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printed. Total circulation for 1906 to date, 426,950 copies, an
average of 8210 copies per week.*

Permissive Blocking in Suburban Service

One of the most serious questions in the operation of sub-
urban railway lines, steam or electric, on private rights of
way, is the matter of passing block signals at danger. From
one point of view a train or car should never pass a danger
signal under any circumstances whatever; from another, this
seems too restrictive in view of the long delay which follows
if a signal is out of order. Suburban blocks are getting
shorter and shorter as traffic increases, so that in some cases

it is possible to see more than one block signal at a time for a
single route control. Traffic is so heavy in some cases that
if a train or car is held up more than a few seconds by a
signal between stations, the delay becomes cumulative to an
extent that tends to become very trying at the busy terminals.

There ought to be little question about the danger of pass-
ing a block signal set against one on a single-track line, and
no argument is needed to demonstrate the serious risk at-
tending such a course. It is better to go ahead with a flag
or lantern in such a case than for a car to leave a turnout
or block section point. If the signal system is out of order
it will not take long to find it out. Here is where the tele-
phone and the dispatcher can do a great deal to facilitate
the safe movement of traffic without long delays.

On a double-track system, permissive blocking may be safe
on tangent tracks if the train or car comes to a full stop at
the danger signal, and then proceeds slowly and under perfect
control to the next clear signal. The same thing may be
true on curves, but in no such case is it safe to run past a
danger signal at full speed, or even at half speed. This is
sometimes done by cars or trains passing the last signal at a
curve before entering a station, on the assumptions that the
preceding train has reached the station and that the track
between the signal and the platform is clear for a slow-down
and stop, if necessary, by the succeeding cars. In such cases
dependence is shifted from the block signal to the rear brake-
man or electric car conductor, who may go back quickly
enough for flagging, and who may not. Only upon double
track is it safe to allow permissive blocking, and then only
after a full, complete stop has been made.

The Waltham Suburban Plant

The new power plant at Waltham, Mass., which we de-
scribe in this issue, is a comparatively small installation in
point of present capacity, but one of no little interest as em-
phasizing some of the more recent tendencies in the design of
power stations built for both railway, lighting and commer-
cial motor service. The use of reinforced concrete in the
walls, chimney foundation, chimney and roof is quite in line
with the latest modern development in the adaptation of
common structural materials to pleasing designs suited even
to residence districts in the suburbs of large cities. Again,
the provision of open-work lockers and first-class lavatory
facilities marks the further progress of a movement for the
industrial betterment of power-plant workers which is quite
generally being taken up elsewhere.

The selection of turbines instead of reciprocating engines
is of course a common procedure in these days, but it is
significant that in this installation the capacity of the gener-
ating plant can be increased 250 per cent without much alter-
ation of the engine room, and even then the station will not
be crowded. The compactness of the turbo units is striking
when one realizes that each 500-kw outfit is less bulky than the

400-kw motor-generator set which supplies d. c. power to the suburban lines in Newton and Waltham.

A noticeable feature in the boiler room design is the basement underneath, which allows the ashes to be carted away without the least hard labor, since the teams are driven into the basement directly beneath the hoppers. The centralization of the feed-water heating equipments, the boiler feed pumps and the tank receiving the condensation of the turbines, into a compact central area in the boiler room is thoroughly commendable in its economy of piping and reduction of complications. Mechanical stokers and large overhead bunkers, which under ordinary conditions would have been good practice, were not used in conjunction with the interesting coal-handling system because the cost of the work was too great when balanced against the advantages. Nothing could have been gained by storing the coal in bins under cover, as the amount of coal to be stored outside is comparatively small and the effect of exposure to rain and snow would be slight. The outside storage provided for is simply to store coal in anticipation of a strike or a shortage on cars. Of course the question of motor vs. steam-driven auxiliaries is one of the old-time subjects for debate, the solution of the problem depending largely upon the amount of exhaust steam needed for heating the boiler feed water. The use of a synchronous motor generator set for railway service is certainly commendable in this instance of combined railway and central station output. All things considered, the plant is well adapted to the economical production of power through the modern equipment and combined railway and lighting load factors which it has, and when it is completed to its full capacity of 4500 kw it will doubtless well serve the needs of interurban transportation at the west of Boston outside the limits of the Boston Elevated system. The Newton and Waltham lines have long needed a typically modern power supply, and it is reasonable to expect that the new plant at Waltham will in time entirely supersede the older plants which are still in harness.

Car Ventilation

This is the season of discussions upon the ventilation problem. In a recent editorial we indicated a fertile cause of ventilation difficulty in the too common overheating of cars. We believe that with this remedied the amount of complaints would be very considerably reduced, yet there is no doubt that much of difficulty would still remain. A car is in itself a rather small space, say 2000 to 2500 cu. ft. in extent. If it were a room with a small number of occupants, as in an office, ventilation would be a trivial task to be accomplished by the simplest means. Most offices, in fact, have no means of ventilation whatever in winter save a little natural draft from windows open a mere crack. Into the car, however, must be crowded at times more people than would be found in ten offices of similar area and considerably greater height, as many, in fact, as can be crowded into the floor space. Under such conditions vitiation of the atmosphere proceeds very rapidly and the car becomes stuffy in a few minutes. Now, bad air does not go out of its own accord, especially when pocketed in the interstices of a crowded car, and here lies the root of the difficulty. In a room of ordinary area and height a fan working far above the heads of the occupants can change the air several times an hour without perceptible draft, for the space is fairly high and free, so

that air can be withdrawn very freely. Not so in the car, for the air must go out, if at all, either directly through the crowd or barely over its head, and to give really good ventilation must be moved at something like ten times the rate that would be amply sufficient in an office of similar capacity.

Here is the difficulty in the contracted space in which air must be moved rapidly to make the requisite change, complicated by the fact that the space is filled with people who obstruct free flow of the air. If one could run a car with the doors wide open he would move the air rapidly enough, but at the expense of creating an intolerable draft. Barring the front door, the available entrances for air are the windows just at the backs of the passengers' necks, and the ventilators in the monitor just over their heads. There is also a chance for admitting air under the seats about the passengers' legs. The proximity of the live load to all these entrances makes drafts well nigh inseparable from any of these methods of getting fresh air. Has the man who kicks ever seriously considered these things? We hear now and then of agitation in favor of compulsory ventilation of cars. If there were a simple and effective way of getting good ventilation without drafts it should certainly be applied at once—nay, it would already have been applied long since. Ventilation on a rapidly moving car is easy, extremely easy, but one cannot open up holes in the car of the requisite size without direful drafts. Between these two things a middle course must be steered and a suitable compromise effected. Let those who kick put their wits to work and find a practical solution of the difficulty. It will be no easy task, as all who have tried it, and they are many, have found to their sorrow. As a pointer in the investigation it is worth noting that no manner of ventilating fan can work without giving the air considerable velocity, which means a draft, and without in fact velocity enough to draw air rapidly through the interstices of a crowded car, which implies a yet bigger draft. It can only be more effective than natural ventilation if it moves the air more rapidly.

To take up the question seriously one must consider what constitutes the peculiar offensiveness of a draft. More than anything else it is a considerable difference of temperature between the still air and the moving air. Hence, as we before intimated, less difference between the external and internal temperatures will tend to decrease the ill effects of a draft and will render a rapid current of air less disagreeable. One can open a ventilator in a car heated to 50 degs. or 55 degs. with comparative impunity, while if the temperature were 65 degs. or 70 degs. the effect would be far from agreeable to many people. Granting this, the first step toward good air in a car should be moderate heating, which enables one to get fresh air in with less apparent draft. Next, where should the air be admitted? Probably the most effective point would be the front door, but this would tend to chill the very front of the car and would practically reduce it to the outside temperature almost immediately. Entrances under the seats would tend to chill the passengers' feet, and if at the heaters would render even moderate heating exceedingly difficult. This expedient has been many times proposed, but we have grave doubts whether it could be made to give good results with any feasible system of heating. Taking everything into consideration, it would seem that the regular ventilators in the monitor give the best chance for getting in fresh air. People may throw open their wraps in a car, but

they do not remove their hats and are better protected from air entering from above than from any other direction. All this sounds commonplace enough, but how often does one enter a car and find the ventilators doing proper work? Most, or all, of them will be found closed, whereas the best chance of letting air enter without noticeable draft is by opening them all slightly and keeping them so. By doing this and keeping the rear door open as much as practicable pretty good conditions can be maintained. In addition to this much good can be done by systematic and thorough airing of the cars at the ends of the run or at any time when possible. A run of two minutes with both doors wide open would do much in freshening the air, and it is a remedy for bad air very easily applied. Combined with persistent moderate opening of the ventilators it should be tolerably effective even during the rush hours—certainly much better than the usually rather unsystematic though well-intentioned efforts generally made. If tried in combination with very moderate heating good results should be secured.

Water vs. Steam in Africa

For more than a decade the Victoria Falls project has been under discussion. It was almost contemporaneous with the early stages of the Niagara plant, and falling from time to time into abeyance, it has been regularly revived with renewed enthusiasm. About a year ago it began one of its periods of activity with greater hopes than ever before, and only a few weeks since it was announced that at last development work had been undertaken and that a contract for the electrical part of the great enterprise had in fact been awarded to a well-known German firm. The project is indeed a mighty one, the transmission of 150,000 hp some 700 miles through the heart of Africa and its utilization for the mines on the Rand. Recent London papers, however, contain additional information that rather stems the rising tide of congratulation. It seems that the contract in question is not for the Victoria Falls transmission at all, but for the equipment of a steam-driven central station near the mines, reputed to be for immediate distribution and stand-by purposes. The capacity of this station is stated to be 20,000 hp. Whether this full capacity has been contracted for or not we do not at present definitely know, but there is certainly no record-breaking transmission under way yet. The British South Africa Company has also planned to purchase the larger of the existing plants which dispense electric power on the Rand, and clearly intends to go into the electric central station business at once. Whether anything has been done to bring the actual Victoria Falls transmission from out the realm of promotion into that of accomplished fact has not yet transpired. The promoters have secured competent engineering advice at all events, but it takes more than a board of consulting engineers to promote a six-million-pound investment.

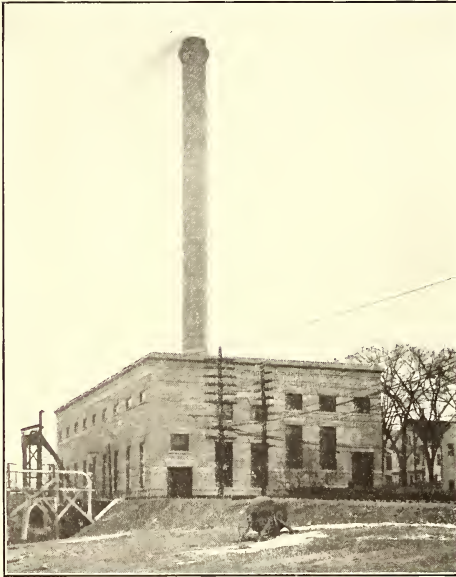
The transmission scheme as at present outlined lacks, so to speak, artistic verisimilitude. It is bald and unconvincing as yet. The voltage and the nature of the current to be transmitted are still mere details which are secondary to the stock subscriptions. A steel tower line is projected, with Nature's mighty forces at one end and a 20,000-hp steam turbine station at the other end. Another curious and diverting feature is the proposed use of a gigantic hydraulic accumulator near the Rand, capable of taking care of a twelve hours interrup-

tion of service before the steam reserve is called upon. This is interesting if true, and we hope at some future time to present the specifications of such an hydraulic accumulator—they would make mighty interesting reading. In particular an estimate of cost would be most welcome, together with the reasons why it is desirable to duplicate the generating plant twice rather than to use a gas auxiliary which can be quickly put into action, if an ordinary steam reserve is undesirable on the score of slow starting unless kept fully under steam. Another point on which we should like to be enlightened is the minimum power at Victoria Falls in the dry season. The drainage basin of the Zambesi is not reinforced like the Niagara basin by the biggest lake area in the world, but is practically without storage and is not heavily forested, large portions of it being open country in need of irrigation. In times of flood the available power is certainly enormous, but of late there have been rather discouraging rumors of the power of the minimum. The facts in the case and the possibilities of artificial storage have not yet been adequately stated. It is one of the world's great powers, doubtless, but how great and how reliable as a source of transmitted power on a colossal scale?

The market for power in the Rand seems to be of a most promising character. It is rated at hard upon a quarter of a million horse-power, much of it in use twenty-four hours per day for pumping and milling. The possible load factor upon an electric power plant would therefore be very high, whether the source be water or steam power. In either case the large and steady load is most advantageous from the standpoint of economy, and the neighborhood of the Rand is certainly a good field for a big steam plant such as has been contracted for. When one can work on a very large scale and the load is steady a steam plant can profitably furnish power at a very low figure—low enough beyond question to displace power generated at the individual mines. The proposed steam plant, therefore, should be able to make a good profit quite independently of its possible use as a stand-by plant for a transformer at some later period. The nature of the demand, the prices practicable, and the general features of the Rand as a market can therefore be ascertained precisely and profitably before the company has committed itself irrevocably to the huge transmission. This is an advantage, although it may not hasten the completion of the whole work. A few years from now the high-voltage question may be nearer a definite answer than now. Basing judgment on American experience the proposed transmission is feasible enough granting a working pressure of not less than about 150,000 volts. The extra length of the line is rather a nuisance from the standpoint of maintenance, but that is all, providing 150,000-volt insulators are proved to be reliable. Until data on this point are at hand it is idle to pass an opinion on the financial prospects of a plant at Victoria Falls. At the present moment it looks very much as if the major project had seen its own shadow in the form of a steam plant and after the fashion of the ground-hog had retreated for another brief nap. Meanwhile the British South Africa Company is apologizing elaborately for failing to patronize home industry and leaving German capital and German engineers to begin the project, if a steam plant near the mines can fairly be called a beginning. Success to the enterprise, anyhow, whether it ends with steam or goes on to furnish electric power for the Cape-to-Cairo railroad.

THE NEW POWER PLANT FOR RAILWAY AND LIGHTING SERVICE IN WALTHAM

A new power plant has recently been placed in operation in Waltham, Mass., by the Waltham Gas Light Company, which supplies railway power in part to the Newton Street Railway Company, to the Lexington & Boston Street Railway Company, and the Newton & Boston Street Railway Company, besides generating central station current for sale in the city of Waltham itself. The group of suburban street railways lying in the Newton and Waltham territory has been somewhat handicapped for power of late, and the generating plants which have operated these systems have not been of the latest and most economical design. The new station at Waltham was therefore built for the double purpose of supplying cheap power to the railway lines above



EXTERIOR OF WALTHAM POWER STATION

mentioned and to produce current for power and lighting on a thoroughly modern basis of operating economy.

The plant was designed by J. G. White & Company, of New York, and it is located near the business center of Waltham on the south bank of the Charles River, where an ample supply of condensing and boiler feed water is available. The building is a steel frame and reinforced concrete structure, 157 ft. long, 80 ft. wide and 65 ft. high above the boiler-room basement, with a concrete-steel chimney 197 ft. high and 8-ft. 6-in. inside diameter serving the plant. The side walls, roof and interior curtain walls are of reinforced concrete, and the building is a thoroughly attractive structure in its general appearance. It stands on one side of a street on which a large number of dwelling houses are located, but the finish of the concrete and the plain cut, effective ornamentation are so pleasing that it is not in any sense a disturbing factor in the appearance of the street. A number of shade trees are growing on the south side of the station, next to the street, and the whole building is decidedly inconspicuous. The design of the stack is unusually graceful, and

there is no suggestion of the architecturally unlovely brick or iron chimney in its slender column of gray.

The building is divided longitudinally into a boiler room and an engine room by a fire wall running through its center. Beneath both boiler and engine rooms are basement portions containing various auxiliary piping and pumping equipment. Coal is stored both in the bunkers above the boilers and in a yard just outside the plant. The yard has a bottom of tar concrete and a storage capacity of 3000 tons, while the overhead bunkers have a storage capacity of about three days' supply at full plant load. Coal is brought to the plant in cars over a siding of the Fitchburg division of the Boston & Maine Railroad. This siding connects with a private track which runs upon a trestle over the yards, and coal is dumped by gravity into the yard from the cars. A hopper is also located beneath the track to receive the coal, which is delivered to a crusher in the boiler room basement, whence it is elevated to the bunkers in a bucket elevator and distributed by a belt conveyer. The coal-handling machinery was supplied by the Robins Conveying Belt Company, of New York City. The crusher is a 24-in. x 30-in. outfit, weighing 7000 lbs. It is driven by a 25-hp, 550-volt d. c. Westinghouse motor. The bucket elevator consists of 85 Salem buckets spaced 18 ins. apart on centers, and the belt conveyer is a rubber belt 18 ins. wide and 86 ft. 8 ins. long. These two are driven by a 15-hp, 550-volt d. c. Westinghouse motor, the capacity of the conveying system being 50 tons per hour. From the bunkers over the boiler-room floor the coal passes down through stationary automatic coal scales of the Richardson type, each 100 lbs. being weighed and registered as it passes into the discharge chutes which terminate near the floor of the fireroom in front of the boilers. As there are four boilers at present in the plant there are four sets of hoppers, with gates of cast iron having a maximum opening of 20 ins. x 24 ins. for delivering and controlling the coal supply to the weighers.

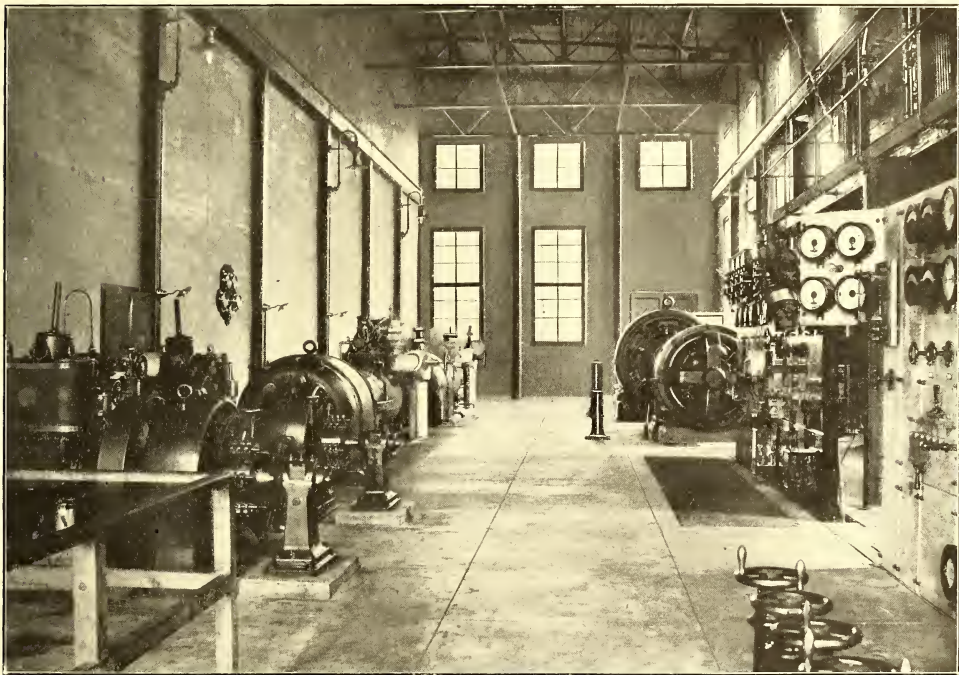
Each weigher is equipped with an agitator operated by hand, and the crusher is fitted with a shaking screen of 2½-in. mesh.

The four boilers were each supplied by the Stirling Company, and each is rated at 354 hp, containing 3540 sq. ft. of heating surface, three 36-in. x 16-ft. 3-in. steam drums and 348 ¾-in. charcoal iron lap-welded tubes. The grates are of the Foster shaking type and the working steam pressure is 175 lbs. The boilers are arranged in two batteries of two each, and the ashes are discharged by gravity from the ash pits into wagons which enter the basement and are driven beneath the ash-pit hoppers, to save an extra handling. The boiler room is large enough to allow the present equipment to be doubled, and this work will shortly be undertaken. Each boiler has a 7-in. steam delivery outlet. The chimney was built by the Weber Steel-Concrete Chimney Company, of Chicago, and it is one of the highest chimneys in the State of Massachusetts, outside of Boston proper. The concrete of this chimney was made of 1 part Portland cement and 4 parts sand, and the largest outside diameter of the chimney is 11 ft. The first 77 ft. above the foundation is built double with an air space between, the balance of the height being single. The outer shell of the double part is 7 ins. thick, while the air space between the shell and the inner shell are each 4 ins. thick. The single-shell portion, 120 ft. high, is 5 ins. thick. The foundation is reinforced with cross layers of steel bars placed diagonally and parallel to one another. The steel reinforcement of the chimney consists of vertical bars and horizontal rings, the vertical bars being of sufficient strength to take up all the bending strains caused by wind pressure. The horizontal rings are placed 3 ft. apart in the outer shell and single part and 18 ins. apart in the inner

shell. The ends of the steel bars connecting lengthwise are overlapped, and the rings are fastened to the steel vertical bars, with overlapped ends. The air space is connected at the bottom with the atmosphere and at the top of the inner shell with the flues proper by means of an expansion joint.

The vertical bars of the chimney reinforcement are bent to spread out over the base and partly go down below the cross layers in the foundation, to form a perfect anchorage. The chimney is guaranteed to withstand a wind pressure of 50 lbs. per sq. in., which is equivalent to a wind velocity of 100 m. p. h., and to withstand the influence of the atmosphere, the

Westinghouse vertical engine running at 390 r. p. m., with 2½-in. steam and exhaust outlets. The maximum length of each turbine, excluding the generator, is about 12 ft. 7 ins., the width being 4 ft. 6 ins. The maximum height above the floor level is 6 ft. 7 ins. Each turbine set weighs 25,000 lbs. exclusive of the generator, the complete set weighing 45,000 lbs., or 9 lbs. per kilowatt. The maximum length of the combined unit over all is 21 ft., and the weight of the heaviest piece of the generator to be handled by the power house crane was 15,500 lbs. The revolving bipolar field weighs 4,500 lbs. The guaranteed maximum dry saturated steam



INTERIOR OF WALTHAM POWER STATION

chimney gases and temperature not exceeding 1500 deg. F. It is equipped with an inside ladder and a three-point platinum-tipped lightning rod which extends 5 ft. above the top of the chimney.

