating for the property. The company has been earning a large surplus, and some of the directors are anxious to have the common stock placed on a dividend paying basis, but this dividend is opposed by President James C. Ernst, who wants the money spent in improvements. The common stock advanced to 75⅛ and the preferred to 98. Toledo Railways & Light sold at 32¼, Cincinnati Street Railway at 141, the latter a decline of two points.

Northern Ohio Traction & Light came in for considerable activity last week, selling at 28½. Cleveland Electric opened the week at 71, but declined to 68¾. Lake Shore Electric sold at 15½ and later at 16¼. A few small lots of Cleveland & Southwestern preferred sold at 61¼. Western Ohio sold at 13. Both of these stocks have been inactive for some time. Baltimore Terminal Underwriting has been in demand in Cleveland, and it went to 5 points, advancing the early part of this week to 5¾. Washington, Baltimore & Annapolis bid at 13½ with no sales.

Security Quotations

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

	Sept. 19	Sept. 26
American Railways	51¾	52¼
Boston Elevated	153¾	156
Brooklyn Rapid Transit	80⅛	76
Chicago City	160	150
Chicago Union Traction (common)	4¾	4¼
Chicago Union Traction (preferred)	18	17¾
Cleveland Electric	70	*69
Consolidated Traction of New Jersey	77	78
Detroit United	94	94
Interborough-Metropolitan, W. I.	38⅝	36
Interborough-Metropolitan (preferred), W. I.	77½	76¼
International Traction (common)	54½	62
International Traction (preferred), 4s	76	81
Manhattan Railway	144¼	140¼
Massachusetts Electric Cos. (common)	20	19
Massachusetts Electric Cos. (preferred)	72½	71¼
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	107	105¼
North American	92⅞	91½
North Jersey Street Railway	27	27
Philadelphia Company (common)	—	—
Philadelphia Rapid Transit	29¾	29¾
Philadelphia Traction	98½	98
Public Service Corporation certificates	69½	69
Public Service Corporation 5 per cent notes	—	94
South Side Elevated (Chicago)	95	96
Third Avenue	126	124
Twin City, Minneapolis (common)	114½	114¾
Union Traction (Philadelphia)	64	64½
West End (common)	—	—
West End (preferred)	—	—

* Asked.

Metals

According to the "Iron Age" the pig iron markets throughout the country have been quiet. From the West come reports of increasing scarcity of steel. There are in the Chicago market now two inquiries for 10,000 tons each of forging and axle billets. The railroads continue to appear as important buyers for next year, and there are in the market inquiries for steel rails aggregating between 150,000 and 200,000 tons. In the lighter lines there is enormous pressure to meet the demands.

Copper metal continues strong, prices for all the principal grades advancing to the highest points in years. Lake is quoted at 19¾ and 20c., electrolytic at 19⅝ and 19⅞c., and castings at 19½ and 19¾c.

A NEW ELECTRIC CAR LINE INTO NEW ORLEANS

The St. Bernard Traction Company, of New Orleans, was organized Sept. 20, with a capital stock of $300,000, for the purpose of constructing and operating an electric railway from the Stock Landing to the district Court House. The officers and board of directors for the company will be elected at a meeting of the stockholders to be held within a few days. New Orleans and Eastern capitalists are behind the project and it is understood that the New Orleans Railway & Light Company is also interested. The construction of this line will probably mean the operation of cars as far as Borgnemouth within the next six months. The extension to the district Court House will be made later. The line, when completed, will traverse 12 miles of suburb, and will be, it is believed, a continuation of the Dauphine line of the New Orleans Railway & Light Company.