The boiler feed pumps are located in the boiler room at the level of the firing floor and beneath a feed-water tank of 1740 gallons capacity, which is mounted on a steel framework about 10 ft. above the floor. The pumps were supplied by Fairbanks, Morse & Company, of New York, and consist of two 10-in. x 6¼-in. x 10-in. outside-packed pot-valve pumps, each having a capacity of 150 gallons per minute at 50 ft. per minute piston speed. Each pump was built for operation on full boiler pressure, and the sizes of the connections are: suction, 5 ins.; discharge, 4 ins.; steam supply, 2 ins.; steam outlet, 2½ ins. The water cylinders were tested tight at 350 lbs. pressure per sq. in.

The present generating equipment consists of two 500-kw, 60-cycle, 2300-volt, two-pole, three-phase, 3600-r. p. m. Westinghouse-Parsons turbo-alternators. There are two 25-kw, 125-volt exciters, each direct connected to a 7½-in. x 7-in.

consumption at various loads was:

Approx. Full Load.....	728 B.H.P.	14.3 lbs. per B.H.P. hour.	} 3,600 r.p.m. } 28" vacuum. } 175 lbs. steam
Approx. ¾ Load.....	560 B.H.P.	14.8 lbs. per B.H.P. hour.	
Approx. ½ Load.....	380 B.H.P.	15.7 lbs. per B.H.P. hour.	

With 100 deg. superheat the guarantees were:

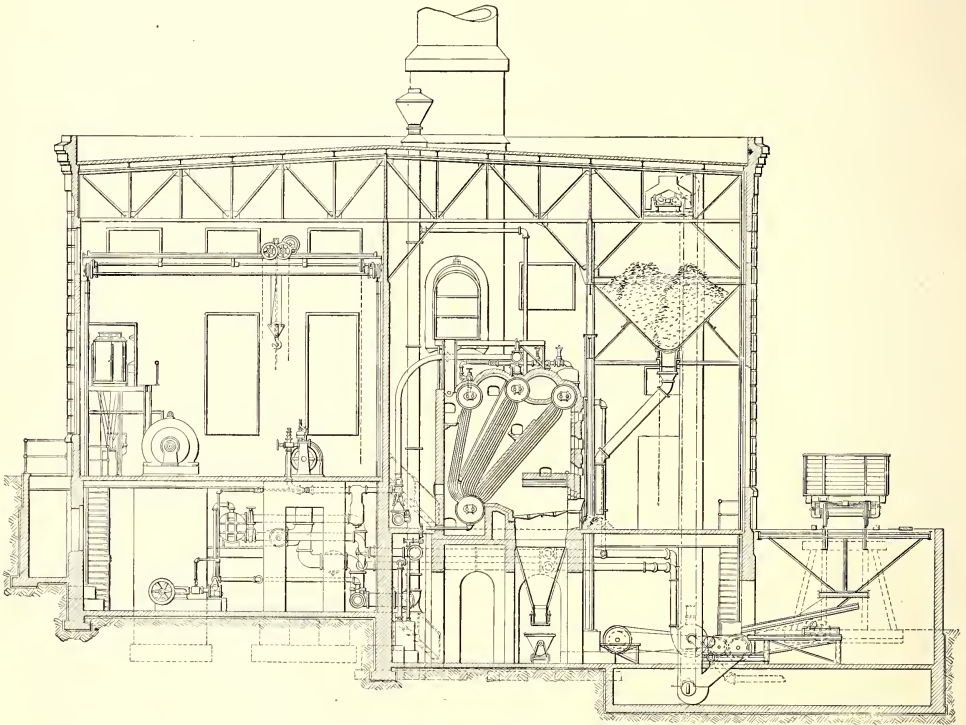
Full Load.....	12.9 lbs. per B.H.P. hour.	} 3,600 r.p.m. } 28" vacuum. } 175 lbs. steam.
¾ Load.....	13.4 lbs. per B.H.P. hour.	
½ Load.....	14.3 lbs. per B.H.P. hour.	

These sets are mounted on concrete foundations in the engine room, and they deliver power to two sets of three-phase, 2,300-volt bus-bars behind the switchboard from which the various services of the station are drawn. It was planned originally in building the plant to install a 400-kw, 600-volt direct-connected generating unit driven by a reciprocating engine in the southeast portion of the engine room, but this has not been done, as it has been decided to install a 2000-kw turbo-alternator here, to operate at 6000 volts. A 1500-kw turbo-alternator will also be installed at the west end of the engine room. Railway power is at present drawn from a 400-kw motor-generator set which is installed in the engine

room, and which consists of a 432-kw Westinghouse sixteen pole, three-phase, 2300-volt separately-excited synchronous motor direct coupled to a 400-kw, 450-r.-p.-m., 550 to 600-volt railway generator mounted on the same bed plate. A G. E. induction motor-generator set of 120-kw capacity supplies the local 550-volt power load of the station. This set is connected with the trolley wire at night after the cars have stopped running, for the purpose of supplying light and small power to the company's shops and car houses, and also supplies 500-volt power to city power customers during the day time.

The efficiency guarantees of the railway motor-generator

a 7-in. x 8-in. vertical engine, and two 20-in. hot wells. All this equipment was supplied by the Alberger Condenser Company, of New York, and the installation is guaranteed to maintain a vacuum of 28 ins. of mercury or 2-in. absolute pressure when the circulating water is supplied at 70 deg. F. The circulating water for the condensing system is taken from a well located 50 ft. from the boiler room towards the river, and connected therewith by an intake conduit 440 ft. long and 10 sq. ft. in cross-sectional area. The discharge conduit back to the river is of the same area. The circulating pumps are located in the boiler-room basement next the outer wall. The circulating water is elevated by a siphon system, the



CROSS SECTION OF POWER STATION

set were, at 100 per cent power factor and normal voltage:

	Synchronous Motor	Generator (Including Friction).
Full Load.....	93.5 per cent.	92.5 per cent.
$\frac{3}{4}$ Load.....	93	91.5
$\frac{1}{2}$ Load.....	90	88
$\frac{1}{4}$ Load.....	85.5	80

The efficiency guarantees of the exciter sets were:

Full Load.....	88.5 per cent.
$\frac{3}{4}$ Load.....	88
$\frac{1}{2}$ Load.....	87
$\frac{1}{4}$ Load.....	80.5

The condensing equipment consists of two Alberger counter-current surface condensers, one for each turbine, with 2000 sq. ft. of cooling surface each, two 6-in. x 4-in. x 10-in. horizontal single-stage rotative dry-vacuum pumps, two 8-in. double suction centrifugal circulating pumps, each driven by

highest point of which does not exceed 32 ft. above the low water level in the wet well. The Alberger Company also furnished two wet vacuum pumps for the hot wells, whose sizes are each $5\frac{1}{4}$ ins. x $4\frac{3}{4}$ ins. x 5 ins.

The condensation from the hot wells is used over and over in the boilers, make-up water being supplied from either the river or the city mains by a pump in the boiler-room basement. The condensation from the turbines is delivered to the feed-water storage tank in the boiler room, after which it passes through the feed pumps and thence through a Goubert exhaust steam feed-water heater of 250 sq. ft. heating surface, whence it is delivered to the boilers. The exhaust steam from the auxiliaries is used for heating the feed water in the usual way. A second heater will shortly be added to the equipment. The hot well and dry vacuum pumps are located in the basement of the engine room.

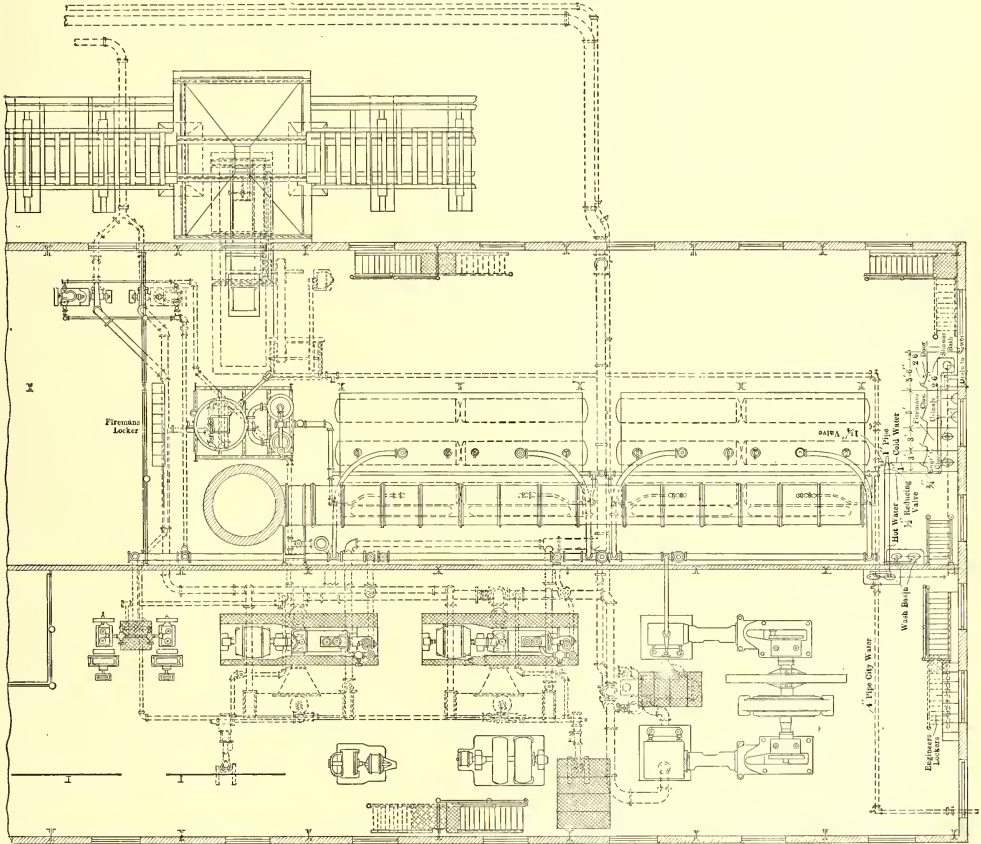
A 20-ton crane supplied by the Cleveland Crane & Car

Company, of Wickliffe, Ohio, serves the engine room. It is a double trolley outfit operated by hand, with a span of 34 ft. and lift of 35 ft. The runway is equipped with 50-lb. T-rails.

The piping was installed by the Walworth Manufacturing Company, of Boston. Standard wrought-iron pipe was used for all live steam lines, the main and auxiliary exhausts, low and high-pressure drains, priming, etc. The feed-pump discharge and boiler blow-off line are of cast iron, as is the condenser, circulating water, overflow and feed-pump section piping. Cast-iron pipe was tested in sample bars as follows:

stalled for the use of the turbines and the tanks and steam pump connected with it are in place in the engine-room basement. The exhaust riser is drained into the blow-off tank, and the feed-water heater is drained into the overflow pipe of the hot well. The trunk exhaust is a 16-in. line running nearly the entire length of the engine room. The exciters are supplied with live steam through a 4-in. line having two 2½-in. branches, one for each engine. A 1¼-in. and a ¾-in. line supply the dry and wet vacuum pumps. Special 3-in. lines serve the engines of the circulating pumps.

There are two switchboards in the plant, one for the rail-



PLAN OF POWER STATION

Sample bars having a sectional area of 1 sq. in. cast from the heat from which the pipe was made were tested with a central load of 500 lbs., when supported on knife edges having a clear span of 4 ft. 6 in. An exhaust riser of 16-in. diameter, made of spiral riveted pipe, is provided as an atmospheric bypass on the condenser system. This terminates in a 16-in. Stirling exhaust lead. The boiler 7-in. steam supply lines deliver into a 10-in. horizontal main from which the turbines are fed by 5-in. connections coming up from beneath the engine-room floor. In some cases loops are installed which provide an emergency supply to the apparatus served, in case of trouble on the main supply lines. An oiling system is in-

stalled for the use of the turbines and the tanks and steam pump connected with it are in place in the engine-room basement. The exhaust riser is drained into the blow-off tank, and the feed-water heater is drained into the overflow pipe of the hot well. The trunk exhaust is a 16-in. line running nearly the entire length of the engine room. The exciters are supplied with live steam through a 4-in. line having two 2½-in. branches, one for each engine. A 1¼-in. and a ¾-in. line supply the dry and wet vacuum pumps. Special 3-in. lines serve the engines of the circulating pumps.

There are two switchboards in the plant, one for the rail-

way service and one for the a. c. generators, power and lighting. The railway board contains six 16-in. and four 24-in. panels devoted to railway and 550-volt power service. The special feature of the totalizing panel on the railway board is the use of both a Thomson recording wattmeter and a Bristol recording ammeter. The direct-current generator for railway service is equipped with a reverse current relay to prevent the running away of the machine in case it should be reversed. At present a 400-kw generator for railway service in the old plant of the Waltham Gas Light Company is operated in multiple with the 400-kw motor-generator set in the new station, which is but a few hundred feet away.

The a. c. switchboard contains ten panels. There are two 16-in. panels, one for a Tirrell regulator, and a blank, and eight 24-in. panels. This board is of blue Vermont marble, and it has a panel for the two exciters, two 500-kw generator panels, a synchronous motor panel, an induction motor panel, also used for tub transformers, and four lighting feeder panels. Hand-operated oil switches with remote mechanical control are provided for throwing any machine or feeder upon either set of bus-bars. No special attempt is made to separate the railway and central station loads, the voltage regulator permitting smooth and close regulation in spite of the fluctuations. A special 30-in. panel is installed at one side of the engine room for the control of the various local lighting and power circuits in the plant, such as engine and boiler-room lamps, coal-handling motors, etc. A special motor-driven hoist is provided to enable coal to be delivered to the company's cars from the storage pile when desired for

promised open and short-circuit heat runs. The air gap measured 1 1/4 ins. and was uniform around the circumference of the revolving member.

In making the saturation and core loss test on open circuit the turbo-generator was belted to a direct-current motor, the pulleys of which were so adjusted as to give normal speed on the generator under test. The machine was run at its rated speed for a sufficient length of time to allow all variable conditions, such as friction, etc., to become constant, after which the following readings were taken:

MOTOR.				GENERATOR.			
D. C. Volts.	Amperes, Armature.	Amperes, Field.	KW.	Speed, R.P.M.	A.C. Volts, Armature.	Amperes, Field.	Core, KW.
525	52	3.35	27.3	3,600	0	0	.....
525	55	3.35	28.8	3,600	395	8	1.57
525	59	3.35	31.0	3,600	795	15.25	3.77
525	64	3.35	33.6	3,600	1,192	23	6.3
525	69	3.35	36.2	3,600	1,600	30.8	8.9
525	77	3.35	40.5	3,600	1,995	39.	13.2
525	85	3.35	44.6	3,600	0	0	.....
525	85	3.35	44.6	3,600	2,300	46.5	17.3
525	100	3.35	52.5	3,600	2,700	58.2	25.2
525	110	3.35	57.8	3,600	2,865	65.	30.5
525	52	3.35	27.3	3,600	0	0	.....

In making the short-circuit core loss and impedance test the armature leads were short circuited through an ammeter, and the field current increased from zero to a sufficient amount to have the amperes flowing through the armatures equal to about 150 per cent of full-load current. The following readings were taken:

MOTOR.				GENERATOR.			
D.C. Volts.	Amperes, Armature.	Amperes, Field.	KW.	Speed, R.P.M.	Amperes, Armature, per Phase.	Amperes, Field.	Core, KW.
525	52	3.35	27.3	3,600	0	0	0
525	55	3.35	28.8	3,600	63.8	12.2	1.5
525	60.5	3.35	32.3	3,600	126.5	24.5	3
525	68.	3.35	35.7	3,600	154.	30.2	8.4
525	77.	3.35	40.5	3,600	191.	37.4	13.2
525	9.5	3.35	3.	Belt off.	.....	.....	.....

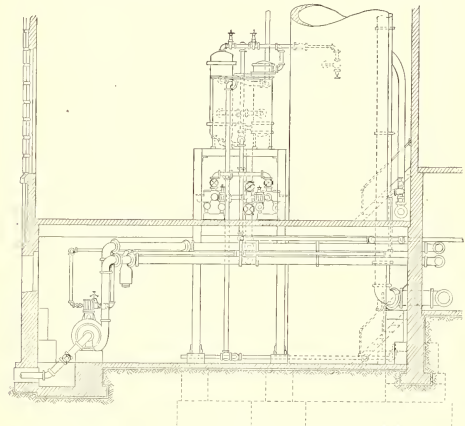
On account of local conditions it was not feasible to run the machine under full load, and it was therefore necessary to substitute a compromise heat run, which consisted of a one-ninth-hour short-circuit heat run at 125 per cent load and a one-quarter-hour open-circuit run with fields excited to give 10 per cent above the normal rated voltage of the machine. The temperature rises fell within the guarantees. The rise in temperature by resistance measurement after the overload run was determined to be 40 degs. C. in phases 1 and 2 of the armature, the field winding rise by resistance being 38.4 degs. C. above the surrounding air (25 degs. C.).

From the saturation and impedance curves the regulation was computed in accordance with the recommendations of the American Institute of Electrical Engineers, the results under various loads and power factors being:

- 100 per cent power factor, full load, 2300 volts, regulation 9.8 per cent.
- 100 per cent power factor, 2000 volts, regulation 14 per cent.
- 80 per cent power factor, 2300 volts, regulation 23 per cent.
- 80 per cent power factor, 2000 volts, regulation 33 per cent.

A high potential test was made after the heat runs, 5000 volts alternating being impressed for 1 1/2 minutes between armature winding and core, without breakdown or leakage. Between the field winding and core 1500 volts was impressed.

The efficiency was determined from the C²R losses in the armature and field and armature iron loss. At various loads,



SECTION THROUGH BOILER ROOM, SHOWING FEED AND CIRCULATING WATER SYSTEM

feeding the older plants at Lexington and Newtonville. The local power and lighting panel contains fifteen switches and a Westinghouse single-phase integrating wattmeter.

Admirable lavatory facilities with open plumbing are provided in the plant, with expanded metal lockers for the operating force. Both hot and cold water are piped to the washing stands. An office for the chief engineer was also built in the engine room at the time the plant was constructed.

TESTS OF PLANT

Through the courtesy of Matthew C. Brush, of the Suburban Manufacturing Company, some results of tests upon the machinery of the new Waltham power station are presented below:

The first alternator tested was a 500-kw, 60-cycle, 2300-volt, three-phase machine, of the enclosed type, having small brass hand-hole covers in the end shields, which afforded easy access to parts of the winding. Mounted on the shaft were two small brass fans, located one on each side of the rotating member. The normal speed of the machine is 3600 r. p. m. These fans provided additional means for dissipating the heat generated in this machine due to the forced circulation of air set up through the ventilating spaces and coils. The tests made included cold resistances, open-circuit saturation, short-circuit core loss, regulation, high potential, hot resistance, open-circuit core loss, impedance, and com-

normal voltage and 100 per cent power factor the results were:

FROM TEST.		SPECIFIED.	
1/2 load	.....85 per cent	1/2 load	.....92 per cent
"	.....92 "	"	.....94 "
"	.....94 "	"	.....95 "
Full	.....95.4 "	Full	.....95 "
1 1/2	.....96 "		
1 3/4	.....96.5 "		

The armature resistance per leg was 0.0506 ohm cold and 0.0575 ohm after the heat run. The field resistance was 1.27 ohms cold and 1.48 ohms hot. The efficiency guarantees were thus equal at half load and 0.4 per cent better at three-quarters and full loads, in the performance of the machines.

The second 500-kw turbo-generator was a machine similar to the first, and it was tested in the same way. The results were so much in accordance with those derived from the first generator test that it is not considered necessary to reproduce them here, except in the case of regulation, resistance and efficiency. The regulation was:

- 100 per cent power factor, full load to no load, non-inductive, 2300 volts, regulation 10.6 per cent rise.
- 100 per cent power factor, 2000 volts, regulation 16 per cent.
- 80 per cent power factor, 2300 volts, regulation 25.6 per cent rise, full load to no load.
- 80 per cent power factor, 2000 volts, regulation 34.5 per cent.

The efficiency results were:

TEST.		SPECIFIED.	
1/2 load	.....86 per cent	1/2 load	.....92
"	.....92	"	.....94
"	.....94.3	"	.....95
Full	.....95.2	Full	.....95
1 1/2	.....96		

The armature resistance per leg was 0.0527 ohm cold and 0.0595 ohm after a run of nine hours at 25 per cent overload, temperature rise 33.5 degs. C. The field resistance cold was 1.30 ohms; hot, 1.629 ohms (the voltage was 10 per cent above normal for four hours), and the temperature rise 45 degs.

Two sets of tests were made upon one of the 500-kw turbines, one without superheat and the other with 100 degs. superheat. The essential results of the test with practically no superheat are given in the following table:

SATURATED STEAM TEST—500 KW TURBINE

Throttle pressure, lbs. gage per sq. in.	154.6	150.7	149
H. P. inlet pressure, lbs. gage per sq. in.	55.2	91.6	120
Vacuum in low pressure outlet by mercury col.	27.33	27.23	26.8
Vacuum referred to 30-in. barometer	28	28	27.57
Barometer	29.23	29.23	29.23
Temperature at superheater outlet, deg. Fahr.	306.7	378.2	373.3
Superheat at superheater, deg. Fahr.	28.9	12.3	8.2
Temperature at throttle, deg. Fahr.	367.8	366.5	364.9
Superheat at throttle, deg. Fahr.	0	0	0
Quality shown by calorimeter, per cent.	99.89	100	99.93
Speed in r. p. m.	3,630	3,612	3,550
Load in bhp.	357.6	553.9	706.1
Total net lbs. steam condensed.	5,511	7,575	9,869
Lbs. steam per bhp hour.	15.44	14.12	13.69
Character of test in per cent of full load.	50	75	Full

This turbine was thus thoroughly in accord with the characteristics of good practice in its excellent economy at fractional loads.