UNITED POWER AND TRANSPORTATION MAKES PURCHASE

The Philadelphia, Bristol & Trenton Street Railway has passed into the hands of the United Power & Transportation Company, which owns a connecting line, the Holmesburg, Tacony & Frankford Street Railway, and operates the Trenton Street Railway system. No figures as to the amount of money involved in the transaction has been given out. It is understood that the line will be operated by the Holmesburg, Tacony & Frankford system, which has been running cars over the Philadelphia, Bristol & Trenton line (under a joint traffic agreement) from the Philadelphia city line, near Torresdale, to Bristol. There is a break of about 200 ft. in the line at Bristol, passengers walking across the Pennsylvania Railroad tracks. From Bristol the line extends to Smith and Bridge Streets, in Morrisville, from which point cars are run over the Yardley, Morrisville & Trenton (New Jersey & Pennsylvania Traction system) Street Railway to Warren and Hanover Streets, Trenton. The agreement with this latter company has, it is said, three years yet to run. Whether the Philadelphia, Bristol & Trenton Railway will make an attempt to get into Trenton over the lower Delaware River bridge is not known, but if it should succeed in so doing, cars could be run to the center of Trenton over the tracks of the Trenton Street Railway, which run direct from the City Hall to the lower river bridge. A franchise would be necessary in Morrisville either for a track on some street other than Bridge Street, or for the joint use of the Yardley, Morrisville & Trenton track on that thoroughfare.

ANNUAL REPORT OF THE AMERICAN RAILWAYS COMPANY

The report of the American Railways Company for the year ended June 30, 1906, as made public at the recent annual meeting of the company, shows earnings as follows:

INCOME

Interest and dividends on bonds and stocks owned by the company	$331,830.66	
*Miscellaneous income	154,881.23	
Gross income		$486,711.89

DEDUCTIONS FROM INCOME

General expenses	$297.32	
Printing and registration of stocks and bonds	4,206.69	
Legal expense	1,602.24	
Taxes	13,000.00	
Interest on funded debt	121,775.00	
Depreciation of office furniture and of engineering department instruments	600.79	
Total deductions from income		$141,482.04
Net income		$345,229.85
Dividends paid		251,385.00
Surplus		$93,844.85
Surplus June 30, 1905		357,820.39
		$451,665.24
Charged off on account of depreciation of Chicago Union Traction Company's capital stock	$71,250.00	
Adjustment of disputed taxes of the People's Railway Company, of Dayton, for years 1899 to 1905, inclusive	30,944.50	
	$102,194.50	
Profits from sale of securities and property	57,617.56	
Net charges to "profit and loss"		44,576.94
Surplus June 30, 1906		$407,088.30

GENERAL BALANCE SHEET FOR FISCAL YEAR ENDING JUNE 30, 1906

Assets

	Total Issue	Owned by the A. R. Co.	Value on A. R. Co. Books
The Springfield Railway Company first mortgage bonds, 6 per cent	$500,000	$500,000	$500,000.00
The Springfield Railway Company capital stock	1,000,000	994,400	39,959.16
Bridgeton Electric Company capital stock	25,000	25,000	17,270.44
Bridgeton & Millville Traction Company capital stock	200,000	200,000	159 364.32
The People's Railway Company capital stock	1,100,000	1,100,000	1,334,228.59
The Springfield Light & Power Company capital stock	700	700	700.00
Altoona & Logan Valley Electric Railway Company capital stock	1,500,000	1,500,000	403,750.00
Du Page Construction Company capital stock	25,000	25,000	25,000.00
Dellwood Park Company capital stock	78,750	78,750	78,750.00
The Franklin Real Estate Company capital stock	10,000	10,000	10,000.00
Chicago Union Traction Company capital stock	Preferred	.....	75,000.00
Chicago Union Traction Company capital stock	Common		
Scranton Railway Company capital stock, preferred	1,500,000	1,495,800	1,495,790.50
Scranton Railway Company capital stock, common	2,000,000	1,991,850	1,995,375.13
Total cost of stocks and bonds			$6,135,188.05
*Bills receivable, accounts receivable, etc			$3,876,206.88
Office furniture and fixtures			4,023.20
Engineering department instruments			1,158.91
Fire insurance fund investments			126,480.00
Interest on bonds owned, accrued, but not due			15,387.29
Call loans			300,000.00
Cash on hand			103,692.10
			$10,562,136.53

* Chiefly advances to subsidiary companies.

Liabilities

Capital stock	$5,051,300.00
Collateral trust convertible gold 5 per cent bonds	2,435,500.00
New York Trust Company, trustee Scranton Railway Company preferred stock	1,495,000.00
Bills payable	975,000.00
Vouchers payable	36,402.30
Bills audited, but not paid	1,379.66
Accident insurance fund	5,467.69
Fire insurance fund	130,365.19
Taxes accrued, but not due	14,485.48
Interest accrued, but not due, on funded debt	10,147.91
Profit and loss, surplus, as per operating report	407,088.30
	$10,562,136.53

E. & O. E. WALTER W. PERKINS, Treasurer.

Besides these earnings the report also contains a list of the stocks owned by the American Railways Company, June 30, 1906, also the bonds and the stocks and bonds of the subsidiary companies.

In presenting the report, President Sullivan said in part:

To the Stockholders of the American Railways Company:

The president, on behalf of the board of directors, presents the following report for the year ending June 30, 1906:

Gross earnings of subsidiary companies, $2,099,816.57. This represents an increase over 1905 of $627,878.62, of which $463,849.45 are the gross earnings of the Scranton Railway Company for six months, showing an increase on the properties owned in 1905 of $164,029.17, or 11.14 per cent.

After paying all fixed charges, interest and taxes the net income is $345,229.85.

There was paid in dividends to the stockholders of the American Railways Company $251,385, showing an increase of $16,642.50 over the amount paid the previous year. This leaves a balance of $93,844.85 to be credited to surplus account, which, after certain adjustments hereinafter noted, contains a balance to the credit of surplus on June 30, 1906, of $407,088.30.

As shown in our report in 1905, certain bonds in the treasury of the company were sold at a profit, which profit had been carried to the credit of the bonds still held. These bonds, viz.: $1,100,000, par value, Altoona & Logan Valley Electric Railway Company 4½ per cent bonds were sold during the year, and the profit carried to surplus account.

The sale of the property of the Springfield Light & Power Company, referred to in my last annual report, has been finally closed by the payment of the notes received in settlement. The profit realized on the sale has been carried to the credit of surplus account, the total amount of profit on this sale and on that of the 4½ per cent Altoona bonds being $57,617.52.

There has been charged off during the year the sum of $71,250, and deducted from surplus account to make the book value correspond with the market value of Chicago Union Traction stock as of June 30.

On June 30, we reached an agreement with the taxing authorities of the city of Dayton, as to certain taxes which have been in dispute for the years 1899 to 1905 inclusive, and settlement was made for the same on that date in the sum of $30,944.50, and the same was charged to surplus account.

During the year we carried 48,879,689 passengers, showing an increase of 15,657,676; of this increase 11,118,827 is due to the purchase of the Scranton Railway Company, leaving a net increase on the properties previously owned of 4,538,849, or over 13 per cent.

During December, 1905, we agreed to purchase the stock of the Scranton Railway Company for $3,500,000, being the par value of the preferred and common stock.

On Jan. 5, 1906, we took over the property and assumed the management of the same. The $1,500,000 of preferred stock was paid for in 5 per cent trust certificates. As regards the $2,000,000 of common stock, we paid $1,000,000 in cash and gave notes for $975,000, due Dec. 15, 1906. The remaining $25,000 worth of stock has been nearly all acquired since and paid for in cash.

As regards the capital stock of the Springfield Light & Power Company, for legal reasons it is not possible at the present time to liquidate this company completely, formal action was taken reducing its capital stock to seven shares (those necessary to qualify its directors), and the balance of its cash assets were turned into the treasury of the American Railways Company, the only stockholder. It now appears on our balance sheet at the sum of $700.

On Jan. 31, 1906, the capital stock of the American Railways Company was increased $1,135,800, making the capital stock stand at $5,090,100. The increase was made to provide in part for the

purchase of the Scranton Railway, and for other corporate purposes. Stockholders were given the privilege to subscribe at par for 30 per cent of their respective holdings, under which right 21,940 shares of additional stock has been issued full paid; 1552 shares have been issued $25 per share paid, the remaining $25 per share will become due and payable on Sept. 15 next.

During the year the fire insurance fund of the company has been continued with success. From premiums charged and interest on invested funds $20,824 has been added to the sum invested for fire protection.

In November last we purchased 63 acres of land known as "Dellwood," 3 miles from Joliet, and 1 mile south of the city of Lockport. This property is well wooded and has an attractive and deep glen running through it. The tracks of our Chicago division pass directly in front of the entrance to this park.

For the purpose of developing the park, the Dellwood Park Company was formed during the year, your company subscribing for all of its capital stock, and has up to June 30 paid in thereon the sum of $78,750, which appears in the balance sheet. Permanent and attractive improvements have been made which, we trust, will be highly advantageous to this company.