SUPERHEATED STEAM TEST—500 KW TURBINE

Throttle pressure, lbs. gage per sq. in.	151.9	151.5	146.2
H. P. inlet pressure, lbs. gage per sq. in.	55	120	132.9
Vacuum in low pressure outlet	27.28	27	25.8
Vacuum referred to 30-in. barometer	28	27.77	26.59
Barometer	29.28	29.23	29.23
Temperature at superheater outlet, deg. Fahr.	519.3	493.	483.4
Superheat at superheater, deg. Fahr.	152.9	126.6	119.8
Temperature at throttle, deg. Fahr.	467.2	466.6	465.1
Superheat at throttle, deg. Fahr.	100	100	101.4
Quality shown by calorimeter			
Speed in r. p. m.	3,677	3,579	3,535
Load in bhp.	362.1	712	1,066.6
Total net lbs. steam condensed.	5,007	8,838	14,507
Lbs. steam per bhp hour.	13.83	12.41	13.60
Character of test in per cent of full load.	50	Full	125

Thus, by superheating 100 degs. a minimum water rate at full load of 12.41 lbs. is secured.

The speed variation test on the turbine resulted in the following figures:

Per cent variation, no load to full load.	3.71
Per cent variation, full load to no load.	3.71
Per cent variation, no load to 1 1/2 load.	4.50
Per cent variation, 1 1/2 load to no load.	4.50

The exciters were tested for efficiency, temperature rise and operation under load, efficiency and regulation. The efficiency was determined by measuring the losses in armature iron, armature copper, shunt and series fields and brushes. Both machines exceeded the efficiency guarantees. The generators were operated at normal load until the temperature became constant. After measuring temperatures they were heated up to normal before the one-hour 50 per cent overload run. The commutation was found perfect at all loads from no load to 50 per cent overload, and there was no serious sparking at 75 per cent overload. The machines were well within the temperature guarantees. Immediately after the overload run an insulation test was made by applying for one minute 1500 volts a. c. between the windings and the frame. Both machines withstood this test. They were compounded by means of shunts on the series fields to rise from 122.5 volts at no load to 125 volts at full load, the speed being 2 per cent above 375 r. p. m. at no load, and decreased in proportion to the load to 375 r. p. m. at full load.

The efficiencies of one machine are representative:

Test	Full Load.	1/2 Load.	1/4 Load.	1/8 Load.
Test	89.5	89.6	87.8	81.5
Specified	88.5	88	87	80.5
Armature resistance	Cold, 0.0 ohm, hot (27 deg. rise), .022 ohms			
Shunt field resistance	Cold, 12.9 ohms, hot (30.5 deg. rise), 14.4 ohms			
Series field resistance	Cold, .0092 ohm, hot, .0094 ohm			

These tests were all carried out by J. G. White & Company, of New York, consulting engineers for the Waltham installation.

The officers of the Suburban Manufacturing Company are: President, Samuel L. Powers; vice-president and general manager, Matthew C. Brush; superintendent, W. H. Cole; chief engineer, Mr. Frizzell.

TRANSFERRING PASSENGERS BY WARRANTS

A fundamental principle in handling transfer traffic is that as far as possible all passenger movement shall be in the same general direction. On large systems where the routes are complicated it is often extremely difficult to prevent outward passengers from boarding inward cars and journeying back toward their starting point, or to keep inward passengers from making a journey to the business district for the purpose of making purchases within the transfer time limit and returning to their homes on a single fare. Transfers to lateral lines are of course to be regarded as in the proper uniform direction, but sometimes cases arise where a lateral line forms a part of both an inward and an outward route, and it becomes necessary to make a geographical separation of transfer privileges in order to maintain the proper direction of traffic.

A case of this kind occurred in the recent opening in Boston of a new line of surface cars between Park Street subway station and Harvard Square, Cambridge, via Commonwealth Avenue and Cottage Farm. The new line crosses the Charles River into Cambridge by a new bridge opposite Cottage Farm station, and outward bound cars run northward over Brookline Street to the Brookline Street transfer station on Massachusetts Avenue, the latter street being the main east and west trunk line thoroughfare between Boston and Harvard Square. From the Brookline Street transfer station the new line of cars proceeds westward to Harvard Square. East-bound traffic on Massachusetts Avenue is in the main inward, so that as far as the operating scheme of the new line goes it is equivalent to the creation of a long loop

which joins the main line again about 1.5 mile beyond the point of departure therefrom, which latter in this case is at the junction of Beacon Street and Massachusetts Avenue.

Between the Charles River and the Brookline Street transfer station in Cambridge the line carries passengers desiring to proceed outward to Harvard Square and also inward to Boston via Massachusetts Avenue. To prevent outward passengers from Boston from securing transfers back into the city at Brookline Street, and yet to enable legitimate inward passengers to do this, conductors have been instructed to issue warrants to all passengers boarding their cars between the Charles River and Brookline Street station, provided that such passengers signify their desire to transfer to inbound cars at the latter point. These warrants are exchanged for regular transfers at Brookline Street and transfer agents issue inward-bound checks only upon receipt of warrants, from passengers on the Cottage Farm route. In this way the inward traffic originating on the Cambridge side of the river is equitably handled, and reverse journeys by outward-bound passengers prevented on a single fare.

Another case where warrants are conveniently used is in times of breakdown or blockade, where it becomes necessary for a conductor to transfer all his passengers to a forward car. Sometimes this is done by running the two cars into a car house on a through track and making a free bodily transfer, but on the street the warrant serves a useful purpose in recording actually paid fares on preceding cars. Of course, the transfer problem as a whole on any large road is liable to be so intricate that the use of substitutes for transfers is to be avoided whenever possible. For certain special cases like that outlined above, the warrant affords a relatively simple solution of the problem of keeping passengers "face front."

RAIL CORRUGATIONS ON THE BOSTON ELEVATED RAILWAY

The subject of rail corrugation is one of such interest and also is so replete with difficulties as respects the determination of its course at the present time that any additional facts which can be brought to light regarding the experience of different roads need no excuse for presentation. Believing that any points hitherto unpublished will be welcome, a representative of the STREET RAILWAY JOURNAL recently called upon H. M. Steward, roadmaster of the elevated division Boston Elevated Railway Company, with the object of getting some of the particulars of the rail corrugation situation in Boston.

The severity of the service on the Boston Elevated has been commented upon so many times in this paper that only passing mention of it need be made here. The maximum speed of the trains on this system is about 40 m. p. h., and the cars, loaded, weigh from 36 to 37 tons each. Each car is propelled by a two-motor equipment mounted upon a motor truck, the other truck being used as a trailing truck only. About 63.5 per cent of the weight of the car is upon the drivers, which gives a maximum load of about 11,700 lbs. per wheel. The rails are 85-lb. T's, and a great variety of compositions have been tested on the system to secure long life. On some sharp curves the rails are of manganese steel, carbon rails of varying percentage being employed on those of larger radii and on tangents.

No serious corrugations have been found on the straight track. On short curves corrugations occur, but on account of the rapid wear of the rails they are quickly worn down and give little or no trouble. The train speeds are of course low at sharp curves. The presence of grades does not appear

to be a contributory cause of corrugation, though the slipping of the driving wheels at times produces a sort of case-hardening effect on the head of the rail, which remains high while the balance of the rail wears down rapidly. The more serious corrugations occur on curves of from 500-ft. radius upward, the maximum length of the wave being about 31 ins. All the curves are protected by steel guard rails.

Fig. 1 is a sketch showing the depth of the wave or corrugation on the outer rail of the curve on the southbound track at Rollins Street. The radius of this curve is 1000 ft., the gage 4 ft. 9 ins. and the super-elevation 4 ins. The speeds of trains at this point vary from 25 to 30 m. p. h., and the depth of the wave is shown as 0.016 ft. (0.192 in.). The average length of the wave was measured as 2 ft. 7 $\frac{3}{8}$ ins.,

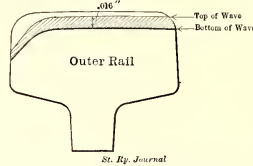


FIG. 1.—SECTION OF OUTER RAIL

and the length of the service at time measurements were taken was 365 days. Fig. 2 shows the depth of corrugation on the inner rail of the same curve, 0.015 ft. (0.18 in.). Here the average length was found to be 2 ft. 5 7-16 ins., and the length of service was the same as on the outer rail. On the average the corrugations found on the Boston Elevated Railway vary in length from 6 ins. to 18 ins. Some curves exhibit a tendency for the corrugations to wear smoother as time elapses. The depth to which the wave is allowed to form before the rail is renewed varies according to conditions and the roadmaster's judgment, but in general a somewhat greater depth than shown in Fig. 2 might be tolerated before the rail would be replaced. No hard and fast practice can be observed, for the smoothness or roughness of the track in riding over it is a factor of considerable importance in deciding when to take out the rail. It is probable that from 30 to 40 per cent of the rail renewals are caused by corrugations. It has not

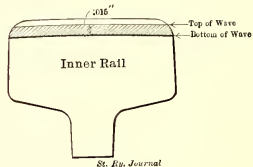


FIG. 2.—SECTION OF INNER RAIL

yet been found feasible to do anything to get rid of the trouble except the radical step of complete rail removal. Observations seem to show that the corrugation starts on the inner rail and extends to the outer rail of the curve. A fresh outer rail laid on a curve beside a corrugated inner rail has been found to acquire waves quickly; a new inner rail laid beside a corrugated outer rail has not been found to acquire corrugations much more rapidly than if the outer were new; and when both rails are laid new the inner rail seems to contract the disease first, and it is then passed across to the outer. So far no microscopic examinations or strength tests have been made of the corrugated rails to determine the relative hardness of the peaks and hollows of the waves. The trouble is chiefly a question of rough riding, joined to the imposition of excessive strains upon the rolling stock and the rail itself, and the reduction of rail strength through the irregular wearing down of the stock in the head. An instance of shortened life may be cited in the case of an outer and inner rail which had lives respectively of 19 months 18 days and 32 months 13 days before a guard rail was used at that point, and only 13 months after a guard rail was installed.

It has also been noticed that the corrugations are deeper

and longer at points where the speed is greatest, and it therefore naturally follows that the most serious trouble experienced from corrugations occurs on the large radii curves. Where the speed is low the corrugations are short and shallow.

Perhaps the most striking point about the Boston Elevated experience is this established fact that there have been no serious corrugations on track rails which are not protected by guard rails. This leads to the conclusion that a probable cause is the skidding of the inside wheels on curves, a cause which is greatly aggravated by the bearing of the flanges of the inside wheels against the guard rail. It is not feasible in Boston to remove the guard rail far enough from the service rail so that there will be no bearing of the flange against the former, for the reason that it has been found necessary to grease the guard rails and allow the flanges to bear against them to reduce noise. If the guard rail could be eliminated—which is of course out of the question—or if it could be moved back, it is probable that the corrugation question would, to say the least, be of less importance. Thus far there seems to be no evidence that the conditions of manufacture or varying chemical compositions have any direct bearing on the problem, except that a softer rail wears down much more rapidly than a harder one.

In regard to corrugations on the surface lines, A. L. Plimpton, civil engineer of the Boston Elevated Railway Company, attributed them to a number of causes, such as imperfect rolling in the mills, loosened rails in track built on solid foundation, widening of the gage on curves, and imperfect elevation of the outer rail. Irregularities in the track tend to increase the trouble. Corrugations seldom occur in Boston in straight surface track. The remedy at present seems to be to grind down the rail, and in some cases to put in a guard rail to keep the wheel flanges off the rail of the surface line on curves. Track conditions on the surface are obviously quite different from those on the elevated division, which has an unobstructed right of way and every facility for maintaining the line in permanently even condition.

CARE OF AIR GOVERNORS

BY H. SCHLECEL.

When in order, no automatic regulating device is more satisfactory than the Christensen air governor, which is designed to keep within predetermined limits the reservoir pressure on air-braked cars equipped with independent motor-driven air compressors. The diagram herewith shows the general connections of the device, the automatic operating features of which are as follows: When high-resistance magnet *L* takes current it pulls armature *A* to the position of the figure, thereby causing the main contact to engage, close the motor circuit and start the motor and compressor if governor switch *K* is closed. When high-resistance magnet *R* takes current, it pulls armature *A* to the right, thereby disengaging the main contacts and stopping the motor. Only one of the magnets can act at a time. Which one shall act is determined by the regulator hand, the position of which depends on the pressure in the gage of which it is a part and which is piped to the reservoir. Assuming that the air pressure is to be kept between 50 and 65 lbs., at 50 lbs. and under the hand will be in contact with post *l*, introducing current to magnet *L*, and at 65 lbs. the hand will be in contact with post *r*, introducing current to magnet *R*. Between these limits the hand makes no contact.

With all parts in the positions of the diagram, closing

switch *K* allows current to take path *T*-1-2-3-4-5-6-7-8-9-10 to ground, thereby starting the compressor. Magnet *L* takes no appreciable current because the stretch of circuit of which it is a part, extending from *a* through *L*, a fuse, the regulator post and hand to tap point 5, is short circuited by the low-resistance stretch of circuit through the main contacts and blow coil to the same point 5. When an increase in air pressure due to the pump working causes the hand to leave post *l*, the hand contact will draw no arc because it breaks no current. As the pressure increases the hand moves toward post *r*, touching it when the pressure reaches 65 lbs. Current then takes path *T*-1-2-3-4-5-*r*-hand-fuse-*R* to ground, thereby energizing magnet *R*, pulling the main contacts apart and stopping the motor. Since point 5, which is the point

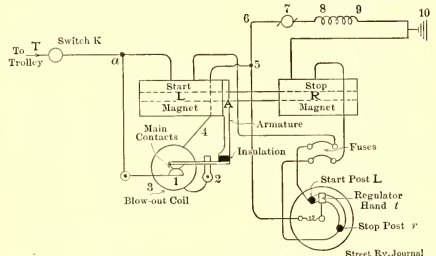


DIAGRAM OF CONNECTIONS

at which the path leading to *R* taps trolley, is on the negative side of the main contacts, opening of these contacts simultaneously opens the circuit of magnet *R*. As use or leakage of air reduces pressure, the hand leaves *r*, but draws no arc because *R* is dead. So soon as the pressure reduces to 50 lbs. the hand touches *l* again, thereby allowing current to take path *T*-*a*-magnet *L*-fuse-post *l*-hand-5-motor circuit to ground, pulling the armature to the left, causing the main contacts to engage and start the compressor to raise again the pressure to 65 lbs. Ordinarily, then, the operating magnets are subjected to but momentary current, because operation of *L* simultaneously starts the motor and short circuits itself, and operation of *R* simultaneously stops the motor and open circuits itself, *L* being in parallel with the main contacts and *R* getting its trolley on their negative side. Moreover, hand *t* never breaks current because the circuit of which it is a part is either short circuited or open circuited before the hand leaves the post.

Under the above conditions the operating magnets should not bake nor should the regulator contacts burn. That both of these things do happen can't be disputed, but failure is in most cases due to abuse, neglect or to wrong connection of the car wires to the governor wires. If for any reason the armature is stuck at one end of its stroke, the operating coil at the opposite end roasts because it becomes subjected to full line voltage for considerable lengths of time, and is unable to move the armature and thereby make the circuit change effective in cutting itself out. For example, suppose that rust or other foreign particles or some article thrown under the seat and falling between the armature and *R* magnet, or want of alignment of *L* and *R*, binds the armature in the position of the diagram. On closing *K* the pump will start and store air, but when the pressure reaches maximum standard the governor will not cut out because *R* has not sufficient pull to overcome the interference; consequently *R* will take full current until the circuit is opened by hand.

The same conditions obtain when the line voltage varies excessively. The voltage may send sufficient current through

L to cut the governor in, but when the pressure reaches standard value, R may not get voltage sufficient to cut the governor out: R will continue to take current, and if t leaves r in the meanwhile it will draw an arc that causes burning. If the governor cuts out at maximum standard and use of air reduces the pressure to the value at which the governor should cut in, and the voltage should be too low to give L current enough to do it, L will take current until the voltage rises or the governor is cut in by hand. Excessive line voltage variation is bad for automatics of any kind because magnets cannot be designed to act smoothly at very low voltage without liability of their acting with excessive impulse at high voltage.

Confusion of governor car wires will also cause irregular action, resulting in roasting of coils and burning of contacts. For example, suppose the trolley and motor wires to be interchanged. If the armature is to the left the motor will start on closing K , and if the armature is to the right L will pull it to the left and start the motor. As soon as pressure reaches maximum and t contacts r , R will pull A to the right, thereby stopping the motor; but since R now gets trolley from the + side of the main contacts its operation will not interrupt its own circuit. Accordingly it will take current until reduced pressure causes t to leave r with an arc that causes burning. With the motor and ground wires interchanged, closing K with A to the left will blow the main governor fuse at once: And if K is to the right L will pull it to the left and the main governor fuse will then blow.

As the governor frame and the reservoir pipe leading to it are insulated from ground, ground trouble should be rare. Unfortunately, insufficient care is taken to see that this condition is observed. Trouble and expense are taken to put an insulation joint in the governor pipe, but if the governor itself is set down on a grounded bolt head or car brace rod or against the car stove it will be liable to ground troubles. Of course the trolley and motor wires leading to the governor are liable to grounds the same as other wires. Two grounds to the governor frame will form a short circuit that will cause irregular action even if the governor frame is not grounded. A ground on a governor, the frame of which is grounded, will blow either the main governor fuse or one of the little regular fuses. For example, a grounded blow-out coil will blow the main fuse, but a ground on, or a short circuit in, one of the magnet coils may blow only one of the small fuses.

There is too much of a tendency to install governors and never look at them until they give trouble. They should be installed free from grounds and protected with a cover. The main contacts should be kept in good condition and the regular contacts should be adjusted. Freedom of movement of the armature plunger should be insured. Fuses of protecting size should be used. Car wires to the governor should be laid in some standard easily-identified manner, likewise the three wires issuing from the governor, so that in event of disconnection the proper reconnection may be evident. All parts should be maintained free of leaks.

Y. M. C. A. WORK IN MEMPHIS

BY B. F. BLACK

Secretary Memphis Street Railway Department, Y. M. C. A.

The launching of the Memphis Street Railway Department on Aug. 26, 1905, by the Central Association of the Young Men's Christian Association, with the co-operation of the Memphis Street Railway Company, marked a new epoch in the daily routine of the street railway employees of Memphis.

A room 30 ft. x 50 ft. adjoining the starter's office was turned over by the company for the use of the association.

The street railway company put in tub and shower baths, hot and cold water, electric lights and steam heat. Two pool tables, six small tables for crokinole, checkers, dominoes, etc., three reading-room tables, three dozen chairs, a book-case 15 ft. x 8 ft. with 300 good books to start with, a small office 8 ft. x 10 ft. with cabinet for towels, soap and stationery; a desk for the secretary, an organ, 100 song books, 12 Bibles, 29 magazines and periodicals and pictures for the walls were also furnished, and a secretary in charge was placed on the pay roll of the company.

With this equipment, which cost about \$1,800, the men began to "look in," then to join. Out of about 550 white employees of the company the association keeps its membership at 400. The annual report for the year ending Aug. 26, 1906, shows:

Total attendance at rooms.....	127,757
Number of baths taken.....	7,000
Books read.....	195
Magazines read.....	7,300
Games of pool played.....	23,977
Small games used.....	10,113
Letters written by men.....	4,800
Religious meetings conducted.....	41
Total attendance.....	1,650
Professions of religion made.....	15
Money raised for the sick by the secretary and members.....	\$400
Visits to sick by secretary.....	55

These figures are given to afford the reader an idea of what can be done within the walls of one room.

Before this department was established the motormen and conductors, when off duty, or while waiting for their run after being "signed up," had nothing to engage their time except the saloons, with their pool tables, crap games, etc. Pitching crackaloo with nickles was common with many of the men. The saloon has suffered since the association badge has been put on 400 lapels. Gambling has gone out of style. On one occasion a conductor won \$5 pitching nickels. All this has passed away. Hundreds of people in the city speak daily of the improvement in the character of the motormen and conductors and their politeness and gentlemanly demeanor toward the public. The men are complimented on their neat appearance.

Before the association opened the men were strangers to one another. The social features have developed a kindly spirit for the other fellow. As an extra conductor said, "This is fine; a fellow can read, write home, play games, or sit and rest in a nicely furnished room, all for less than a cent a day."

The regulations of the street railway company necessarily prohibit certain actions on the part of the men when off duty. The association says to them: "It is easy to comply with these rules. Come in and we will employ your time and mind in a way profitable to yourself, and acceptable to the company." As many as 600 of the employees and their families have attended a single entertainment given by the association. On these occasions the company furnished free transportation. Office men, car men, shop men and track men unite in the association feeling: "After all, we are but men in a common struggle."

In one case a man—a motorman—was in the hospital for six weeks. The secretary in charge went to the employees and officers of the company, collecting money to pay the sick man's expenses and put him on his feet. Before association work was inaugurated employees, in some instances, fell sick, died and were buried before the company knew of the distress of their families.

Although the department has been established a little more than one year, it has passed the experimental stage and its good work is recognized not only by the community and the employees of the street railway company, but also, and very positively, by the company itself.

THE EAST SIDE-BRONX TRANSPORTATION QUESTION IN NEW YORK: I—PRESENT CONDITIONS

At the time the present subway in New York city was decided upon it was generally regarded as the preliminary only of a series of rapid transit lines to be constructed as soon as possible between different sections of the city. Both the Rapid Transit Commission and the public recognized that in a city situated like New York, which was growing constantly in population, the need for transportation would increase rapidly and that additions to the elevated and subway systems were absolutely imperative. For this reason the commission early in 1902 decided upon an East Side subway, and on May 9 of the same year requested its chief engineer to prepare plans for a comprehensive scheme for rapid transit which would include a line of the kind. In compliance with this request Mr. Parsons on Feb. 19, 1903, submitted a report to the commission, outlining an extensive rapid transit scheme. In this report he said:

"Tremendous increase in passenger travel on all lines during the past year clearly indicates that when the present subway system now under construction from Brooklyn to the Bronx is completed it will almost be immediately congested, so that no great amount of permanent relief can be counted on. In order to meet the growing and imperative demands for increased facilities, arising from the natural growth of our city, it is evident that new lines should now be laid down and put under construction as soon as possible, and that steps should be taken to improve the existing facilities so as to permit them to carry the increased burden during the time when the new lines are being constructed."