The statement of general expense in the treasurer's report shows a marked decrease. This is caused by the policy adopted this year of charging direct to the underlying companies the expenses of the Philadelphia office other than strictly corporate expenses of the American Railways Company.

We have expended during the year the sum of $518,046.82 in construction and equipment on the different properties as follows:

Altoona & Logan Valley Electric Railway Company..	$215,835.55
Chicago & Joliet System.....	17,201.98
The Peoples Railway Company.....	67,301.34
The Springfield Railway Company.....	28,273.27
Bridgeton & Millville Traction Company.....	7,717.24
Bridgeton Electric Company	9,711.78
Home Electric Light & Steam Heating Company, Tyrone	3,377.50
The Franklin Real Estate Company.....	3,255.85
Dellwood Park Company	110,399.21
Scranton Railway Company (six months).....	54,973.00
Total	$518,046.82

ARRANGEMENTS FOR THE A. S. & I. R. A. CONVENTION

Under date of Sept. 26, the American Street and Interurban Railway Association issued through its secretary, B. V. Swenson, a most important circular dealing with arrangements for the convention at Columbus during the week beginning Oct. 15, of which the following is an extended digest:

The New England, Trunk Line, Eastern Canadian, and Southeastern Passenger Associations have granted the rate of a fare and one-third on the certificate plan for all points within their territory. The Central Passenger Association has granted similar rates for all territory excepting from points in the State of Ohio. The Western Passenger Association has granted the same rate from all points in its territory including all points in Colorado. The Southwestern Passenger Bureau grants the rate, excepting for points on the Fort Worth & Denver City Railway. The Trans-Continental Association grants the regular nine months rates which are in effect from Pacific Coast points daily, to Chicago, St. Louis, Minneapolis, Missouri River points, Sioux City, Council Bluffs, Omaha, St. Joseph, Kansas City, Memphis, New Orleans, etc., and which approximate 2 cents per mile in each direction, or about one fare and one-third for the round trip. The nine months rates do not apply to intermediate or interior points, but only to what are known as the Eastern gateways of the association, such as those named. Delegates coming from Pacific Coast points may obtain the fare and one-third rates to Columbus from these Eastern gateways of the Trans-Continental Passenger Association.

The usual rules are observed in granting the reduced rate on the certificate plan. Tickets for return journey will be furnished only on certificates procured not sooner than Thursday, Oct. 11 (except that when meetings are held at distant points to which the authorized transit limit is more than three days, the authorized transit limit will govern), nor later than Wednesday, Oct. 17, and will be available for continuous passage only, no stop-over privileges being allowed. Certificates will not be honored for return trip if presented later than Tuesday, Oct. 23. The special agent at time of validation will collect from the holder of each certificate a fee of 25 cents.

It is expected that special trains or special cars will be run to Columbus from various centers, such as Boston, New York, Philadelphia, Chicago and St. Louis. The executive committee of the Manufacturers' Association has selected the New York Central lines as its official route from New York City. The New York Central people have made the following arrangements regarding schedule and equipment: The special train will consist of baggage, buffet, library, smoking car, with barber and bath, Pullman open section, compartment drawing room and observation cars of latest design, together with two dining cars, which will insure comfort and leisure to members and their guests. The schedule of trains leaving Sunday, Oct. 14, will be as follows: Leave Boston, via Boston & Albany Railroad, 10:45 a. m; Worcester, 11:55 a. m.; Springfield, 1:11 p. m.; Pittsfield, 2:59 p. m. Leave New York, New York Central Railroad, 2:04 p. m.; 125th Street, 2:17 p. m.; Albany, 5:08 p. m.; Schenectady, 5:36 p. m.; Utica, 7.09 p. m.; Syracuse, 8.24 p. m.; Rochester, 10:00 p. m. Leave Buffalo, Lake Shore Railway, 10:52 p. m.

Rate named for this meeting is fare and one-third, on certificate plan. When purchasing ticket for the going-trip ask ticket agent for a certificate which, when properly validated, will entitle passenger to one-third fare returning. Pullman accommodations will be at regular rates.

For reservations apply to Milton C. Roach, assistant general passenger agent, New York Central lines, 1216 Broadway, corner Thirtieth Street, New York. Those starting from Boston apply to R. M. Harris, city passenger agent, Boston & Albany Railroad, 366 Washington Street, Boston.

The Pennsylvania Railroad has announced it will run a special train (or cars) from New York to Columbus for the accommodation of the delegates and others attending the convention, leaving New York at 8:25 p. m., Saturday, Oct. 13, 1906, and arriving at Columbus at 1:40 p. m., Sunday, Oct. 14, thus affording practically a day's rest prior to the convening of the convention on Oct. 15. The Pullman berth rate is $3.50; section, $7.00, and drawing room $12.00 each way. Accommodations on this train must be obtained by writing Colin Studds, Eastern passenger agent, Pennsylvania Railroad, 263 Fifth Avenue, New York City.

An erroneous impression seems to be prevalent in some sections of the country in regard to hotel accommodations and hotel rates. The secretary of the association was at Columbus on Sept. 12 and 13, and investigated these matters. The difficulty concerning accommodations has been due largely to the fact that while applicants have been notified that a certain number of rooms at stated hotels have been assigned to them, they have not been given the specific numbers of their rooms in the different hotels. Up to the present time it has not been practicable for the hotel people to give specific numbers of rooms, but notices are now being sent out to all applicants giving the name of the hotel and the room numbers in each case. All who go to Columbus to attend the convention will be well taken care of as far as hotel accommodations are concerned.

Henry C. Pirrung, chairman of the convention committee of the Columbus Board of Trade, guarantees that the regular rates will apply at all hotels in the city throughout the convention period. Because of the large attendance at the convention and the consequent great demand for hotel accommodations, this guarantee is made with the understanding that two persons occupy a single room, and that each person pay the regular rate for that room, whether on the European or American plan. Each room will be provided with two beds, double towel service, etc., so that there will be no doubling up, excepting in so far as two persons occupy one room. In general, hotel accommodations should be reserved for the entire five days of the convention. If it becomes necessary to cancel the accommodations for certain days of the convention week, this matter should be taken up direct with Mr. Pirrung.

The convention and exhibit halls are located at the State Fair Grounds, at the north end of the city. The Columbus Electric Railway & Light Company will run cars direct to the Fair Grounds, passing by the Southern, Neal, Chittenden and other convention hotels. These cars will be provided with signs indicating their destination. The trip from the Southern Hotel to the Fair Grounds entrance is a 14-minute ride. The distance from the gate to the convention and exhibit halls is short, being but a 3 or 4-minute walk. In case of inclement weather conveyances will be provided at this point of the route.

The advance copies of convention papers are now being printed, and will be mailed to member companies as soon as they are ready for distribution.

THE CLEVELAND SITUATION

The Cleveland Electric Railway Company, acting as a taxpayer, has requested the City Solicitor to bring action to nullify the franchises of the Forest City Railway Company, on the grounds that at the time the ordinances were passed, approved and accepted, the Mayor of the city was, and still is, interested in the profit of the grants made by such ordinances, and is financially interested in furthering the street railway enterprise. This announcement caused a decided sensation in Cleveland. The City Solicitor replied by requesting the company to present all evidence it may have upon the subject in question. In an open letter, Mayor Johnson does not deny that he has frequently lent his credit to the Forest City Railway Company, and that he has endorsed the promises of the company made to property owners to pay paving rebates in return for property owners' consents. At the Council meeting Monday night, the Forest City Railway Company was granted franchises on Central Avenue and on Quincy Street, and on the east side of the Public Square from Superior Street to Euclid Avenue.

The Forest City Company is pushing work on the equipment of its power station, formerly a water-works pumping station leased from the city, and it claims that within thirty days it will be operating cars over the route from Denison Avenue across Fulton Street, and down Detroit Avenue to Pearl Street, and thence to the Public Square. About one-quarter of the distance is over the tracks of the Cleveland Electric Railway on alleged free territory. The company has not yet made its connections with the free territory tracks being held up by a switch on Fulton Road, owned by the Cleveland Electric. It is attempting to get around this by building through Franklin Circle, a small park owned by the city. The property owners near the park object to building through the circle, and this question has yet to be settled.

The City Council has fixed the amount which the Forest City Company is to pay the Cleveland Electric for the use of the free territory tracks.