It is now more than two years since the present subway was put in operation from Brooklyn Bridge to West 137th Street and East 180th Street, and nearly four years since the paragraph quoted above was written. During this time the prediction made by Mr. Parsons has been more than realized, but the additional East Side-Bronx subway recommended by him seems no nearer fulfillment than at the time it was written, so far as the award of actual contracts is concerned. Both elevated roads and subway are operating their maximum number of trains during the rush hours, but so rapidly has the city grown that it has more than caught up, so far as its transportation facilities are concerned, with the relief which was temporarily afforded by the construction of the subway. In the meantime conditions in the great East Side district between the Bowery, Fourteenth Street and the Brooklyn Bridge have been getting worse instead of better, and according to Dr. Lynden Macassey, late secretary of the Royal Commission on London Traffic, this section is probably the most densely populated territory in any civilized city on the globe.

In view of the agitation now going on in regard to additional means of transit to relieve this condition, a review of the present situation, it is thought, will be of interest.

THE ISOLATION OF MANHATTAN ISLAND

Owing largely to the fact that its great business and social centers, which are located on Manhattan Island, are separated by waterways from the other boroughs of Richmond, Brooklyn, Queens and Bronx, certainly no other American city and probably no other city in the world is confronted with so many transit problems as New York. With only two of these boroughs, Brooklyn and Bronx, is Manhattan connected by bridges, and these bridges in the case of Brooklyn are limited to two. Transit to Richmond and Queens is confined to ferries, which necessarily must be slow and comparatively uncertain and expensive, as it has required the use

of at least two and usually three means of communication. Hence the history of New York has always shown a marked tendency of development toward the north.

Bronx Borough is now connected with the business district on Manhattan Island by the West Farms branch of the subway, one elevated railway and several surface lines, although the latter cannot be considered as having any influence on the long-distance transportation between Bronx Borough and the business sections of Manhattan Island.

NO IMMEDIATE RELIEF POSSIBLE FROM THE OTHER BOROUGHES

The ferry facilities for Richmond Borough have been greatly improved since the municipal service was installed, so that this interborough transit problem may be considered solved for years to come. That is to say, the present service is as rapid as it can be made and any growth in traffic could be quickly met by additional boats with perhaps another pier. With regard to Brooklyn and Queens, the work already under way, if rapidly done, is bound to bring some relief; but for the travelers to and from the Borough of the Bronx, which for the reasons already outlined is the territory probably most easily accessible, no ameliorative work is under construction.

GEOGRAPHICAL CONSIDERATIONS

To understand clearly the elements involved in the Manhattan-Bronx problem one must bear in mind that Manhattan Borough is a narrow, densely-populated island whose local traffic alone is almost if not quite sufficient to tax the capacity of the longitudinal lines, which naturally are few in number, owing to the shape of the island. Add to this the great population which has sprung up in the Bronx to the north of Manhattan and the thousands of suburbanites still further north who are clamoring for swifter transportation through these two boroughs, it becomes only too plain that rapid transit lines even on every longitudinal street in Manhattan would probably not be sufficient to carry all of the people who could be comfortably housed north of the Harlem River and who would like to commute with the business districts downtown.

A partial solution of the transit problem on the west side of Manhattan Borough was effected by the opening of the Broadway and Lenox Avenue divisions of the present subway, Oct. 27 and Nov. 23, 1904, and some relief was afforded to the Bronx by the installation of the West Farms branch on Nov. 26, 1904. The West Farms extension, however (as will be shown later by statistics), carries very much less Bronx traffic than the East Side elevated railway systems, to which there have been no extensions below 145th Street since 1890. In fact the difficulties of transit to this district have reached such a serious pass that both in Brooklyn and the Bronx manufacturers have removed their establishments to small towns in New Jersey where the absence of congested districts and insufficient transportation prevents exorbitant rentals and loss of time to employer and employees.

The conditions described have been felt for years and possibly would have been obviated by this time if the city of New York had been in position to build two East Side subways at the time that the present one was begun. It will be remembered, however, that there were then such serious doubts of the commercial practicability of a subway railroad that private capital could not be brought to attempt the task, while on the other hand the amount which the city could expend for this work was so limited by the courts that the Rapid Transit Commissioners were obliged to adopt a compromise route for the first subway.

THE PRESENT SUBWAY

An examination of the map in Fig. 1 will show that from its start at the Battery up to Forty-Second Street the subway runs practically through the middle of Manhattan. It then turns to the west as far as Broadway and Ninety-Sixth Street, where the west, or Broadway line, runs to Kingsbridge, just across the Harlem River, and the east, or Lenox Avenue line, to West 147th Street. From West 135th Street, on the Lenox Avenue Division, a branch runs to West Farms, first as a subway and then as an elevated railway. Where this line crosses under the Third Avenue elevated, at East 149th Street, a transfer point has been established for Bronx passengers to the West Side, or vice versa. Despite the express service on the subway, a passenger from the upper Bronx wishing to travel to any point in lower New York, East Fourteenth Street or Brooklyn Bridge, for instance, would save little or no time by transferring to the subway at that point, because the route on the subway is much longer than on the elevated railways. This fact is mentioned to show that the subway affords no appreciable saving in time for most Bronx passengers to lower Manhattan. Time-speed curves proving this statement will be presented later.

THE PRESENT ELEVATED LINES

That part of New York's elevated railway system built on Manhattan Island may be divided in two divisions, the Sixth Avenue and Ninth Avenue lines on the West Side and the Second Avenue and Third Avenue divisions on the East Side. As no changes are contemplated in the first pair, further reference need not be made to them beyond stating that they begin at the Battery, the southern extremity of Manhattan Island, where all the elevated lines end in a stub terminal, but unlike the East Side lines they do not extend across the Harlem River, which separates Manhattan Borough from the Bronx.

The southern terminus of the Second Avenue and Third Avenue lines is also at the Battery or South Ferry, where a considerable number of passengers is received from the Brooklyn and Staten Island ferries, besides some transfer passengers from the West Side elevated railways. From the Battery the Second Avenue and Third Avenue trains are dispatched over the same structure through Pearl Street and New Bowery for 1.32 miles to Chatham Square. At that point all Second Avenue trains turn east through Division Street for about 0.25 mile, thence move north along Allen Street for 0.66 mile and First Avenue for 1 mile. At Twenty-Third Street the line turns west for 0.34 mile to enter Second Avenue, along which it continues for 5.22 miles to 129th Street and Harlem River. The train service on the Second Avenue division is local throughout.

The Third Avenue line begins at the City Hall and Brooklyn Bridge terminal and runs along Park Row for 0.36 mile to Chatham Square. As only Third Avenue trains are operated from City Hall at present, Chatham Square is the transfer point for passengers to the Second Avenue line. The two stations are on the same level but are connected by an over-grade stairway crossing the east track of the Third Avenue and the west track of the Second Avenue lines. From this point the line continues north along the Bowery for about 1 mile and thence along Third Avenue for 6.45 miles to 129th Street and the Harlem River. Here it turns to the east to meet the Second Avenue line. This junction is also a heavy transfer station, since only part of the Second Avenue trains continue to the end of the line. On the Third Avenue line rush hour express service is given on the third track between Forty-Second and 129th Streets.

From the junction at 129th Street and Second Avenue both divisions cross a single-deck bridge and run along the same

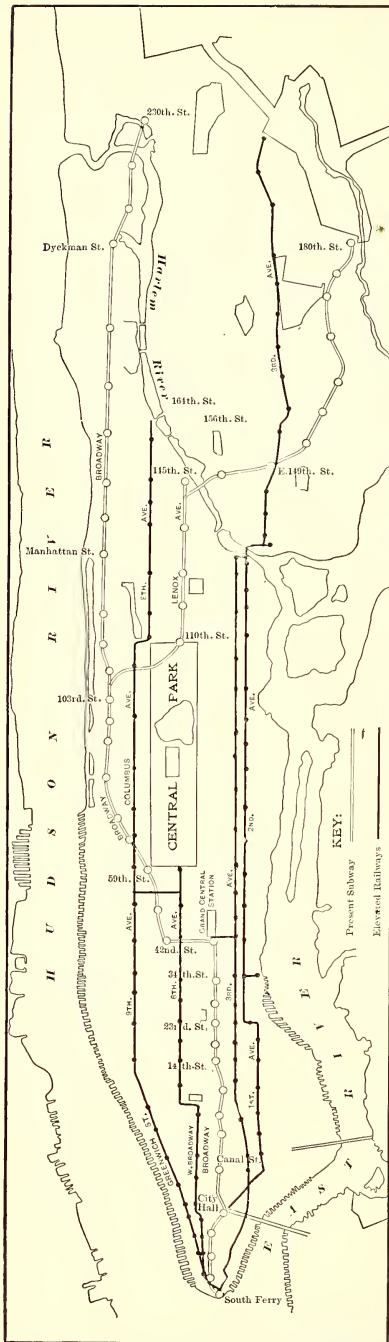


FIG. 1.—SHOWING THE PRESENT MANHATTAN-BRONX RAPID TRANSIT LINES

structure in Bronx Borough. Between the river and East 132d Street the structure is on property leased by the New York, New Haven & Hartford Railroad, which has large freight yards at this place. From East 132d Street the line is continued over the Interborough Rapid Transit Company's right of way to East 145th Street, where it enters and continues along Third Avenue to Webster Avenue and Bronx Park.

in June, 1903, to 3,385,307 for another summer month, June, 1905, is a little over 10 per cent, but by December, 1905, the West Side elevated went up to 3,772,911.

It seems strange that the reduction in the number of passengers carried from the elevated stations in the Bronx should have been only 25,748 between the months of December, 1904, and December, 1905, but the 947,264 passengers car-

COMPARATIVE TRAVEL IN UPPER MANHATTAN AND BRONX BOROUGHS

To determine the effect of the opening of the subway on the traffic carried by the different elevated lines to upper Manhattan and the Bronx, Figs. 2 and 3 were compiled. Fig. 2 shows the total ticket sales during December, 1904, June, 1905, and December, 1905, for all stations on the elevated lines and subway on Manhattan Island above Forty-Second Street. Fig. 3 shows a similar comparison for each of the two lines serving the Bronx. It will be noted from an examination of the December, 1904, line of Fig. 2, that the total upper elevated East Side traffic (excluding the Bronx) was then 4,545,990, and for the Bronx stations alone the ticket sales amounted to 2,507,786. During the same month of 1904 the ticket sales on the subway stations in the Bronx amounted to 357,511. By December, 1905, the Bronx subway travel with the opening of the Mott Avenue and Third Avenue stations had increased to 947,264, but the Bronx elevated travel still amounted to 2,482,038. Thus, in spite of the facilities offered by the subway, the elevated traffic was practically as large as in December, 1904, showing a decrease of only about 3.5 per cent.

Turning now to Fig. 2, it is noticeable that the Third Avenue line, which has a rush-hour express service, actually increased its traffic by 104,321 between December, 1904, and 1905, while the Second Avenue, which is all-local, dropped 262,944. This latter loss can hardly be attributed to the opening of the subway, because the latter is too far away

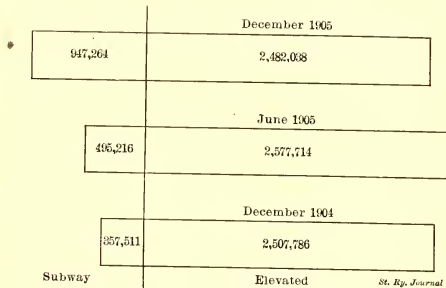


FIG. 3.—DIAGRAM SHOWING COMPARATIVE TICKET SALES ON THE SUBWAY AND ELEVATED LINES IN BRONX BOROUGHS, DECEMBER, 1904; JUNE, 1905, AND DECEMBER, 1905

ried in December, 1905, on the Bronx division of the subway were obtained largely from the building up of a new territory, and also probably to some extent by attracting some surface business. The continued overtaxing of the Bronx elevated lines is also apparent by comparing June, 1903, when 2,299,707 passengers were carried, with June, 1905, when the travel was 2,577,714, or only 21,993 less, despite the full operation of the West Farms or Bronx extension of the subway.

As demonstrating that travel is created purely because of better facilities, it is interesting to note that the Manhattan

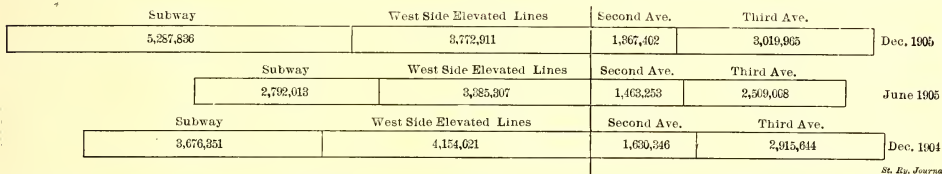


FIG. 2.—DIAGRAM SHOWING COMPARATIVE TICKET SALES ON ALL MANHATTAN ELEVATED STATIONS ABOVE FORTY-SECOND STREET, AND ALL SUBWAY STATIONS ABOVE THE GRAND CENTRAL STATION FOR DECEMBER, 1904; JUNE, 1905, AND DECEMBER, 1905

from the patrons of that line. It is far more likely to have been caused by a shifting of population along the lines of the subway both on the upper West Side of Manhattan and in the Bronx. How little the upper East Side lines to the Bronx were relieved by the construction of the subway is also shown by a comparison of the travel for two summer months. In June, 1903, before the opening of the subway, the Manhattan traffic on both East Side lines from Forty-Seventh Street north was 3,514,389, yet in June, 1905, eight months after the opening of the subway, the travel had increased to 3,972,261.

Naturally the West Side elevated lines have been more affected by the construction of the subway than the East Side lines. This is shown by Fig. 2, in which the decrease on the West Side elevated lines above Forty-Second Street (two months after the partial subway opening) from December, 1904, to December, 1905, was 281,110, or 6.7 per cent. The decrease in traffic on the West Side lines from 3,744,058

stations above Forty-Second Street (Grand Central Station) of the subway carried 2,792,013 passengers in June, 1905, although the total loss in the traffic of the upper stations of all elevated lines between June, 1903, and June, 1905, amounted to only 281,452.

A COMPARISON OF THE EAST AND WEST SIDE SCHEDULES

As already noted, all of the rapid transit lines of Manhattan and the Bronx converge at the Battery. Of these lines the Second and Third Avenue divisions serve the East Side and Bronx; the Sixth and Ninth Avenue lines, the West Side; the subway, the West Side, above Forty-Second Street, and Bronx from Mott Avenue and 149th Street. The Second Avenue line is all local to 129th Street, with some trains through to the Bronx; the Third Avenue has a third-track express service between Forty-Second and Ninety-Ninth Street; the Sixth Avenue is all local; the Ninth Avenue line has an express track between Christopher Street

and 116th Street, and the subway has two tracks giving express service practically all the time.

To represent graphically these three conditions of running during the rush hours, Fig. 4 has been prepared. Since the Sixth Avenue and Ninth Avenue runs resemble respectively those of the Second and Third Avenue lines, they have been omitted from the comparison. It should be borne in mind, however, that as most of the subway patrons are West Siders, it is fair to base the comparison upon the best service given to each side of the island and the Bronx.

Reference to Fig. 4 will show at once that the subway gives the quickest service for a given distance, even where it is necessary to transfer at an express station to a local. For example, to reach West Sixty-Sixth Street via the sub-

via the subway is also shown in Fig. 4, by comparing the three ways of reaching 149th Street and Third Avenue from the Battery during the rush hours. The Second Avenue local requires 39½ minutes; the subway express, 33½ minutes, and the Third Avenue express, 34 minutes, assuming that a passenger starts from the Battery and transfers at Chatham Square for an express from the City Hall spur. It is apparent, therefore, that the subway affords no saving in time over the Third Avenue express between the points mentioned. If the runs to 149th Street and Third Avenue from City Hall (or Brooklyn Bridge) be compared, it will be found that 29½ minutes are required on the subway and 30 minutes on the Third Avenue express.

The foregoing instances have been cited to show how much

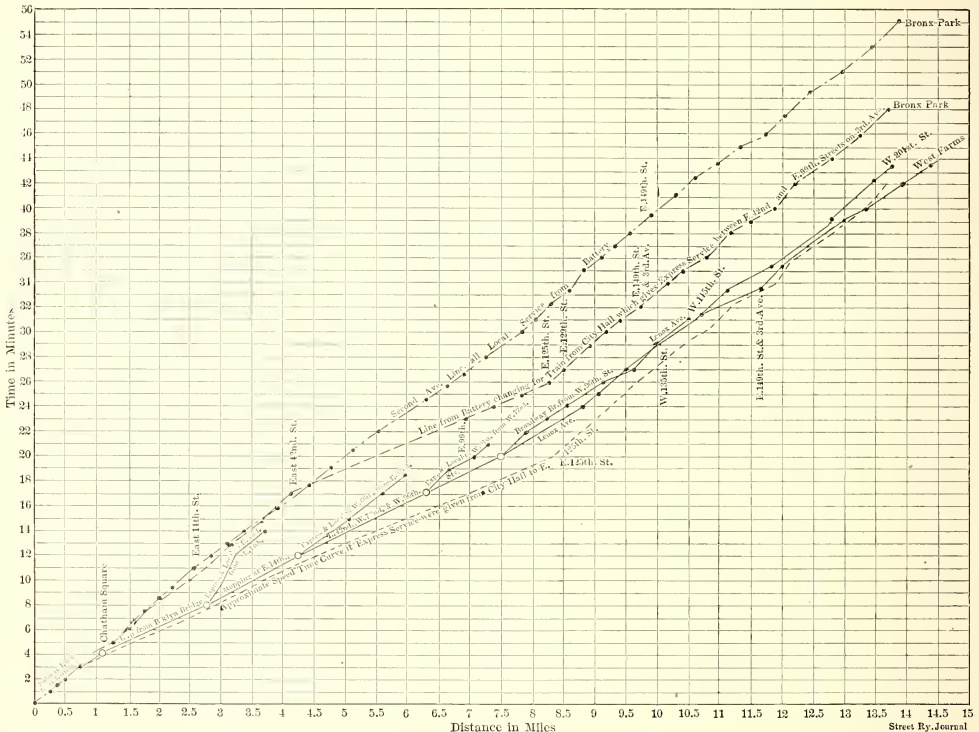


FIG. 4.—SPEED-TIME CURVES FOR THE THREE CLASSES OF SERVICE GIVEN ON NEW YORK RAPID TRANSIT LINES TO BRONX BOROUGH

way, a passenger to make the quickest time would use the express train from the Battery to Forty-Second Street, spend about half a minute to transfer and reach his destination in 18½ minutes; whereas a passenger to East Sixty-Fifth Street on the Second Avenue line would require 22 minutes from the same point, as he could not take advantage of the Third Avenue express, which does not stop below East Ninety-Ninth Street.

Should a West Sider live near an express station, say West Seventy-Second Street, it would take him only 17 minutes from the Battery, as against 22 minutes to reach Sixty-Fifth Street, or 24½ minutes to reach East Eighteenth Street on the East Side.

A slight saving in time to the Bronx from the Battery

improvement is affected even by a partial express service such as the one given on the Third Avenue line between Forty-Second and Ninety-Ninth Streets. Now if the express track on this line were continuous, as favored by the State Railroad Commission, and the same average speed maintained as on the present express division, the resulting time-distance curve would be approximately as shown on the lowest line in Fig. 4. The saving to Bronx Park would be at least five minutes on account of the delays met by expresses at present being obliged to follow locals until reaching the third track at Forty-Second Street. The construction of a similar third track on the Second Avenue line would also cut down the time, as at present the Third Avenue express service is badly congested because few of the Bronx or upper East Side

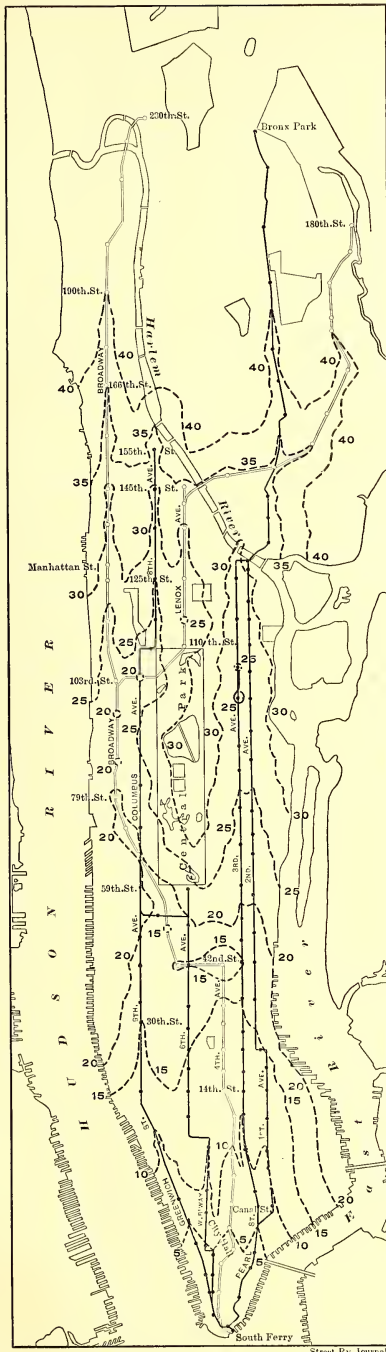


FIG. 5.—TIME-CONTOUR MAP, SHOWING PLACES MOST QUICKLY REACHED IN A GIVEN TIME

residents care to use the slower local service on the Second Avenue line.

For further explanation to those unfamiliar with the topography of Manhattan and Bronx Boroughs Fig. 5 has been prepared. This is a map of the two boroughs bearing a number of 5-minute "time contour" lines which indicate the places reached in a given time from the Battery via the different rapid transit lines. It is assumed that travelers in every case use the quickest means of transit to a given station and then walk at the rate of $3\frac{1}{2}$ miles an hour to their destination. It will be understood that this is a rush-hour comparison only, for the upper West Side possesses the advantage of all-day express service on the subway, while on the East Side the Third Avenue elevated express trains run only during the rush hours.

In the foregoing no attempt has been made to compare the services of the East and West Sides except in regard to time. This, though important, is only a part of the question. Moreover, the times given are schedule times, and these are increased by delays inseparable from congested conditions. That the present subway is overcrowded, certainly during the rush hours, will be admitted by all, and the requirements for additional transit facilities north are urgent. The advocates of the extension of the present elevated railway system claim that the addition of a third track on the Second and Third Avenue lines would supply facilities for the operation between Ninety-Ninth Street and City Hall of 50 per cent more trains during the rush hours. This would very materially relieve the situation for five years to come, by which time the two East Side subways might be built. The new subways, when completed, would undoubtedly afford the relief necessary. But past experience has been that the needs of New York for transportation have always exceeded the facilities which have existed, and if the increase in office accommodation in the lower part of the city continues at its present rate, it is hardly safe to say that history will be reversed. That is, indications point to the necessity of the proposed elevated railway extension five or ten years hence, even with the new subways in operation, as at present.