OLD COLONY OVERCOMES OBSTRUCTIONISTS

The Old Colony Street Railway Company has overcome the obstacle that has for some time stood in the way of a fourth trolley freight and express route in Southeastern Massachusetts. The company started its first freight cars between Taunton and Providence in midsummer of this year; later it added an extension between Taunton and the important shoe center of Brockton; several weeks ago it extended the service still further by adding other cars between Brockton and North Abington, Rockland and Whitman; finally it sought to give a fourth extension by running a car from Brockton down through West Bridgewater and Bridgewater to Middleborough. It proved easy to get the local rights in Bridgewater and Middleborough, but in West Bridgewater it was different. There the grant was held up, and for a time it looked as if the Middleborough connection would have to be temporarily abandoned.

A fortnight ago, however, the Old Colony began to figure out a way of getting around the obstructing town. It has a line from Bridgewater to Taunton, by way of Raynham, and after some study it was deemed feasible to start the Middleborough service from Taunton instead of Brockton. The local rights in Raynham were secured, and the grant approved by the Railroad Commission last week. The single box car that will take care of the business for the present was started on regular trips Monday. It leaves Middleborough in the morning, runs northwest to Bridgewater and southwest to the company's freight station to Taunton. There it exchanges freight to and from Brockton and the other connection places on the north and Providence on the south, the matter being handled by the "through" freight cars already running between Brockton, Taunton and Providence with two round trips daily. The Middleborough car waits for the return car from Providence in the afternoon before making its own return to Middleborough, thus giving Middleborough and Bridgewater one round trip daily. The route for this new car is a little longer than it would be if the connection had been secured with Brockton, but it is expected to answer fully as well. West Bridgewater loses the trolley freight advantage, but the company gets a freight route open to Middleborough, which is virtually the last important town on the run from Taunton to New Bedford.

A change that may develop in connection with the Old Colony company's interesting trolley and boat service between Boston and New York direct was announced in Boston a few days ago. It is the transfer of the Enterprise Transportation Company's property—the water end of the Boston-New York service referred to—to the Dupont Powder Company, of Wilmington, Del. The transfer is supposed to have been in the interests of C. W. Morse, the principal factor in the gradual combination of steamboat and steamship lines along the cost between New York and Boston and Maine and Provincial ports. It is not expected that the change will alter the policy of the Enterprise service at present.

CHANGES IN THE McGUIRE-CUMMINGS MANUFACTURING COMPANY

The McGuire-Cummings Manufacturing Company, since the erection of its new works at Paris, Ill., has found it necessary to establish a New York office and to keep at this most convenient point for export a staff of engineers to look after its increased volume of business. The new offices are located at 42 Broadway, and Elmer E. Cook, formerly with the McGuire-Cummings Company, but lately with a large rolling stock manufacturing company in Great Britain, has been appointed manager.

The opening of the new works marks an important development in the history of this company, as it now enters the field fully equipped to manufacture everything in the rolling stock line, including passenger and freight cars, as well as their many specialties. Considering the number of orders which the company has already received for snow sweepers, it judges the street railway world must be expecting a very severe winter.

THE LIMA & TOLEDO LINE OPENED

The Lima & Toledo Traction Company began operating cars over its line between Lima and Ottawa on Saturday, Sept. 15, at 10 o'clock a. m. The contract for the construction of this line was held by the Stratford Railway Construction Company and sublet to another company, which turned the work over to the Stratford Company on Aug. 17, on account of being unable to complete the line in time to operate the cars on Sept. 15, the date on which franchises expired at Columbus Grove and Ottawa. Gaylord Thompson, president of the Stratford Company, and J. M. Walker, chief engineer, took hold vigorously and succeeded in getting the line into such shape that operation as stated could be begun.