DENSITY OF POPULATION IN MANHATTAN AND BRONX BOROUGHS

In the preceding description a brief outline has been given of the route of the one subway and two elevated railways which form the present means of rapid transit to the Bronx. However, it must not be supposed that the problem is simply a question of giving better and quicker transportation to the present inhabitants of the Bronx alone. The point of much more importance is to make rapid transportation to that section, the most available to workers in Manhattan, so convenient that inhabitants of the crowded tenement districts below Fourteenth Street and along the East River will be able to live in better and larger quarters at a lower net cost for rent and car fare than at present. A great part of the working people living in these districts is employed in the numerous shops and stores in the Fifth, Eighth, Fourteenth and Fifteenth Wards, but these are not so easily reached as the actual distances would indicate. Most of the East Side streets are so narrow and crowded with stands and pushcarts (much of the shopping is done on the street) that fast cross-town service is impossible. Despite this the cars are crowded to the limit during the hours of going to and from work, proving that many thousands of people could remove to the Bronx or Brooklyn without any additional burden in car fare. Of course a great many in the very poor districts walk to and from their work, some to the sweat shops now in that district, others to the wholesale or retail centers on Grand Street, Broadway or Sixth Avenue, or to

the manufacturing districts on the East Side or West Side. But even to a large proportion of these people an outlet to a healthy locality accessible by a single fare, as in the Bronx or in the Eastern District of Brooklyn, would prove attractive, and this would reduce the congestion for those who remain. A slight relief for the East Side districts has been afforded by the opening of the Williamsburg Bridge, which has cut down the time to the Williamsburg section of Brooklyn, and if provided with an elevated service might considerably alleviate conditions.

To demonstrate in a graphic manner the varying density of the population in Manhattan and the Bronx, the accompanying map, Fig. 6, has been prepared. This map shows the ward divisions with their areas sectioned approximately in proportion to the population per acre. The figures used are based on the United States census of 1900, the latest available, as the 1905 police census is still incomplete.

It will be noted immediately that the lower East Side wards show a startling difference in the population per acre over the other sections of Manhattan Island. Taking the figures in the table for the Seventh, Tenth, Eleventh, Thirteenth and Seventeenth Wards, forming the greater part of the Ghetto, the general average is found to be 521 persons per acre, which is three to four times the density in the upper part of Manhattan Island and about seventeen times that of the Twenty-Third Ward in the Bronx. If the figure of 1.9 persons per acre for the Twenty-Fourth Ward in the Bronx is corrected by deducting from the area of that ward the space occupied by Bronx, Van Cortlandt and other parks, a much higher density of population would be secured, but it would still be far lower than the Twenty-Third Ward, which is nearer to Manhattan Island.

CHARACTER OF THE OTHER WARDS IN MANHATTAN

A description of the character of the other wards will explain the reasons for the differences in population per acre. Wards One, Two, Three and Five constitute most of the downtown business and shipping districts with a small resident population; hence the average per acre is low, or only 37.1. Wards Six and Four are similar both in character and density, being respectively 232.7 and 235.7 per acre. Although lower than the East Side, in reality their density of the resident population is almost equal to the latter districts because a large part of the Sixth Ward is taken up by the City Hall Park, Mulberry Bend Park, the Post Office and numerous municipal and private business structures, while the Fourth Ward is half business, half residential. Ward Seven is also more densely settled than even the high average of 450.7 would indicate on account of the territory taken up by Corlears Hook and Seward Parks and the shipping interests. Despite maritime and some other business, Wards Eight and Nine, with their respective averages of 158.8 and 185.2, are well settled, but the low average is due in quite a degree to the absence of tenement houses. Ward Fourteen has an average of 354.5, but here again the actual density is equal to the East Side districts, the lower figure being due mainly to a considerable number of shops. Ward Fifteen is not thickly settled except in the small area contiguous to the Bowery, the low average resulting from a large park area and many business houses. The West Side Wards, Sixteen, Twenty and Twenty-Two, are mainly residential, and if the park area in Ward Twenty-Two were excluded the average population per acre would be about 200. This last figure is of particular interest, as it applies to a district that, though well populated, is not overcrowded. The congestion line might be considered as beginning in a mixed flat-house and private house district when the average per acre oversteps this limit. The three East Side Wards, Eighteen, Twenty-One and Nineteen, op-

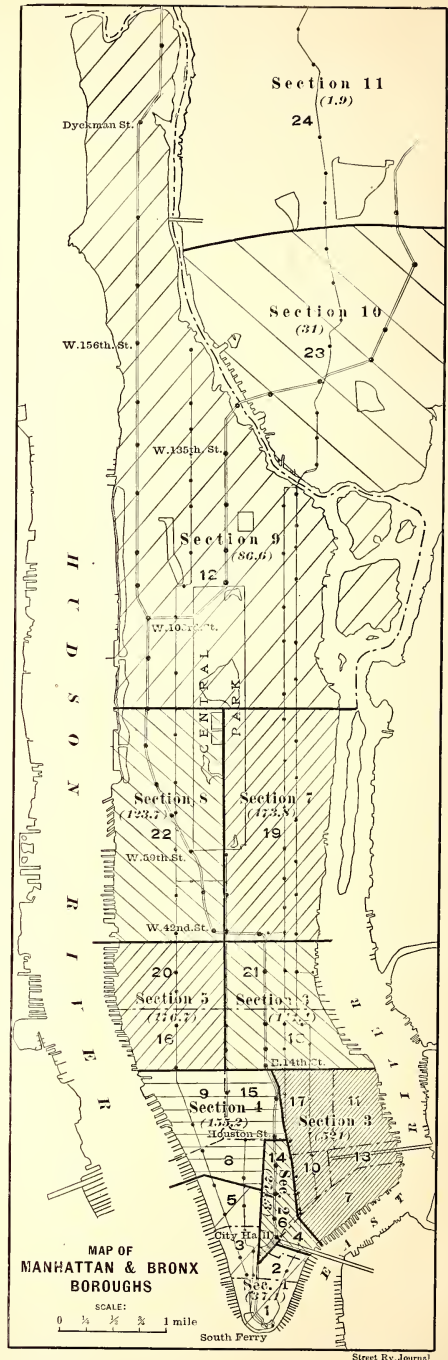


FIG. 6.—MAP SHOWING AVERAGE NUMBER OF RESIDENTS PER ACRE FOR GROUPS OF SIMILAR WARDS. ONE LINE TO INCH EQUALS FOURTEEN PERSONS TO ACRE

posite to the West Side wards just mentioned, do not differ materially in the class or density of population. The most northerly and biggest ward, the Twelfth, although showing the low average of 86.6, is nearer 200, the difference being due

TABLE SHOWING CHARACTER AND POPULATION DENSITY OF MANHATTAN AND BRONX BOROUGHS BY GROUPS OF WARDS

Section 1 Including Wards.	Character of Wards.	Area in Acres.	Pop. Per Acre.	Average Population Per Acre.	
1	Offices and shipping...	154	61.8	} Section 1—37.1	
2	Offices and shipping...	81	18.4		
3	Offices and shipping...	95	18.9		
5	Offices and shipping...	168	49.4		
Section 2 Including Wards.					
4	Offices, tenements and shops.....	83	235.7	} Section 2—274.3	
6	Offices, tenements and shops.....	86	232.7		
14	Offices, tenements and shops.....	96	354.5		
Section 3 Including Wards.					
7	Tenement.....	108	450.7	} Section 3—521.	
10	Tenement.....	110	953.8		
11	Tenement.....	196	595.8		
13	Tenement.....	107	599.2		
17	Tenement.....	331	395.1		
Section 4 Including Wards.					
8	Business and residential	183	158.8	} Section 4—155.2	
9	Business and residential	322	185.2		
15	Business and residential	198	121.5		
Section 5 Including Wards.					
16	Residential.....	349	151.3	} Section 5—176.7	
20	Residential.....	444	202.2		
Section 6 Including Wards.					
18	Residential.....	450	136.3	} Section 6—141.4	
21	Residential.....	411	146.5		
Section 7 Including Ward.					
19	Residential.....	1,481	173.8	Section 7—173.8	
Section 8 Including Ward.					
22	Residential.....	1,529	123.7	Section 8—123.7	
Section 9 Including Ward.					
12	Residential.....	5,594	86.6	Section 9—86.6	
Section 10 Including Ward.					
23	Residential.....	4,267	31.	Section 10—31.	
Section 11 Including Ward.					
24	Partly developed.....	22,255	1.9	Section 11—1.9	

to the inclusion of a large park area, thinly settled islands and the sparsely settled territory in the extreme northwest, but which has rapidly increased in population since the opening of the Broadway arm of the subway. The number of inhabitants in the wards of Manhattan and Bronx Boroughs and the population per acre is given in the table.

Since the taking of the census upon which the foregoing statistics are based there have been reductions in the habitable area of Ward Twenty on account of the space taken for the new Pennsylvania terminal, and in Ward Thirteen,

owing to the Williamsburg Bridge and Delancey Street Parkway. Similar areas will soon be taken up in Ward Seven for the Pike Street or No. 3 bridge, and in Ward Nineteen for the Blackwell's Island bridge. These facts are mentioned to emphasize the absolute necessity of quickly and adequately relieving the ever increasing congestion on Manhattan Island.

EXPRESS AND FREIGHT TRAFFIC AGREEMENTS ON THE CHICAGO & MILWAUKEE ELECTRIC RAILROAD

The Chicago & Milwaukee Electric Railroad Company, of which Charles W. Merrilies is traffic agent, and which operates through the suburban territory north of Chicago along the lake shore, extending from Evanston to Racine, Wis., and with a branch from Lake Bluff west to Rockefeller, where connection is made with the Wisconsin Central Railroad, has recently closed a contract for carrying the United States Express Company's express matter and another contract for an interchange of freight with the Wisconsin Central Railroad.

The contract with the United States Express Company is similar to that made by the express company with the steam railroads which carry its express, and by it the express company is given an entrance into the most important chain of towns near Chicago, express being taken from the Chicago, Milwaukee & St. Paul Company's Evanston branch, which terminates in Evanston at the southern terminus of the Chicago & Milwaukee Electric Railroad. To handle the business the company has opened up twenty-four offices—one for each town of any importance along the road, and has established agents on salary and wagons at ten of these towns. The other offices are in stores at the smaller towns, and in such places the agents are on a commission. The contract is for ten years. The compensation paid the railroad is the same as that usually paid the steam road companies carrying an express company's business, and is based on the gross income from the express traffic over the road. The contract gives the United States Express Company the exclusive privilege of carrying express matter over the road. At the same time the railroad is free to handle freight in car-load and less than car-load lots at freight rates. The railroad furnishes the two express cars which are now in service. An express car is run every four hours, beginning at 5:30 in the morning and running until 10:30 in the evening. The car and motorman are furnished by the railroad and the express messenger, who also acts as conductor, is furnished by the express company.

The freight traffic agreement made with the Wisconsin Central Railroad is practically the same as that made between steam roads. All kinds of freight are interchanged at the junction point at Rockefeller. The division of the rates and the tariffs are the same as on steam roads. The Chicago & Milwaukee Electric Railroad gets pay on tonnage basis in proportion to the number of miles hauled over its lines. It is worthy of note that all freight is being handled by steam locomotives. The local freight tariffs on the road are already the same as those on the Chicago & Northwestern steam road, which it parallels. Freight and passenger agents on a salary have been appointed and offices opened at Evanston, Waukegan, Zion City, Kenosha and Racine. The billing methods are the same as those used on steam roads.

The road is now completed for 4 miles north of Racine, Wis., passing through the property of the Racine Stone Company. A number of ballast cars are being provided for hauling this stone to different points along the line for building and ballast purposes. Gravel for building purposes will also be hauled.

CORRESPONDENCE

ARRANGEMENT OF TRANSMISSION WIRES

Schenectady. N. Y., Dec. 21, 1906.

Editors STREET RAILWAY JOURNAL:

My attention has been called to your editorial on the electrification of the West Jersey & Seashore Railroad (STREET RAILWAY JOURNAL, Nov. 10), in which you criticize the arrangement of the wires forming the transmission line, citing as an objection the placing of the base of the three-phase triangles uppermost and giving as reason for such objections the possibilities of foreign bodies finding lodgment thereon.

It might be of interest to your readers to know that this arrangement was adopted in order to facilitate the work of the lineman. The West Jersey & Seashore transmission line is in duplicate and the arrangement used permits the linemen climbing the poles and working on a dead circuit without the danger of contact with the live wires, the lower wires being further away from the pole than would be possible if the triangles were not inverted. JOHN R. HEWETT.

PASSENGER TRAFFIC ON THE NEW YORK BRIDGES

The annual count of the passengers crossing the Williamsburg and Brooklyn Bridges has just been completed for the Bridge Department by the Brooklyn Rapid Transit. The count was made by the company's agents and by conductors of its cars and of the cars of the Coney Island & Brooklyn system, and extended from midnight of Dec. 12 until midnight of Dec. 13. The weather conditions on that day were inclement, so the count is not entirely indicative. The day for counting is set well in advance and is taken as representative of the bridge traffic for the year. On the Brooklyn Bridge 183,429 passengers were carried from Manhattan to Brooklyn in the twenty-four hours, while 207,153 passengers were carried in the reverse direction, making a total of 390,582 passengers who used the structure on Dec. 12. Of the Manhattan-bound passengers, 88,172 crossed the Bridge from 7 o'clock in the morning to 8:30 o'clock. Towards Brooklyn in the evening rush hours (from 5 to 7 o'clock) 80,648 passengers crossed the old Bridge on surface and cable cars. The Williamsburg Bridge is beginning to loom up as a passenger carrier. On that same day and in the same hours the Brooklyn trolley roads and the local bridge cars carried 47,271 passengers from Williamsburg to Manhattan and 51,221 passengers from Delancey Street to Brooklyn—a total of 98,492 passengers. These figures do not include the cars of the Metropolitan system which use the north tracks, but do include all the lines of the Brooklyn Rapid Transit and Coney Island & Brooklyn systems.

ONE MAN TO A CAR AT HOT SPRINGS, ARK.

Conductors are dispensed with on the cars of the Hot Springs Street Railway Company, of Hot Springs, Ark., the cars being handled by the motorman alone. Both summer and winter cars are of the end entrance type. Gates prevent entrance to the rear platform and to the left side of the front vestibule. Consequently passengers must pass the motorman in entering the car, and as they enter he registers their fares. The passengers themselves are supposed to drop their fares in a cash box near the entrance. If they do not do so the motorman reminds them of the fact when they attempt to leave the car. Transfers are handed direct to the motorman on boarding the car.

Several advantages are claimed for the method. In the

first place, accidents to passengers are reduced, there is not the same tendency for passengers to attempt to board the cars while in motion at the forward platform as there is for them to do so at the rear and the liability of getting under the wheels acting as a check. Again, the motorman can prevent a passenger from leaving the car while it is in motion. In fact, motormen are instructed not to permit unloading until the car has been stopped. The saving effected by the employment of one man instead of two on a small system is a large percentage of the earnings. Edwin Harbin, superintendent of the company, says the method is satisfactory.

DEVELOPMENTS IN CLEVELAND

The Forest City Railway Company succeeded in getting one of its cars from the Fulton Road line to the west end of the Superior viaduct last Thursday, where it was run onto the Cleveland Electric tracks and across the viaduct, thus reaching the much-coveted East Side. This was done by laying a temporary track on Detroit Avenue from a point on Fulton Road to the Cleveland Electric tracks at the corner of Detroit and Pearl Streets. From this place east to the Water Street crossing is free territory, and cars were run back and forth for the remainder of the time. Cleveland Electric attorneys, however, secured a temporary restraining order, barring the Forest City Railway Company from operating its cars from Water Street to the Public Square over the Cleveland Electric tracks. On Monday Judge Phillips granted the order on the ground that the ordinances making this portion of the track free territory are invalid, because of the fact that they were signed by the Mayor, when it is admitted that he was financially interested in one of the roads.

President Carlos E. Moore, of the Low Fare Railway Company, is a clerk in the office of the Cleveland Salt Works, and it has been learned that he is a brother-in-law of A. S. White, representative of the Eastern syndicate which is endeavoring to consolidate the two large gas companies of Cleveland and purchase the Cincinnati, Covington & Newport Traction property for the Columbia Company, a West Virginia corporation. Mr. Moore says he accepted the presidency of the company through friendship for W. B. Colver, secretary of both the Low Fare Company and the Municipal Traction Company.

The bid of W. B. Colver for the franchise of a short route around the Erie Street cemetery has been assigned to the Low Fare Railway Company. It is supposed that the new company will apply for extension to this franchise that will eventually double on some of the franchises that the Forest Railway Company now holds, so that if they are declared null and void the new company will be able to purchase the property that may have been built on those streets and go right on with the work. It has already been granted a franchise on Giddings Avenue between Woodland and Quincy Street, with a loop around the Erie Street cemetery. Now it asks for a franchise extending from the loop down Brownell Street to Euclid and by way of Euclid to the Public Square, around the square to Superior Street and west on Superior Street to Detroit Street. On Detroit Street it wants the right to run to Hanover Street, where it will connect with the Forest City line.

It has been announced that Mayor Johnson has withdrawn from the joint agreement with W. E. Scripps to guarantee the stock of the Forest City Railway Company, and that M. A. Fanning, president of the Forest City Railway Company; C. H. Miller, Herman Schmidt and Otto Leisy, stockholders, have taken his place.

STORAGE BATTERIES AND BATTERY PLATES

Batteries for general power service are of three distinct types—the regulating battery, the floating or line battery as used chiefly on street railway lines, and the boosted line battery. The regulating battery is always installed in connection with a booster through which all current flows, both on charge and discharge. The essential function of the booster battery is to neutralize fluctuations, charging when the current demand is light and discharging when the current demand increases above a predetermined point, thus maintaining a practically uniform load upon the generating equip-

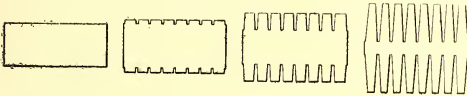


FIG. 1.—DEVELOPMENT OF CONTACT SURFACE FROM A SHEET OF ROLLED LEAD

ment. During hours of very light load the engines may be entirely shut down and the battery furnish all power required.

The line or floating battery has no booster or other charging equipment. It is simply connected across the circuit at points distant from the power house where the pressure drop under fluctuations is considerable. When the current demand is light the e. m. f. of the line exceeds that of the battery and current is absorbed. When the current demand causes the line pressure to drop below the e. m. f. of the battery discharge takes place, so that voltage fluctuations

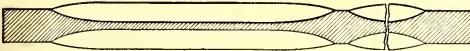


FIG. 2.—LONGITUDINAL SECTION OF PLATE FRAGMENT

are minimized. The boosted line battery as used on long lines entails the erection of a separate feeder line direct to the battery, the voltage of which is raised by a booster in the power station to any necessary extent above the line voltage to compensate for drop.

There are two distinct economies in line batteries; first, the savings on cost per kilowatt delivered due to the elimination of large voltage losses on a given amount of current transmitted, and the smaller investment in copper conductors required to transmit the extreme ampere demand within the

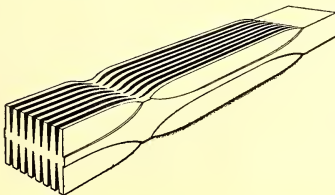


FIG. 3.—PERSPECTIVE VIEW OF PART OF FINISHED PLATE

limits of allowable voltage drop. It is a fact too little appreciated that the first cost of a line battery is often very much less than of copper feeders sufficient to secure anything like equivalent effect. As evidence of the extent of these economies it may be stated that the line batteries installed by the Gould Storage Battery Company, having frequently saved their entire cost in less than eighteen months.

The following brief description of the Gould battery plate

and the accompanying illustrations will serve to explain how this type fulfils the requirements desirable in a storage battery.

The plate is of the Plante type, in which the active material—lead peroxide (PbO_2) of the positive and spongy lead (Pb) of the negative—is formed electrochemically out of the lead composing the support plate or contact surface.

Fig. 1 is a fragment of a plate showing how the large contact surface for active material is developed out of a sheet of rolled lead cut to the size and shape of the plate. This "blank" is placed between two shafts on which are mounted sets of rapidly revolving steel discs with spacing washers. These discs are pressed against the plate and moved to and fro, working into the lead further and further and spinning the metal between the knives into thin parallel ribs.

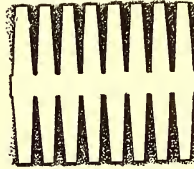


FIG. 4.—CONTACT SURFACES WITH ACTIVE MATERIAL

Fig. 2 is a longitudinal section of a fragment of a plate, and shows the web of metal left as a central conductor and also the diamond-shaped cross conductors and current distributing bars.

Fig. 3 is a perspective drawing of a small fragment of finished plate, and very clearly indicates the character of the construction. The active material is formed out of the lead composing the contact surface between the ribs, filling the spaces with closely packed but highly porous active material, as shown in Fig. 4. Expansion and contraction cannot cause loosening or falling out of the active elements and the closest electrical contact is preserved. Fig. 5 shows the double con-

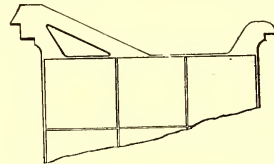


FIG. 5.—DOUBLE CONDUCTING LUG

ducting lug by means of which better distribution of current is secured.

Only chemically pure, densely rolled lead is used, so that secondary actions leading to "self-discharge" are therefore impossible. The plate is absolutely integral; no lead is removed or added in making it—the blank is merely changed in form. The ample provision for circulation of the electrolyte and the large contact surface go far toward securing high efficiency and long life.

INAUGURATION OF ELECTRIC TRAMWAYS IN MONTEVIDEO

The official inauguration was recently celebrated in the presence of Senators, Deputies, Municipal Councillors, judges, press and distinguished members of the business community of the electric service of the United Electric Tramways of Montevideo, Ltd. Hitherto no tramways in Montevideo have been operated by electricity. The work of conversion from animal to electric traction was carried out by J. G. White & Company, Ltd., of London. The systems owned by the United Tramways will, when fully converted, extend to about 78 miles, of which upwards of 40 miles have now been completed and opened for traffic.

HIGH AND LOW-VOLTAGE POWER TRANSFORMERS

The Wagner Electric Manufacturing Company, of St. Louis, whose prominent part in the development of large single-phase motors is so well known, has also given a great deal of attention to the design and manufacture of a wide range of power transformers. These consist, broadly speaking, of three types—oil-filled self-cooled, oil-filled water-cooled, and the air-blast type. The company uses the "shell" form of construction, believing that this is safer and will operate for a longer period with less internal losses than the core type.

The oil-filled self-cooled transformers are built up to 50,000 volts in capacities from 6 kw to 500 kw; the oil-filled water-cooled transformers up to 50,000 volts from 100 kw to 1000 kw; and the air-blast transformers up to 15,000 volts from 60 kw to 1000 kw.

The temperature rise on all transformers is guaranteed not to exceed, at full load, 50 degs. C. above the temperature of the surrounding air. This is in accordance with standard transformer specifications. In water-cooled units the temperature rise may be controlled by regulating the amount of cooling water, and the equipments are arranged to do this with minimum care and attention. The Wagner Company did some of the first work in the field of high-tension long-distance transmission, some of the initial installations of this character on the Pacific Coast still being in operation. The company recently had a report from two California stations stating that these installations have been in daily successful operation for the past nine years without a single dollar having been expended on them for maintenance or repairs.

TWO ENGINES RECENTLY INSTALLED IN THE FORTIETH STREET POWER HOUSE OF THE SOUTH SIDE ELEVATED RAILWAY, CHICAGO

Two new Allis-Chalmers engines, 38-in. and 80-in. x 60-in., of the vertical cross-compound condensing type, have recently been installed in the power house of the South Side Elevated Railway, of Chicago, Fortieth Street and State Street. These engines are equipped with Corliss valve gear, with steam and exhaust valves located in the cylinder heads and operated by separate eccentrics. The valve gear is arranged to vary the point of cut-off from 0 to $\frac{3}{4}$ of the piston travel.

The cylinders are proportioned to give the maximum steam economy at a normal load of 3000 ihp, but each engine is capable of developing continuously 5300 ihp with a steam pressure of 165 lbs. per sq. in., measured by steam gage at the throttle, and with a vacuum in the exhaust pipe of 26 ins. The engines are designed for a speed of 70 r. p. m. and a stroke of 60 ins. Each is direct connected to a 2000-kw, 640-volt d. c. generator. The engines are provided with governors of fly-ball or inertia type, arranged to regulate the cut-off in both cylinders to suit the conditions of the load on the engines; a separate emergency governor, actuating an automatic stop valve in the steam pipe, is also provided, so that in the event of the speed increasing from any cause to above the normal, the steam will be automatically shut off. The regulation is such that, with wide open throttle, the speed of the engines will not rise more than 2 per cent above normal at no load, nor fall more than 2 per cent below normal at the maximum load, so that the engines are absolutely free from the condition of racing.

Each engine is equipped with a device by which the cut-off on the low-pressure cylinder can be adjusted by hand, while the engine is in operation. Valves and other working parts are constructed so that the engines can be operated non-condensing in case of emergency without injury or strain. The fly-wheels are 25 ft. in diameter and weigh not less than 200,000 lbs. They are of the Allis-Chalmers segmental type.

The condensing apparatus attached to the engines comprises the Allis-Chalmers Company's type-B barometric condensers. The condenser is connected direct to the exhaust nozzle of the low-pressure cylinder, thus obviating losses in the exhaust pipe. This apparatus is capable of condensing 80,000 lbs. of exhaust steam per hour and producing a vacuum of 28 ins. at the exhaust nozzle of the low-pressure cylinder.

The injection water pump and dry air pump are direct coupled to an Allis-Chalmers horizontal non-condensing Corliss engine. The dry vacuum pump is of the vertical type, and driven from an extension of the engine crank pin. The suction valve is positively actuated from an eccentric on the main shaft, and the discharge valves are also driven by an eccentric on the main shaft, and are adjustable; the arrangement being similar to the Meyers valve. The injection water pump is of the rotary type, direct connected to the end of the engine shaft, and has a capacity of 56 gals. per revolution.

GROOVELESS-POST SEMI-CONVERTIBLE CARS FOR MUSKEGON, MICH.

Peculiar local conditions govern the operation of the lines of the Muskegon Traction & Light Company, of Muskegon, Mich. The city is contiguous to many attractive pleasure resorts bordering on Lake Michigan, most of which are accessible by trolley, and has received its chief impetus from these resorts. A large portion of the transient traffic which the company handles is drawn from Grand Rapids. The interurban line recently constructed between Grand Rapids and Muskegon brings large crowds to the latter city, especially in the summer time. Many of the passengers coming into the city over this line are bound for Lake Michigan Park, owned and operated by the Muskegon Company. In



SINGLE-TRUCK, SEMI-CONVERTIBLE CAR FOR MUSKEGON

order the better to handle this traffic the company has recently placed in operation four grooveless-post semi-convertible cars built by the American Car Company, of St. Louis, under Brill patents, a type of which car is a new departure to the city. The new cars are similar to others of the type which have been illustrated and described in these columns. They are 20 ft. 8 ins. in length and 29 ft. 8 ins. over the crown pieces; width over the sills, 7 ft. 9½ ins., and the interiors are finished in cherry. All the cars are equipped with the Brill track scraper. The truck employed is the familiar No. 21-E.

FINANCIAL INTELLIGENCE

WALL STREET, Dec. 26, 1906.

The Money Market

There was some improvement in the monetary situation during the past week. The local demand for money was less urgent as a result of the continued liquidation in the stock market, and there was also a falling off in the shipments of funds to San Francisco and to Southern points. The resources of the New York city banks were materially strengthened by the relief measure put into effect by the Secretary of the Treasury, and by the action of some of the large railroad systems in anticipating the payment of Jan. 1 bond interest, which made available about \$10,000,000. As a result of these developments the rate for call money declined sharply, and while the recessions in rates for money for fixed periods was comparatively small, there was more disposition on the part of lenders to put out their funds at the lower level. It is not expected, however, that any material decline in time money rates will take place in the near future. The clearing house banks have gained a very substantial amount of cash during the week, but against this must be reckoned the continued activity in trade throughout the country, and the arrangements making for the Jan. 1 interest and dividend disbursements, which promise to be considerably in excess of Jan. 1 of this year, when they aggregated more than \$150,000,000. These heavy payments are not only likely to keep rates for time funds at near the present level, but they will doubtless result in a flurry in call loan charges during the closing days of the year. Until these disbursements are made, and the moneys are redeposited in the banks, little change in the situation can be looked for. The foreign exchange market has ruled heavy throughout the week, rates for prime demand sterling declining to 4.82 $\frac{3}{4}$, the lowest price of the year. Under ordinary circumstances, the low rates of exchange would result in heavy importations of gold from Europe, but the situation abroad is such that little gold can be secured for import. Money is in active demand throughout Europe, and any attempt on the part of our bankers to send a substantial amount of the yellow metal abroad would doubtless be followed by an advance in official discount rates at the principal financial centers, and thus compel the unloading upon our market of stocks and bonds now held abroad. The bank statement published on last Saturday was extremely favorable, although some surprise was occasioned by the small decrease of \$483,000 in loans, in view of the heavy liquidation in the stock market. The gain in cash, however, was substantial, which not only wiped out the deficit of the previous week, but created a surplus of \$3,280,900, which compares with a surplus of \$4,159,400 in the corresponding week of 1905, and a surplus of \$15,247,225 in the corresponding week of 1904.

The Stock Market

The pronounced weakness in the stock market during the past week cannot be regarded in any other manner than as a legitimate reflection of conditions and developments. Close observers of the speculative situation have been convinced that an upward movement in securities prices could not be successfully carried on while the money market was in so uncertain a position. While the strong features of the fundamental position have been, and now are, very clearly recognized, yet these have been negated by the urgent demand for funds. The most important of these are the proposed additions to capital by some of the leading railroads of the country. While these are legitimate in that they make provision for future extensions and improvements, they are none the less disturbing from the market standpoint, as they make a serious drain upon capital supplies at a time when money is scarce. The announcement of the proposed new issue of stock by the St. Paul was unfavorably received, and was followed by heavy selling of the stock, which carried the price off sharply, and was also reflected in the so-called Hill stocks, all of which recorded material declines. Reading was also a conspicuously weak feature. In other quarters of the market the movement was downward, and while the declines were not as sharp as in the above-mentioned shares, the recessions, nevertheless, were of a substantial charac-

ter. The closing weeks of the year are always a period of readjustment. Accounts are being closed, and traders usually place themselves in a position to start along new lines after Jan. 1. In view of the extent to which prices have declined during the past month, it is not unreasonable to expect a change, even if temporary, in the first month of the new year. The optimists urge that the phenomenal business of the country, the large crops and the general prosperity warrant confidence, and ultimately higher prices, but on the other hand this prosperity means a greater demand for money for commercial uses, and a smaller available supply for speculative purposes. The key to the entire situation is the money market, and this is likely to be rather uncertain for some time. At the close of the week, the directors of the Anaconda Copper Company announced a quarterly dividend of \$1.75 a share, an increase of 25 cents over the previous disbursement, and making the fourth increase in the dividend rate during the year.

The local traction situation is steadily improving, with Brooklyn Rapid Transit the strong feature. The buying of this stock, or rather the support which it received, was based on the new developments which increase the facilities of the company, while at the same time adding largely to its earning capacity.

Philadelphia

Trading in the local traction shares was upon a somewhat smaller scale during the past week, and although prices moved with more or less irregularity, the general tone of the market was better. Philadelphia Rapid Transit was again the leader of the list in point of activity, and while the price failed to improve materially, the buying was much better than of late. Opening off a small fraction the stock advanced to 23, but later receded slightly. About 7000 shares were dealt in. Union Traction, which was under pressure in the preceding week, developed considerable strength, the price rising 2 points to 60, on purchases of upwards of 1000 shares. Philadelphia Traction declined $\frac{1}{2}$ from 96 $\frac{1}{2}$ to 96, and Consolidated Traction of New Jersey was fairly active at 76. Philadelphia Company common, after selling at 48 $\frac{1}{2}$, ran off to 48 on light transactions. Other transactions included American Railways at 51, United Traction of Pittsburg preferred at 49, and Philadelphia Company preferred at 48.

Baltimore

Increased activity developed in the tractions at Baltimore, and especially in United Railway issues, which were in good demand throughout the week. The income bonds were dealt in to the extent of about \$150,000, at prices ranging from 57 $\frac{3}{4}$ to 58, while the 4 per cent bonds brought 88 $\frac{3}{4}$ and 88 $\frac{7}{8}$ for more than \$50,000. The refunding 5s were comparatively quiet, about \$10,000 changing hands at 86 $\frac{3}{4}$ to 87 $\frac{1}{2}$ and back to 87. Other sales were: United Railway free stock at 14 and 13 $\frac{1}{2}$, certificates 14 $\frac{1}{2}$ and 13 $\frac{1}{2}$, Norfolk & Portsmouth Traction at 27, Augusta Railway & Electric 5s at 107 and 107 $\frac{1}{2}$, Knoxville Traction 5s at 106 and Baltimore City Passenger 5s at 103 $\frac{3}{4}$.

Other Traction Securities

In the Boston market trading has been rather quiet and prices moved irregularly. Boston Elevated advanced from 151 to 152 on the purchase of odd lots, and Boston & Worcester rose from 29 $\frac{1}{2}$ to 30 $\frac{1}{2}$. On the other hand, Massachusetts Electric declined from 19 $\frac{1}{2}$ to 18 $\frac{1}{2}$, and the preferred ran off from 69 to 68. West End sold at 93 and 92, and the preferred at 109. The Chicago market was dull and absolutely without feature. Sales included Union Traction common at 5 $\frac{3}{8}$ and 5 $\frac{1}{2}$, West Chicago at 29, Metropolitan Elevated preferred at 71, Northwestern Elevated preferred at 64 $\frac{3}{4}$, and Chicago & Oak Park Elevated at 16.

Security Quotations

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

	Dec. 19	Dec. 26
American Railways	51	50 $\frac{1}{2}$
Boston Elevated	151	151
Brooklyn Rapid Transit	79 $\frac{1}{2}$	79 $\frac{3}{4}$
Chicago City	150	150
Chicago Union Traction (common).....	5	5 $\frac{1}{2}$
Chicago Union Traction (preferred).....	18 $\frac{3}{4}$	18 $\frac{3}{4}$

	Dec. 19	Dec. 26
Cleveland Electric	62	—
Consolidated Traction of New Jersey.....	76	76
Detroit United	79	75
Interborough-Metropolitan	36	34½
Interborough-Metropolitan (preferred)	73	73
International Traction (common)	62	66
International Traction (preferred), 4s.....	85½	85
Manhattan Railway	141	140½
Massachusetts Electric Cos. (common)	19	18
Massachusetts Electric Cos. (preferred).....	68½	67½
Metropolitan Elevated, Chicago (common).....	29½	28½
Metropolitan Elevated, Chicago (preferred).....	69½	69
Metropolitan Street	106½	—
North American	87½	87¼
North Jersey Street Railway	40	40
Philadelphia Company (common).....	48½	47½
Philadelphia Rapid Transit	227½	22½
Philadelphia Traction	96½	96
Public Service Corporation certificates.....	67	67
Public Service Corporation 5 per cent notes.....	96	96
South Side Elevated (Chicago).....	89	89
Third Avenue	121½	119
Twin City, Minneapolis (common).....	106	102
Union Traction (Philadelphia)	58	58½

½ Asked.

Metals

The "Iron Age" says the buying for the second half of 1907 on the part of consumers of pig iron has developed in increasing volume in the Eastern markets and is becoming a feature, too, in the Central West. Conspicuous among the purchasers are again the open-hearth steel producers. That consumers should be willing to contract for delivery so far ahead, at prices which would have seemed extravagant six months ago, is surprising proof of confidence in the future, and in some branches seems hardly in harmony with the outlook for values in finished material which the powerful interests are striving to hold at old levels. Only small contracts for bridge work and structural material have been placed.

Copper metal continues in urgent demand and prices for all grades are ½c to ¾c higher for the week. Lake is quoted at 23½c to 24c; electrolytic at 23¼ to 23¾c, and castings at 23c to 23½c.

THE COMING MEETING OF THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK

The executive committee of the Street Railway Association of the State of New York held a meeting at Buffalo on Friday, Dec. 21, at which it was decided to hold the next quarterly meeting of the association at the Iroquois Hotel, Buffalo, at 10 a. m., Jan. 11, 1907, the subject of meeting to be "Track and Roadway." It is anticipated that there will be several papers, and as the subject is a very important one in railway operation, a large attendance is expected. Notice of the meeting giving the subjects of the papers will be made in the STREET RAILWAY JOURNAL of Jan. 5, not being available at this time.

LAKE SHORE COMPLETES IMPROVEMENTS

The Lake Shore Electric Railway Company has completed the work of double-tracking its line between Cleveland and Lorain, a distance of 20 miles, and is now operating over the line. This will not only allow better time, but makes it possible to take care of all the business offered the road with the greatest possible despatch. The single track has hampered the company for some time, and the large number of cars that were necessary rendered operation with despatch difficult. With the additional track, however, it is probable that a 15-minute schedule will be arranged in the spring when travel begins to grow heavy. The new 2000-kw turbine at the Beach Park power house has been tested out and is almost ready to be put into operation. This will give the road all the power that is needed. With the completion of the new sub-station at Dover Bay, the distribution on the Cleveland end of the line has been improved so that it is in shape for any requirements that may be made. The first shipment of rails for the Sandusky-Fremont division of the Lake Shore has been received. With nearly all of the other equipment on the ground, the work will now be carried on steadily until the rails are laid. It has been planned to keep the men at work throughout the winter or as much of the time as they can work, and it is thought that the road will be completed by May 1, at the outside.

RULING ON ISSUANCE OF PASSES IN OHIO

The State Railroad Commission has made a ruling on the issue of passes that seems to apply to interurban as well as steam roads. In reality, it is said, the ruling was called out by a discussion of the subject at the recent meeting of the interurban managers with the Commission. The ruling in effect is that free passes or special rates can be given for use entirely within the State only, to ministers, agents of incorporated colleges and charitable societies when traveling on business, destitute and homeless persons, and for an attendant in shipping live stock, when one is required, with return transportation. The penalty for violation of these requirements is a fine that may be as high as \$10,000. While the interurban companies will be glad to rid themselves of the pass evil, to a large extent through this ruling, it is possible that they have not been allowed quite as much latitude as they would like in some cases.

YORK (PA.) COMPANY APPLIES FOR EXTENSION RIGHTS

The York Street Railway Company has purchased for a private consideration the franchises and all other interests of what are known locally as the Philadelphia Companies. As a result the York Street Railway Company will ask from the city the right to build such lines as were formerly requested by the Colonial Street Railway Company and the Penn Park Street Railway Company, both of York, as well as the King Street & Carlisle Avenue Street Railway Company, the York Intramural Street Railway Company, the York Railway & Electric Company, the York & Hanover Western Railway Company and the York & Susquehanna Railway Company. Deeds conveying the rights of all the above companies to the York Street Railway Company have been made and henceforth the York Company will have complete control of all the above interests under the one head of the York Street Railway Company.

As a preliminary the York Street Railway Company has presented to the Select Council bills covering the new arrangement and including the Penn Park and the Colonial Street Railway Companies. The new bills ask for new routes and substitute for the bonds of \$25,000 to be given by the two companies mentioned, a bond in the sum of \$50,000 for the faithful performance of the agreement made by the York Street Railway Company according to the new order of things.

As before, the company agrees to pay to the city 3 per cent of its gross earnings, to sprinkle the streets, to furnish a car for the removal of ice and snow, etc. The company also obligates itself to begin work on the extensions within 120 days from the time of the passage of the bills and to complete the same within three years from that date. In these and in all other respects the provisions of the bills are the same as in the ones passed by the Councils sometime ago and under which the York Street Railway Company is at present working. The extensions cover nearly the whole of York and include a loop of the suburban lines in this city so as to avoid congestion in Centre Square.

INTEREST IN COLUMBUS COMPANY'S MEETING

Unusual interest attaches to the annual meeting of the Columbus Railway & Light Company, of Columbus, Ohio, which has just been announced for Jan. 10, because of the rumors current of a deal which concerns the Central Railway Company, over which the interurban lines operate into the city. As first rumored reports were to the effect that the Central Railway would become part of the Columbus Railway & Lighting system, either through lease or purchase. A report now in circulation is to the effect that through the Central Railway overtures will be made by the Schoepf-Morgan syndicate for taking over the Railway & Light Company's property.

DIRECT CURRENT REPLACES THREE-PHASE ON SOUTH-WESTERN TRACTION COMPANY'S LINE

It is stated that the Ganz three-phase system has been rejected by the South-Western Traction Company, of London, Canada, and will be replaced before spring with the direct-current system in accordance with American practice. To this end, the company is understood to have just closed a contract with the Canadian Westinghouse Company for sub-station equipment and double-end car equipment with the 93-A-2 motor. The Ottawa Car Company is building six interurban cars for the company.

MAYOR DUNNE HOLDS OUT FOR REFERENDUM VOTE

While a consultation of attorneys for the city of Chicago and the City Railway and Union Traction Companies was in progress last week, Mayor Dunne made the announcement that before the measure was brought to a vote in the Council he would ask for a referendum. The Mayor stated that he had in public addresses during the last mayoralty campaign stated time and again that before any settlement ordinance was passed by the Aldermanic body he would see that it was approved by the people. On this ground he declared he would have to let the voters of Chicago pass judgment on the ordinances.

"The traction question is one in which the city, as a whole, is vitally interested," said the Mayor, "and it is my opinion that the people should have a chance to pass on it. I favor the adoption of a resolution by the Council to make a referendum imperative."

"At the same time I feel that I would urge the people to ratify the traction agreements. It seems that the ordinances are to be put in such shape that they will meet my hearty approval, and if they do I will not hesitate to advise the voters to stand by them."

This attitude of the Mayor is not taken kindly by the papers and the conservative interests. The pressing demand is for a settlement of the controversy at the earliest possible moment so that the rehabilitation of the properties can go forward at once, and any measure tending to hinder matters or put off the needed improvements is looked upon with disfavor. The papers, especially, are antagonistic to this move by the Mayor, and the "Tribune" has even gone so far as to conduct a canvass of its own to learn what the general opinion of voters is on the matter of a referendum.

There was rather an unexpected turn in affairs at the meeting of the transportation committee of the Council on Wednesday, Dec. 19. As the city railway ordinance was being considered, John M. Harlan, Judge Grosscup's counsel, representing the people, made a proposal to the committee to postpone the final disposition of that ordinance until the Union Traction Company is in a position to accept its ordinance. Mr. Harlan pleaded for the excision of the clause providing that in the event of the failure of the Union Traction Company to accept its franchise, the City Railway will extend its lines to the North and West sides. In place of the present provision Mr. Harlan wanted one for concurrent acceptance of the ordinances by the two companies. Walter L. Fisher, Mayor Dunne's special traction counsel, said he was decidedly opposed to this, and that a final answer should be made by the Company before Jan. 15 so that the city might shape its actions accordingly. The committee adjourned without taking action on the Harlan proposal, most of the Aldermen declaring their opposition to the plan.

The details of the finances of the companies were also worked out. As the plan now stands, the 5 per cent interest on the whole investment allowed the companies will be deducted from the net receipts, after which the division of profits between the city and company will be made. Several new clauses were inserted in the ordinance. One provides that during the three-year rehabilitation period 70 per cent of the gross receipts shall be set aside for actual operating expenses, the remainder of this amount, after the payment of operating expenses, to be applied on renewals. After the rehabilitation period, 6 per cent of the gross receipts is to be spent on renewals. President Mitten, of the City Railway, stated that the gross receipts next year will be \$18,000,000. On this basis the financial scheme will work out in this way:

Gross receipts	\$18,000,000
Operating expenses	12,600,000
Net receipts	5,400,000
Interest (5 per cent on \$55,000,000)	2,750,000
Net profits	2,650,000
City's share of net profits (55 per cent)	1,457,500
Company's share of net receipts (45 per cent)	1,192,500

In explanation of the \$55,000,000 taken as the investment for 1907, it was stated that \$50,000,000 is the agreed value of the present properties and that not more than \$5,000,000 possibly can be spent on reconstruction and new construction next year.