On Aug. 17, there was still 2 miles of track to be laid, 17 miles of poles to be erected, 10½ miles of feeder and trolley wire to be stretched, 10½ miles of track to surface and 5500 yards of excavation and embankment to finish at one point where there was a deep cut and high fill ¾ of a mile apart. The work of getting the excavation completed and track finished was handled by Harry Evans, and that of erecting the overhead by William Jeffries. On Aug. 17, the entire force consisted of about 80 laborers and 7 linemen. This force was gradually increased to 240 laborers and 20 linemen. Poles were set at the rate of 1½ miles per day. A boring machine cutting a hole 24 ins. in diameter was used on some parts of the line for digging holes and a derrick attached to same set the poles in the hole. Feed-wire and three high-tension wires were placed on the poles by means of two masts erected on a car, with booms extending from one mast over the cross-arms, the reels of wire being set in jacks at the front of the train, the wire running through a snatch block on the first mast above the cross-arms and then through blocks on the two booms of the second mast, which left them lying on the proper cross-arms. By this means a mile of wires, consisting of a 300,000 cm cable and three No. 2 high tension could be laid on the cross-arms in 7 to 10 minutes, after connections were made and reels installed in jacks. The trolley wire was erected in much the same way and suspended by means of hooks at each pole. About 5 miles could be put up in one day of 10 hours.

At one or two points on the line considerable ingenuity was used to get the trolley wire up. On account of local difficulties at Ottawa, where the poles had not been set, the trolley wire was suspended from ropes stretched across the street between trees. The track for 10 miles is in good surface and line. The balance is still lying on the subgrade on account of lack of stone for ballast, but a speed of 15 miles per hour can be maintained over any part of it.

THE WEST JERSEY & SEA SHORE OPENED

As scheduled, service was begun Tuesday, Oct. 18, over the electrified line of the West Jersey & Sea Shore Railroad between Camden and Atlantic City, which has been referred to from time to time in the STREET RAILWAY JOURNAL. Through trains leave daily, including Sundays, both Camden and Atlantic City, on the full hour, every hour from 7.00 a. m. to 11.00 p. m. The running time is 90 minutes. The fare one way from Philadelphia to Atlantic City is $1, and an excursion ticket, good for fifteen days, is sold for $1.50.

AN OPPORTUNITY IN MEXICO

Manufacturers of electric railway supplies and equipment would do well to get into communication with Schondube & Neugebauer, electric railway department, Toluca, Mexico, as they contemplate the laying of several lines of electric railways in Mexico, and in a near future will be in the market for bids for the material.

STREET RAILWAY PATENTS

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

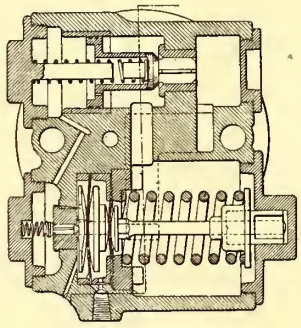
UNITED STATES PATENTS ISSUED SEPT. 18, 1906

831,063. Car Seat; Henry W. K. Hale, Philadelphia, Pa. App. filed April 2, 1902. Relates to twin seats mounted on a common pedestal, and refers particularly to means for positioning and locking the seats at any angle with respect to the car.

831,121. Car Wheel; Edward L. Troup, Wauseon, Ohio. App. filed Dec. 11, 1905. The wheel is provided with a detachable flanged rim or tire, adapted to be securely locked thereon without the use of bolts, whereby the tire may be readily removed from or attached to the body of the wheel without removing the wheel from the axle.

831,149. Amusement Device; Ernest A. Fuller, New York, N. Y. App. filed Dec. 12, 1905. The car passes down an inclined trackway having a U-shaped loop at its lower end, which imparts a rotary movement to the car. A body of water is provided at the bottom of the track into which the car is projected while rotating.

831,216. Car Step; George W. Davis and Joseph A. Hicks, Denton, Tex. App. filed May 21, 1906. An auxiliary step hinged to the lower step of the ordinary set of steps and adapted to fold thereunder when not in use.



PATENT NO. 831,418

831,295. Shield for Car Handles; William H. Pontius, Columbus, Ohio. App. filed May 28, 1906. A shield to prevent persons leaving an open car from grasping the rear handle.

831,325. Rail Sanding Device; Frederick J. Burlingame and Joseph Merrill, Woonsocket, R. I. App. filed Jan. 18, 1906. Relates to details of construction of the discharge valve and agitator.

831,376. Railroad Signaling; Petrus J. Portman, Amsterdam, Netherlands. App. filed July 6, 1905. A special trolley is provided in a steam railroad, and the switches of the track are arranged to establish an alarm circuit therewith when improperly positioned.