In accordance with the decision noted in the last issue of the STREET RAILWAY JOURNAL to appoint Bion J. Arnold chief engineer of the city's engineering commission, under the supervision of which the street railway service will be rehabilitated, Mr. Arnold was formally appointed on Wednesday. His salary was fixed at \$30,000 a year. It was stipulated that as chief engineer he should "have charge of the preparation of plans and specifica-

tions and the general direction of the entire work." The other two engineers, one appointed by the city and one by the company, are to be paid at the rate of \$100 a day, not less than \$3,600, nor more than \$10,000 a year.

Mr. Arnold's appointment is everywhere conceded to be the most judicious that could have been made. Not only Mr. Arnold's familiarity with the situation as a result of his acting as special advisory engineer to the city throughout the entire negotiations, but the personality of the man and his standing in his profession insure the ablest possible conduct of the relations between the city and the company. The newspapers are a unit in their expressions of appreciation at Mr. Arnold's appointment, several of them printing long editorials eulogizing Mr. Arnold for the service he has already performed. Under the caption "Bion J. Arnold's Service" the "Evening Post" recently said:

"Men mean more than measures in a democracy. Thus, the association of Bion J. Arnold with the traction agreement gives that document a trustworthiness that cannot be denied by the most maulingly suspicious seeler after 'joker' clauses. Mr. Arnold has been to Chicago's transportation what Mr. Burnham is going to be to Chicago's civic beauty. He is at the head of his profession, and he has turned his talents toward the service of his fellow citizen. Not only as an engineer, but also as a man, he has always had some measure of that wonderful faith which the people bestow so lavishly upon Theodore Roosevelt.

* * * It is beyond words good that the pressure of such a man gives the public every assurance that both parties to the traction bargain are acting in unquestionable good faith."

FOREST HILLS TERMINAL PLANS DEVELOP

The Boston Elevated Railway Company has filed with the Massachusetts Railroad Commission revised plans of its new elevated terminal station at Forest Hills, and a public hearing upon the plans was scheduled for Dec. 28. As prepared, the plans include a surface island platform about 300 ft. long and 17 ft. wide on the westerly side of Forest Hills Square, a surface platform on private land at the east of the square, two elevated railway platforms, an elevated railway loop and two opposed surface loops. The elevated platforms in each case are located above the surface platforms, that on the west side of the square being planned for unloading elevated traffic, southbound from the city, and that on the private land at the east side being a loading platform for inbound or northbound elevated trains. The westerly platform will probably be connected with the Forest Hills station of the New York, New Haven & Hartford Railroad by a foot bridge.

About 35 ft. of clear street width will be left between the westerly surface platform and the west sidewalk of the square, and in this space no surface tracks are at present contemplated. About 60 ft. of clear roadway are planned at the east of the island platform, leaving a total width of street of about 100 ft., with the object of meeting the objections to the plans first offered, which left about 48 ft. of roadway.

Southbound elevated trains arriving at the west side of the square will discharge their passengers and will pass around a loop to the easterly or loading elevated platform near Morton Street, going thence into the city. Surface cars coming from Hyde Park and Roslindale will probably run into the square along the easterly surface platform, and loop around near Morton Street to make their several stops at the westerly island platform, before returning on their course southward. Surface cars entering the square from the city will virtually make no transfers to and from the elevated trains, but will transfer to the Hyde Park and Roslindale lines on the surface. They will stop first at the westerly or island surface platform, which is the loading platform for southbound surface lines, and will then pass around by the street loop to the easterly surface platform, in order to receive such Hyde Park and Roslindale passengers as desire to continue toward Boston proper by surface lines. The latest plans fence in only the track on which southbound surface cars stand while at the island platform.

An announcement and map are being distributed in Chicago by the Metropolitan Elevated, calling attention to the nearness of the company's stub terminal at Fifth Avenue to much of the business district. This is part of an effort that is being made to relieve the congestion during the rush hours on the loop, as the stub terminal is not being worked up to its full capacity.

NEW HAVEN MAKES FORMAL ANNOUNCEMENT OF THE CONNECTICUT RAILWAY & LIGHTING AND RHODE ISLAND DEALS

At a meeting in New York, Thursday, Dec. 20, of the board of directors of the New York, New Haven & Hartford Railroad Company, announcement was made of the completion of the purchase by the New Haven Company of the Rhode Island Securities Company and the Rhode Island Company, operating a system of electric railways in Rhode Island. The stock and indebtedness of the Rhode Island Companies, as of Aug. 1, 1905, will be paid for at par, upon payment by present holders of Rhode Island Securities stock of an assessment of \$10 in cash per share. The directors also announced the taking of a lease practically in perpetuity of the properties of the Connecticut Railway & Lighting Company in Connecticut. A purchase has also been made of the United Gas Improvement Company interests in several Connecticut power companies, and these plants will be turned over to the Consolidated Railway Company, the corporation which has been formed to handle the electric properties of the New York, New Haven & Hartford Railroad Company. The company gave out the following formal statement:

The New York, New Haven & Hartford Railway Company has purchased the capital stock and all of the indebtedness of the Rhode Island Securities Company, paying therefor in debentures of the Providence Securities Company (a Connecticut corporation), bearing interest at 4 per cent and indorsed as to principal and interest by the New York, New Haven & Hartford Railroad Company at par for said stock and indebtedness as of Aug. 1, 1906, upon the payment by present holders of Rhode Island Securities Company stock of an assessment of \$10 in cash per share.

Upon the completion of this purchase the directorate of the Rhode Island Company and Rhode Island Securities Company has been changed by a majority of said directors resigning and representatives of the New York, New Haven & Hartford Railroad Company being temporarily elected in their places pending the permanent reorganization of the directorate.

In pursuance of the above, Mr. Mellen, of the New Haven Railroad, has been elected president of the Rhode Island Company and the Rhode Island Securities Company. A. S. May has been elected treasurer, and J. G. Parker, secretary of both companies, these men occupying relatively the same positions with the New Haven Company.

A purchase has also been made of the United Gas Improvement Company interests of all the capital stock of the Meriden, Southington & Compounce Tramway Company, of the New Milford Power Company and of the Housatonic Power Company, and changes in the organizations of those companies have been perfected whereby the officers of the Consolidated Railway Company have been elected and the directorate of the companies changed, so that a majority of the directors are now held in the interest of the Consolidated Railway Company.

The purchase of the Connecticut Railway & Lighting Company, with all its rights and privileges in lighting and power plants, its water power on the Housatonic River above New Milford, its franchises in many of the manufacturing centers, together with the railway system owned by the Rhode Island Securities Company, the holding company of the Rhode Island Company, which itself was owner of the Rhode Island Suburban Railway Company, the Union Railroad Company and the Pawtucket Street Railway Company, is one of the largest transactions ever made in New England. It gives the New York, New Haven & Hartford Railroad Company ownership of about 1350 miles of single trackage, trolley lines in Connecticut and Rhode Island, from which the gross earnings a year are upward of \$16,000,000.

The total market values of the companies included in the whole combination, including all the underlying bonds in the constituent companies, is not less than \$130,000,000.

The purchase of the Connecticut Railway & Lighting Company, it is stated, calls for \$975,000 as first payment, rising by \$70,000 a year until it reaches the amount of \$1,500,000. This sum will permit the payment of interest on bonds and other obligations and about 4 per cent immediately upon the preferred stock and ultimately a dividend of 3 or 4 per cent upon the common stock. The 4½ per cent bonds of the railway and lighting company can be called at 105 and interest under a recent arrangement made by the United Gas Improvement Company, of Philadelphia, except as regards about \$1,000,000 of the bonds which did not come into the agreement. Under the terms of the purchase the bondholders of the railway and lighting company in return for the guarantee of the bonds by the United Gas Improvement Company allowed the bonds to be called at the figure named. This arrangement includes a provision for the interest on underlying bonds of the

railway and lighting company with mortgage power upon the subsidiary properties, which amount to about \$1,000,000.

The total outstanding stock of the railway and lighting company, of which, it is understood, the United Gas Improvement Company had a considerable majority, was \$5,535,900 preferred and \$9,464,100 common, a total of \$15,000,000, of which none has ever been returned to the Connecticut Railroad Commission as paid in cash. The number of stockholders in this State was twenty-one, out of a total of sixty-six, and their share holdings amounted to \$299,400. The bonded debt consisted of about \$13,000,000 in 4½ per cent bonds, a large part of which can be retired at 105.

The Rhode Island purchase will be vested in the Providence Securities Company, a Connecticut holding company. To take over the Rhode Island Securities Company it will issue its own 4 per cent fifty-year debentures to the amount of \$20,000,000, to be guaranteed, principal and interest, by the New York, New Haven & Hartford Railroad Company. The Providence Securities Company will be controlled by the New York, New Haven & Hartford Railroad Company as holders of the stock.

PLANS FOR CONSOLIDATION OF OHIO ROADS

Plans for the consolidation of the Cleveland & Southwestern Traction Company, the Ohio Central Traction Company and the new Cleveland, Ashland & Mansfield, which are now under way, have been approved by the directors of the parent company, the Cleveland & Southwestern. The system, after the merger, will consist of 207 miles of single track, and will bring towns of the North Central portion of the State into direct communication with Cleveland. The new company will be known as the Cleveland & Southwestern Railway Company and will have a capital stock of \$10,000,000, of which \$2,500,000 will be 5 per cent cumulative preferred and the remainder common stock. A first general mortgage bond issue of \$10,000,000 will also be authorized. When the deal is completed there will be outstanding \$2,400,000 of 5 per cent preferred stock, \$4,700,000 common stock and \$5,500,000 bonds. For the purpose of building other lines and making improvements and betterments, there will remain \$100,000 preferred and \$2,800,000 common stock and \$5,000,000.

Under the basis of exchange agreed upon the new company will pay for the \$2,000,000 preferred stock of the Cleveland & Southwestern and accumulated dividends of 10 per cent, \$2,000,000 of the new preferred stock, \$200,000 general mortgage bonds and \$200,000 common stock. The holders of common stock will receive the same amount of common stock in the new company or \$3,000,000. The \$3,110,000 bonds will be allowed to stand, the same amount of new bonds being held in escrow.

For \$1,000,000 bonds and \$1,000,000 stock of the Cleveland, Ashland & Mansfield, the same amount of stock and bonds of the new company will be given. The bonds of the present company will all be retired.

For the \$400,000 preferred stock of the Ohio Central, an equal amount of the new preferred stock will be given, while \$500,000 common stock will be exchanged for the \$750,000 that the old company now has in force. The \$300,000 first mortgage bonds will be allowed to stand, the same amount of the new bonds being held in escrow.

For the immediate needs of the combined property, \$290,000 bonds are to be held out and sold. When the properties under construction are completed and the proposed improvements made, the company will have no floating debt.

The present Cleveland & Southwestern system has 135 miles of track, the Cleveland, Ashland & Mansfield 43, and the Ohio Central 29, making 207 in all. So far, there has been no decision as to power for the Cleveland, Ashland & Mansfield. Whether it will be operated from the present power house of the Cleveland & Southwestern or whether an additional power house will be built on the line or at some other economical point has not been decided. In addition to the street and interurban lines owned by the Cleveland & Southwestern, it also owns and operates the Norwalk Gas & Electric Company, at Norwalk.

The officers of the company are as follows: F. T. Pomeroy, president; A. E. Akins, vice-president; E. F. Schneider, secretary; A. F. L. Fuller, treasurer. The directors are: A. H. Pomeroy, A. E. Akins, F. T. Pomeroy; M. J. Mandelbaum, M. A. Sprague, L. M. Coe, S. C. Smith, F. L. Fuller, H. Q. Sargent, W. H. Lamprecht, F. H. Ginn and F. E. Myers. The committee that arranged for the consolidation consists of F. T. Pomeroy, chairman; George N. Chandler, F. L. Fuller, F. H. Ginn, M. J. Mandelbaum and F. E. Myers.

NEW PUBLICATIONS

Engineering in the United States. By Frank Foster. Manchester, England: Sherratt & Hughes; 119 pages. Price, 1 shilling.

This is a report to the electors of the Earlside Scholarships, by which certain students at the University of Manchester are enabled to study abroad and examine commercial or industrial subjects. The author selected the United States, where he spent a portion of 1904-'05, partly as a worker in a manufacturing works and in a power station, partly on a tour of inspection of mechanical and electrical engineering undertakings. Among the general subjects which impressed him were the American love of organization; number of technically educated men in manufacturing enterprises, particularly the electrical; high prices for nearly all commodities; specialization, which, according to the writer, is not an unmixed good; the use of cheap materials and finish where none better is required, and the absence of the apprenticeship system. The book is interesting reading, especially as the observations and comparisons with British practices made by Mr. Foster are largely in the field of the electrical industry, in which he thinks that Americans have some things to learn from the British.

The Immediate Care of the Injured. By Albert S. Morrow, M. D. Philadelphia and London: W. B. Saunders & Company; 340 pages; illustrated. Price, \$2.50.

This book is divided into three parts, viz.: The Anatomy and Physiology of the Human Body; Bandages, Dressings and Practical Remedies, and Accidents and Emergencies. It is designed to be useful alike to physicians, nurses and laymen, but particularly to those who have to apply medical aid before the arrival of the physician or surgeon. The volume should prove useful in claim departments.

Steam Turbine Engineering. By T. Stevens and H. M. Hobart. Published by The Macmillan Company, New York, and Whittaker & Company, London; 814 pages; illustrated. Price, \$6.50.

This book discusses the application of the steam turbine rather than its design; that is, it is a consideration of the subject from the standpoint of the purchaser and user, and so differs from most of the other treatises on the subject which have taken up the design and methods of manufacture. For this reason a large portion of the book is devoted to results obtained with steam turbines of different types, methods of installation, including foundations, boiler and superheater surface condensers, statistics of power stations, etc. The principal turbines described are the DeLaval, Parsons of different types, Curtis, Rateau, A. E. G., with briefer discussions of the Hamilton-Holzwarth, Elektra, and Union. A chapter is also given on marine turbines. The book is very fully illustrated and provided with a bibliography, appendix and index.

Economics of Railroad Construction. By W. L. Webb. Published by John Wiley & Sons, New York; 339 pages; illustrated. Price, \$2.50.

This book is divided into two parts: "Financial and Legal Elements of the Problem," and "Operating Elements of the Problem." In the former the writer considers problems connected with the organization and capitalization of the roads, and discusses method of obtaining the value of a property and of estimating the volume of traffic. In the latter a comparison is drawn between methods based on the comparison of earnings per mile of track and earnings per capita of tributary population, and by actual estimate of the sources of revenue. The writer concludes that the latter is practically the only accurate means. In Part II the book first considers classification of accounts and defines the different items used by the Interstate Commerce Commission. The subjects of motive power, economics of car construction, track economics, train resistance, and momentum grades are then considered. Part III is devoted to the physical elements of the problem. We are somewhat surprised to find no reference to electric power or its possibilities in connection with many of the subjects discussed by the writer, as, for instance, pusher engines. Even the discussion on train resistance, to which an entire chapter is devoted, relates entirely to steam railroad tests; otherwise the book is extremely instructive.

The Management of Electrical Machinery. By F. B. Crocker and S. S. Wheeler. Sixth Edition. Published by D. Van Nostrand & Company, New York; 223 pages; illustrated. Price, \$1.00.

The demand for this manual on the practical management of

dynamos and motors is the best evidence of its worth. The contents of the book appeared first as a series of articles in the "Electrical Engineer" in 1891 and 1892, and part of the new matter more recently in the "American Electrician." Since its first appearance 10,000 copies of the book have been printed. In the sixth edition some portions, such as that relating to constant-current motors, which are no longer used, have been eliminated, while other parts have been expanded. New material has been introduced on the management of a. c. motors and generators, and fourteen pages on railway motors. In this chapter the writers recommend grease as a lubricant for motor bearings, and give receipts for several different mixtures. In Part III, on the "Localization and Remedy of Troubles," the plan of giving the "cause," "symptom" and "remedy" for the different troubles has been followed. This makes the application of the remedy very easy.

BOOKS RECEIVED

Fowler's Electrical Engineer's Handbook and Directory of Light, Power and Traction Stations. 725 pages; illustrated. Published by the Scientific Publishing Company, Manchester, England. Price, including postage, 2s. 9d.; with superior binding, 3s. 9d.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED DEC. 18, 1906

838,200. Snow-Flow; Peter G. Minier, Ridgway, Pa. App. filed Oct. 8, 1906. Pneumatic means for moving the wings of a snow-plow outwardly and inwardly.

838,430. Railway Switch; George W. Long, Lindsay, Indian Territory, App.-filed April 3, 1906. Details of construction.

838,495. Block-Signal Apparatus; Alexander Bevan, Providence, R. I. App. filed Oct. 25, 1906. A single-track block-signal system. Has ratchet wheels in the signal boxes, which are engaged by pawls so as to allow a certain number of cars to enter the block and continue to display the signals until all of such cars have left the block.

838,520. Air Brake; Benjamin Canell, West Springfield, Mass. App. filed July 10, 1906. Provides means for partially releasing the brakes and holding the balance of air retained in the brake cylinder and for preventing an overcharge of the auxiliary reservoirs.

838,542. Railway Signaling Apparatus; Albert J. Hitch, Ridgeway, Ontario, Canada. App. filed Dec. 4, 1905. Sitchrolley wires on both sides of the usual track rail and adapted to make contact with depending rails on the train. Has a special construction of signal boxes, etc.

838,562. Composite Metal-and-Wood Tie for Railway Tracks; William H. Miner and John F. O'Connor, Chicago, Ill. App. filed Aug. 2, 1906. A metal tie member, having at each end an enlarged base provided with a wedging angular or flaring socket with upright ends formed by transverse shoulders on the base portion, diagonally-arranged wood blocks fitting in sockets, and metal rail seat or cap members having angular wedging or flaring sockets fitting and resting upon the wood blocks and fitting between the upright shoulders of the enlarged bases of the metal tie member and provided with integral lips or hooks for securing the track rails thereto.

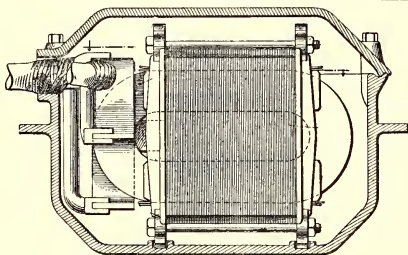
838,574. Metallic Tie for Railway Tracks; John F. O'Connor, Chicago, Ill. App. filed Aug. 2, 1906. Consists of a two-part metal tie, comprising two longitudinally movable metal members, each preferably of channel form, provided with oppositely-faced rail engaging or anchoring plates or devices and with means for securing the two members together and longitudinally adjusting them in respect to each other to cause the oppositely-faced rail anchors on the two members to properly clamp and engage the flanges of the rails.

737,575. Tie for Railway Tracks; John F. O'Connor, Chicago, Ill. App. filed Aug. 10, 1906. Comprises a series of composite wood and metal ties comprising a plurality of diagonally-extend-

ing metal tie members, each having at each end parallel base portions extending at an angle to the intermediate diagonal portion, the parallel base portions of adjacent diagonal tie members being superposed, one on top of the other, and short wood blocks interposed and locked between the superposed base portions of adjacent metal tie members.

838,586. Electric-Car Sign and Signal; Charles W. Hyder and Franklin Orth, Burlington, Vt. App. filed April 8, 1905. The rotatable sign box is provided with different compartments with colored lenses and when the box is rotated to expose a new sign, a switch or commutator is automatically positioned to illuminate different lamps so as to change the color of the signal lenses.

838,589. Automatic Switch-Controlling Device; Mahlon Shaaber and Michael J. Seiling, Reading, Pa. App. filed March 28, 1906. Means whereby a locomotive will always automatically set a switch so as to remain on the main line, and which will



PATENT No. 838,916

also permit of switching cars to a side line while permitting the locomotive to follow the main line without the necessity of an attendant at the switch.

838,738. Track Fastening; Frank J. McGuire, Long Eddy and Edward L. McGuire, Hankins, N. Y. App. filed Oct. 1, 1906. A substantially V-shaped brace extending between and attached to the rails by means of fish-plates and also attached to the ties.

838,742. Trolley Catch; William A. Oates, Los Angeles, Cal. App. filed April 5, 1904. The trolley harp is pivoted to the pole and a detent arrangement actuates a spring on the pole to pull the trolley cord and retrieve the pole when the wheel leaves the wire.

838,752. Railway Signal; Barnet Samuels and David Samuels, Leavenworth, Kan. App. filed May 18, 1904. Comprises an opaque stationary member indicating two permanent positions, and a blind pivotally mounted upon said member and adapted to alternately obscure or cover said positions.

838,773. Railway Car Brake; Seth A. Crone, New York, N. Y. App. filed June 11, 1906. A brake-shoe head comprising a forged-metal back wherein is formed a keyway and a separate forged-metal face-plate secured thereto and adapted to receive the brake-shoe and its securing key.

838,775. Railway Car Brake; Seth A. Crone, New York, N. Y. App. filed Aug. 27, 1906. The brake-shoe heads are connected at opposite sides of the car truck by means of stay-rods which maintain the relation of the heads with respect to each other and to the wheels and the heads are directly operated by brake-levers, which incline inwardly and upwardly, the upper ends of the live-levers being pivotally connected with the operating or draft rods and the upper ends of the dead-levers being pivotally mounted in the dead-lever guides supported from the bolster.

838,776. Brake Beam for Railway and Other Cars; Seth A. Crone, New York, N. Y. App. filed June 11, 1906. The web of the beam is fluted at its ends to form seats for the lower wrists of the hangers at about the center of the heads and in line with the center lugs on the shoes.

838,780. Railway Signal; George P. Finnigan, Greene, N. Y. App. filed Aug. 19, 1905. Exhibits a single semaphore signal at clear, caution or danger positions by single actuating means. Has a motor and a notched disc, which is engaged by a magnet-operated detent to control the positions of the arm.

838,820. Interlocking Machine for Railway Purposes; Jacob R. Struble, Wilkingsburg, Pa. App. filed Oct. 6, 1906. The switch-throwing levers operate plungers, which each have a rack to drive a magnetically damped disc. The arrangement is such that free movement of the plungers is permitted in one direction, but in the other direction their movement is retarded so that a second operation is not permitted until after a certain time interval.