831,412. Trolley Wheel; John Brown, Camden, N. J. App. filed Dec. 16, 1905. A pair of auxiliary wheels mounted one on each side of the main wheel, so as to receive the conductor in case the trolley leaves the wire.

831,418. Automatic Air Brake System; Fred. B. Corey, Schenectady, N. Y. App. filed Dec. 19, 1903. This system relates to means for gradually applying and gradually releasing the brakes.

831,467. Trolley Head; William H. Pfrimmer, New Albany, Ind. App. filed Nov. 2, 1905. A pair of arms mounted on the harp which may be projected upward opposite the trolley wheel when guiding the latter onto the wire. When the arms are returned a pair of small guiding wheels are positioned to hold the trolley wheel against leaving the wire.

831,509. Trolley; Jacob T. Haudenshield, Scott Township, Pa. App. filed Nov. 10, 1905. Supplemental arms pivoted at the upper end of the trolley harp and in which the wheel is journaled. The arms are normally held in a vertical position by spring means, but when the wheel strikes an obstruction they are capable of a rearward yielding movement.

PERSONAL MENTION

MR. H. H. CARR, of Newport News, Va., has been appointed general manager of the Raleigh Street Railway Company, as a result of the acquisition of a controlling interest in the company by the Bond & Electric Company.

MR. GEORGE A. SAYLOR has resigned as superintendent of the Indianapolis, Columbus & Southern Traction Company, of Columbus, Ind. Mr. Saylor has been connected with the road from its inception. He will enter commercial work.

MR. FRANCIS H. ELY has been appointed electrical engineer of the Union Railway Company, of New York, to succeed Mr. R. E. Bennings, resigned, who is now in charge of important work at Lima, Peru, for W. R. Grace & Company, of New York.

MR. T. EDWARD HAMBLETON, retired banker and former head of the banking house of Hambleton & Company, of Baltimore, died Friday, Sept. 21, at his country home, aged 78. Mr. Hambleton was the father of the rapid transit system of Baltimore, having financed the cable system, afterwards changed to electric, in connection with the Widener-Elkins syndicate of Philadelphia.

MR. JAMES H. McGRAW, president of the McGraw Publishing Company, publishers of the STREET RAILWAY JOURNAL, the "Electrical World" and the "Engineering Record," has been appointed one of a committee of three by Governor Stokes, of New Jersey, to report on the feasibility of a law providing for a division with the State of the profits of public service corporations derived from privileges they enjoy through the State and the municipalities in which they operate.

MR. O. D. COLVIN, who some weeks ago resigned as general manager and treasurer of the Seattle-Tacoma Power Company, has announced that he will hereafter associate himself with William Piggott, president of the Seattle Car Manufacturing Company, which has its plant at Youngstown. Mr. Colvin will be general manager of the Seattle Car Manufacturing Company. The company intends to secure a new location, its capital stock being increased, and will engage in the manufacture of all kinds of steam railway rolling stock on a large scale.

MR. GEORGE W. PIERCE, who, as noted in the last issue of the STREET RAILWAY JOURNAL, resigned as manager of the Stamford and Port Chester divisions of the Consolidated Street Railway Company, on account of ill health, is succeeded by Mr. E. R. Gilbert. Mr. Pierce has been prevailed upon to retain the position of superintendent of the Stamford lines of the company. Mr. Gilbert will make his headquarters in Port Chester. Mr. Gilbert has had experience in street railway work in Hartford and elsewhere and has worked in the West in railroad and other construction work.

MR. DANIEL T. HUNT, Illinois manager of the American Surety Company, of New York, and former president of the North Chicago and West Chicago Railroad Companies, died suddenly of heart failure, Monday, Sept. 18, in his apartments at the Hotel Del Prado, Chicago. Mr. Hunt was born in Rutland, N. Y., and moved to Rochester when a young man. He lived in that city for thirty years, and was postmaster of Rochester from 1875 to 1887. He was business manager of the Rochester "Post-Express" from 1882 to 1893. He came to Chicago to live in July, 1893, and was made manager of the surety company for Illinois. He succeeded Mr. Charles T. Yerkes as president of the North Chicago and West Chicago Street Railroad Companies in 1899, and took charge of the legal exigencies of the situation after the lines were absorbed by the Union Traction Company. Mr. Hunt is survived by a widow, two daughters and a son.