838,854. Electric Block-Signal System for Railways; George P. Finnigan, Greene, N. Y. App. filed Aug. 19, 1905. Sectional track rails energized by batteries and contact plates between the rails for establishing alarm circuits to the locomotive. Provides means by which the signal is sometimes actuated automatically by the next succeeding signal and at other times directly by a passing train.

838,900. Rail Chair and Anti-Creeper; Frank L. Rager, Salt Lake City, Utah. App. filed Oct. 24, 1905. Consists of rail-holding plates having means for engaging the rail at opposite sides, and spikes connecting the plates and the rail support and serving as centers for the plates and having heads arranged to engage the base of the rail at opposite sides.

838,916. Inductive Bond; Louis H. Thullen, Edgewood, Pa. App. filed Feb. 27, 1906. The bond consists of a spirally-wound copper band inclosed by an ordinary transformer core. The band has a single terminal and is so connected to the track circuit that the direct-current flow neutralizes the magnetism of the core and does not completely saturate it so as to destroy its efficiency as an inductance to the alternating current.

839,037. Process of Making Brake-Shoes; William D. Sargent, New York, N. Y. App. filed Feb. 20, 1904. The process of making brake-shoes, which consists in providing a back having attaching means thereon, placing the same in a mold in which the said back forms one side, and thereupon pouring in molten metal to fill the space for the wearing portion of the shoe.

839,072. Rail-Bond; Frank D. Masterson, Boston, Mass. App. filed Oct. 2, 1905. In order to prevent the layers of the bond from separating under the motions of the rails, the patentee has a strap or tie-band surrounding the layers, which permits their free movement to preclude their separation.

PERSONAL MENTION

MR. E. E. WINTERS has resigned as assistant to the president of the Chicago & Milwaukee Electric Railroad Company.

MR. R. S. IVES, several years ago superintendent of the Chicago & Milwaukee Electric Railroad Company, recently returned to that position.

MR. SAMUEL LITTLE, ex-president of the West End Street Railway Company, of Boston, died Friday, Dec. 21, at the Hotel Lenox, Boston. Mr. Little was 80 years old.

MR. C. J. FRANKLIN, who for the past seven years has been connected with the Tacoma Railway & Power Company, has been appointed general superintendent of the Portland Railway, Light & Power Company, of Portland, Ore. Mr. Franklin will fill a post newly created. He will work under General Manager F. I. Fuller.

PROF. WILLIAM M. PUFFER, who for a number of years has been associate professor of electrical engineering and in charge of the electrical engineering laboratories of the Massachusetts Institute of Technology, has opened an office as consulting engineer at 307 Equitable Building, Boston. Prof. Puffer will give special attention to expert testimony in law cases, examinations, choice and layout of new systems, reports and tests of plants, etc.

MR. O. A. HONNOLD, who has been acting as electrical engineer of the Utah Light & Railway Company, has been appointed to the office of chief engineer. Mr. Joseph S. Wells has been appointed acting general manager of the company. Mr. F. L. Morse is assistant to the president; Mr. F. H. Knickerbocker, secretary, and Mr. Joseph W. Musser, assistant secretary. The personnel of the company as now organized is as follows: Mr. W. H. Bancroft, president; Mr. P. L. Williams, first vice-president; Mr. W. S. McCormick, second vice-president; Mr. L. S. Hills, treasurer; Mr. T. G. Webber, Mr. E. Buckingham, Mr. D. E. Burley, Mr. W. W. Riter, Mr. Heber M. Walls, directors.

MR. T. K. WELLS, for the past year superintendent of transportation of the Manila Electric Railway Company, sailed Wednesday, Nov. 21, on the "Trenton" for the United States. Mr. Wells has been in ill health for some months past and has resigned his position and will return to his home in Syracuse. For eight years, previous to November last, when he entered the employ of the Manila Company, Mr. Wells was transportation manager for the Syracuse Rapid Transit Company. Mr. M. T. Carty, who has served with the street car company in various capacities since operation began, will succeed Mr. Wells as superintendent of transportation.

NEWS OF THE WEEK

CONSTRUCTION NOTES

BERKELEY, CAL.—Edward F. Enggs, representing the Oakland Traction Company, has applied to the Board of Trustees of Berkeley for new franchises to operate cars on certain streets in Berkeley. The sum of \$2,000 was deposited with the Board to show that the company was acting in good faith. The rights of way were asked for twenty-six years.

EUREKA, CAL.—It is reported that the La Grange Hydraulic Mining Company plans to build an electric railroad over the mountains from tide water to Redding by way of Weaverville and its mining property.

KENNET, CAL.—Surveyors have been laying out a route south of here for an extension of the Shasta Southern, which is supposed to be a branch of the Northern Electric Company, which now operates between Chicago and Marysville.

MARYSVILLE, CAL.—John Martin, of San Francisco, on a recent visit here stated that if the Marysville Chamber of Commerce and the citizens of Linda Township would live up to their promises in the matter of right of way and work on the Linda Levee that he was ready to commence work on the road at once and prosecute it to completion. Mr. Butters, president, and Mr. Schneider, general manager of the Northern Electric, have been in conference with Mr. Martin about the work, and it is understood that work is to begin at once. Work will be commenced on the Grass Valley and Auburn ends of the road about Feb. 1.

OAKLAND, CAL.—The San Francisco, Oakland & San Jose Railway Company (Key Route) has applied to the City Council for a franchise which practically covers the water-front in West Oakland, and also laps over on the franchise asked for by both the Western Pacific and the Santa Fe roads. The franchise asked for is for fifty years, and, except for the stipulation that electricity shall be used for motive power, is similar to those of the two other roads named, the applicant promising to grant the same privileges to other roads as is guaranteed by the other petitioners. On Dec. 10 the Oakland City Council, sitting as a committee of the whole, decided that whatever railroad company or companies operate the belt lines about Oakland must do so in such a manner that all other railroad companies have equal track privileges in the switching of cars to points on the belt line. The Western Pacific, the Santa Fe and the San Francisco, Oakland & San Jose Railway Company all agree to the insertion of clauses providing for this in the franchises they have asked for. The Southern Pacific franchise was drawn up with this provision. As to what company shall be granted a franchise along a line where several have applied, this question was hardly touched upon. A resolution was passed by the Council finally continuing these applications until Jan. 2.

ORVILLE, CAL.—The officials of the Northern Electric Company have announced that the work will be started immediately upon the street railway system in this city. Work upon the new depot will not be started until the company has filled in the ground at its present location.

SAN BERNARDINO, CAL.—The Crescent City Railway Company, incorporated in Oakland, has been organized for the purpose of building a railroad over a franchise extending south of Bloomington, and which was granted by the Board of Supervisors last spring. The papers have been filed in the local Clerk's office, and also the incorporation papers of the Southern California Cement Company, a part of the same scheme.

SAN BERNARDINO, CAL.—The San Bernardino-Urban Railway Company has been incorporated by local capitalists to build an electric railway from this city to Rialto, Ontario, Riverside and Redlands. The capitalization is \$1,000,000, of which \$700 is subscribed by H. E. Harris, Victor Smith, A. G. Kendall, O. L. Bloomman, and S. S. Draper. It is believed the corporation is associated with the San Bernardino Valley Traction Company.

SUISUN, CAL.—An electric railway is projected in Solano County from Vallejo north, passing through American Canyon, Suisun Valley, and a mile north of Fairfield, taking an easterly direction to Cement, and through Elmira, Dixon and Sacramento. While the main line will not touch Fairfield and Suisun, Mr. Dozier, the civil engineer, states that a spur track can be run into Fairfield and Suisun and a branch line to Vacaville.

VALLEJO, CAL.—The arrival in Martinez of several carloads of ties and rails for the construction of an electric street railway system for the county seat town of Contra Costa has revived the rumors of the early construction by the East Shore & Suburban Company of an electric interurban line connecting all of the important towns along the bay shore from Richmond to Martinez.

MANCHESTER, CONN.—The talk of an electric line to the Green has again been revived, and it is said that the road will be built as soon as possible, providing the town makes the necessary concessions to the Consolidated Road. It is reported that Manager Bristol has ordered a survey of the proposed route and will present the desires of the company to the town at a special town meeting.

ALBANY, GA.—It is said that as soon as the negotiations already under way can be concluded, the Georgia Northern Railway will proceed to make physical changes necessary for the operation of all its trains by electricity

instead of steam. Power for the operation of the trains will be secured at Albany, but whether from the Big Shoals plant, on Muckafonee Creek, or from another of similar character to be constructed in the course of the next year or two, remains to be determined.

ATLANTA, GA.—The Macon & Albany Securities Company has been organized to build electric railways connecting Macon, Americus and Albany, Ga. The lines will be run in conjunction with the interurban road from Atlanta to Macon, surveys of which have been made. The following officers were elected: Nicholas J. Cruger, president; Joseph S. Davis, vice-president; W. J. Massee, secretary and treasurer; Stuart Davis, assistant secretary and treasurer; M. Felton Hatcher, general counsel.

ROME, GA.—The City Electric Railway Company of Rome has reorganized under the name of the Rome Railway & Light Company, and is capitalized at \$500,000. An application has been made to the Secretary of State asking for a new charter. The new charter will be granted for 101 years. The headquarters of the corporation are located at Rome, with a branch in Louisville, Ky. The incorporators are: S. A. Culbertson, L. W. Botts, Attila Cox, Harry Wesinger, John L. Helm, James P. Helm, S. S. Rush, J. D. Stewart, C. E. Claggett, all of Louisville, and J. W. Ewing and J. E. Dean, of Rome.

LEWISTON, IDAHO.—E. D. Thomas, vice-president of the Commercial Trust Company, of Lewiston, Idaho, makes the announcement that the building of the Lewiston & Grangeville Electric Railway between Lewiston and Grangeville is an assured fact. He is quoted as saying: "Arrangements have been made for the purchase of all supplies, and the contracting engineers will be on the ground in the very near future. The people who are buying the bonds are putting \$6,000,000 into the project. Active construction work will be under way in sixty or ninety days, and will be rushed as fast as weather permits."

SPRINGFIELD, ILL.—The first car went over the new Springfield-Lincoln division of the Interurban Railway Dec. 14, making the round trip with a party of officers of the Illinois traction system. Cars began running regularly between Springfield and Lincoln Dec. 15.

STERLING, ILL.—The stockholders of the Rock River Traction Company have authorized the issuance of bonds to the amount of \$2,000,000, the proceeds to be used for the purpose of constructing an electric line from this city to Rock Island, from Rock Island to Geneseo, also to Princeton, and a branch from this city to Morrison. The total distance planned to be covered is 125 miles. The work will commence next spring.

INDIANAPOLIS, IND.—E. G. Nichols, of Des Moines, Ia., is in this city studying conditions and gathering information and data concerning the interurban system operating in and out of this city. Mr. Nichols says that it is the purpose of the interurban line centering in Des Moines to build a terminal station modeled after the Indianapolis station.

INDIANAPOLIS, IND.—An Eastern syndicate has had representatives in this city during the past week examining the Indianapolis, New Castle & Toledo Company's line, now building, and the Indianapolis, Crawfordsville & Western Company's line, almost completed, with the view of purchasing the said roads. These lines radiate from Indianapolis—one to the east, the other to the west—and stretch across the entire State, making convenient connection with Ohio and Illinois traction lines.

RENSELAER, IND.—The South Bend Interurban Company has begun the construction of an interurban line between Indiana Harbor and Gary.

TERRE HAUTE, IND.—Store & Webster, owners of the Terre Haute Traction Company, have announced that a new and modern terminal station would be erected next year to accommodate the several interurban lines centering into Terre Haute.

DES MOINES, IA.—H. G. Gue, vice-president of the St. Joseph, Stansberry & Northern Railway Company, has just returned from an Eastern trip, where he went to negotiate for the sale of bonds for the company. He reports that the sentiment among Eastern capitalists is very favorable to the securities of electric passenger roads, as those have been very successful, but that electric roads which depend largely upon freight business for their revenue are regarded as a doubtful experiment. The directors of the St. Joseph, Stansberry & Northern Railway Company have recently authorized the issue and sale of \$1,000,000 of 5 per cent, thirty-year gold bonds, which it is estimated will build and equip a 40-mile division of the road. Des Moines capitalists have recently acquired a controlling interest in this company.

SIoux CITY, IA.—The right of way for the Sioux City & Trenton Interurban Railway has been secured from a point a few miles north of Sioux City to Ireton, and the company is now negotiating for an entrance into Sioux City. The company is also trying to come to suitable terms with the managers of the Sioux City Traction Company for an entrance into Sioux City over the tracks of said company.

MOUNT PLEASANT, IA.—The business men of this city have been approached by representatives of the Cedar Rapids & Iowa City Electric Railway Company, which is operating a line from Cedar Rapids to Iowa City, relative to the construction of an extension of this line south from Iowa City through Washington to Mount Pleasant. They were informed that the company would certainly construct and operate the line providing

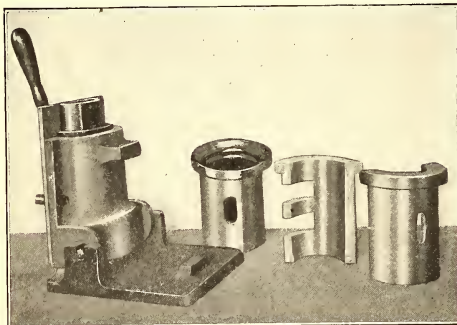


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they would be assured by the business men of Mount Pleasant that \$90,000 would be raised by the residents of Henry County to aid in the project.

COUNCIL GROVE, KAN.—H. M. Herdert, engineer for Lambrecht Bros., of New York, will be here shortly from a trip over the proposed route of the Topeka-Council Grove Electric Railway.

EMPORIA, KAS.—The Toledo parties who are figuring on putting in a street car line here demand the Emporia electric light plant as the price of their coming. They say that the street car line will not pay unless operated in connection with a lighting and power plant. Carlos M. Stone, of Cleveland, Ohio, who visited Emporia with a view of investigating as to the feasibility of putting in an electric street car line here, spoke encouragingly of the project, provided there could be consummated the combining of the electric lighting plant and the electric street car line.

SHARPSBURG, KY.—The committee having the matter in charge announced that sufficient funds have been raised to guarantee the survey of the proposed electric railway from Lexington to this town. The proposed line will be about 20 miles long and, starting at Lexington, will pass through Clintonville and North Middletown, terminating at Sharpsburg and traversing one of the richest agricultural and stock-raising sections in Kentucky. The promoters, consisting of prominent business men and influential citizens of the towns named, will meet soon for the purpose of selecting an engineer to make the survey.

DONALDSONVILLE, LA.—At a regular meeting of the City Council, with Mayor Chas. Maurin presiding, a resolution was adopted granting to F. S. Schneidau a franchise to construct an electric railway here. The conditions of the award is that the work shall begin within the next twenty-four months, and a forfeit of \$3,000 will be posted to carry out the contract.

PITTSFIELD, MASS.—The Pittsfield Street Railway Company has asked for an extension of the franchise privileges of the company to build from the present terminus in West Pittsfield to the Hancock line.

CHARLOTTE, MICH.—George Minneman, of Chicago, who has taken up the work of financing the proposed Albion-Charlotte line, has conferred with the City Council relative to securing a franchise for the road.

GRAND HAVEN, MICH.—One of the promoters of the Riverside Electric Railway, which promises to build an electric railway to Grand Rapids via the river route was in this village recently, and declared to a certainty that the road will be built. The right of way has been secured, and the Government has given permission to build a bridge across Grand River at Pass River. The promoter declares that the project has been completely financed by an Eastern company, and that in all probability work on the roadhead will commence next spring, as everything is in readiness. The Eastern company, he says, will furnish everything, cars and all, and will hurry the construction when the work is started. The new road will enter this village from the Fourth Ward, after coming along on this side of the river from Bass River. The cars will enter Grand Rapids from the West Side.

KALAMAZOO, MICH.—It is rumored here that negotiations are pending between the Kalamazoo, Lake Shore & Chicago Traction Company and the Pere Marquette Railroad Company looking to the sale of the South Haven to the former company. The purchase price under consideration is said to be \$90,000. Such a sale would complete the company's line from Kalamazoo to South Haven, and would place Hartford upon the line of the new road.

HATTIESBURG, MISS.—Work has commenced on the first street railway in Hattiesburg. Crossties have been distributed along the route, and the steel rails are on the ground, ready to be put in place. There will be about 9 miles of track laid at once.

SEDALIA, MO.—A charter has been issued to the Sedalia Light & Traction Company, of Sedalia. The capital stock is \$1,000,000. Lindsay Hooper, J. L. Motley, R. F. Harris and others are the incorporators.

SPRINGFIELD, MO.—The Springfield Club has pledged itself to secure a franchise through the city right of way to Ash Grove, 18 miles distant, and to raise a cash bonus of \$30,000 for the Kansas City & Springfield Southern Railroad, which is being promoted by T. P. McDonough, C. C. McFann and W. B. Forsyth, of Chicago. The agreement provides that work shall be commenced on the new electric railway within eight months, and it shall be completed and in operation between Springfield and Nevada, a distance of 95 miles, within two years. The road will be equipped for passenger and freight traffic.

HELENA, MONT.—The City Council has passed an ordinance granting the Helena Light & Railway Company the privilege of making certain changes in its lines, and also granting the right to make certain extensions. The only negative vote was that of Alderman Wendel, and the only absentee was Alderman Condon. The ordinance gives the company the privilege of taking up its line on Clark Street and running its cars up Lawrence to Harrison. It is also given the privilege of building a loop on Placer, another on Eighth Avenue, and making an extension on State Street to Chaucer. In addition to running up Lawrence instead of Clark, the company is given the privilege of running down Harrison to Knight, and taking up the tracks on Flowerree and Hayes Streets.

NEW YORK, N. Y.—One section of the Pennsylvania Railroad tunnels has now been finished and is ready for the laying of rails. This section is in Long Island City, beyond East Avenue from the Long Island Railroad Station, and is known as the "supplementary contract" of S. Pearson & Son.

NEW YORK, N. Y.—The Sixth and Ninth Avenue elevated lines of the Interborough are to be extended across the Harlem River to High Bridge and there connect with the station of the New York Central. When this is

done a 40-minute schedule from High Bridge to Wall Street for a 5-cent fare will obtain.

NEW YORK, N. Y.—Manhattan and Brooklyn on Friday, Dec. 14, were joined under the East River. Two tubes cross the river from the Battery to Joralemon Street. The north tube is the one just finished. Much work remains to be done on the other.

NEW YORK, N. Y.—The plan to connect the Williamsburg and Brooklyn Bridges will be made the subject of another public hearing by the Rapid Transit Commission upon some day in January, which has not yet been designated. This action was decided on at the meeting of the Commission Thursday, Dec. 13, in spite of the fact that three of the members were not inclined to take up the subject again. Mayor McClellan, however, cast the deciding vote in favor of the hearing.

CHICAGO JUNCTION, OHIO.—A company is being organized by W. K. Southold to build an electric railway between Bucyrus, New Washington and Chicago Junction.

HAMILTON, OHIO.—The Cincinnati Northern Traction Company is now assured a private right of way between this city and Middletown. Judge Hartkoff has held all the preliminary proceedings in condemnation against a number of property owners to be regular, and ordered a jury impaneled to fix the value of the land and the damages.

LIMA, OHIO.—Judge Mathers has refused to grant an injunction preventing the City Council from granting the Schoepf people a twenty-five-year franchise for their Lima-Bellefontaine line to enter the town. A franchise allowing the road to enter on Market Street was recently passed, but was vetoed by the Mayor. Now, it is said the ordinance will be passed over the Mayor's head.

MASSILLON, OHIO.—Surveyors have completed a second route for the Massillon & Northern between here and Akron. This route passes through Barberton, Warwick and Clinton, towns that were missed by the first survey.

RAVENNA, OHIO.—The deal by which the Cleveland Alliance & Mahoning Valley Railway Company secures the old line of the Baltimore & Ohio between Ravenna and Newton Falls has been closed. This will give the company a good start on its plans for building.

TOLEDO, OHIO.—The Toledo Railway & Light Company has applied to the Council for the right to build another track from South Street to the State Hospital grounds, as far as Detroit Avenue, a distance of more than two miles. L. E. Belfstein is general manager.

TOLEDO, OHIO.—The management of the Toledo & Indiana deny that any attempt will be made to finance the proposed Delta-Defiance extension, and say that they will furnish the money themselves for any extensions that may be built. They say they have not even been contemplating a bond issue. Right of way is being secured and other preparations are being made for building the extension.

TOLEDO, OHIO.—Considerable interest is felt here in the proposed through interurban service between Detroit and Indianapolis by way of Toledo. The Toledo & Indiana is planning an extension from Bryan to Waterloo, Ind. The route, as planned would be over the Detroit, Monroe & Toledo Short Line, the Toledo & Indiana and the Indiana Union Traction Company's line. Representatives of the Detroit United will visit this city within a few days to discuss the matter and to make an inspection trip over the Toledo & Indiana.

WILMINGTON, OHIO.—Rights of way are being secured in the southern part of Ohio for a traction line to be run from Wilmington through Washington C. H. and Circleville to Zanesville, Ohio. From a reliable source it is learned that the options are being taken by the Morgan-Dolan-Schoepf syndicate, the owners and operators of the Indiana, Columbus & Eastern Traction lines and other traction systems in Ohio and Indiana. The right of way for this line, it is said, has an important place in the plans for future development of the Schoepf syndicate system. It is the plan of the Schoepf people to, some day, extend their system from Zanesville east to Pittsburg and Wheeling, and, when this is done, the line through Southern Ohio and terminating at Zanesville, 50 miles east of Columbus, will form a part of a short line from Cincinnati to Pittsburg and Wheeling, independent of the present route from Cincinnati to Columbus.

ENID, OKLA.—C. H. Besler, representing Dayton, Ohio, capitalists, has asked the City Council for a street railway franchise. He proposes to build four miles of track.

GUTHRIE, OKLA.—Oklahoma Railway Company has been chartered to build a system of interurban electric lines from Shawnee through Oklahoma City to El Reno and Fort Reno, with a branch line from Shawnee to Tecumseh, from Guthrie southward through Oklahoma City to Purcell, and from Yukon to Chickasha. The company's headquarters is in Oklahoma City. Its capital stock is fixed at \$5,000,000. The directors are Frank Wells, O. R. Ritterhouse, M. G. Barnes, Carlos Combs, J. J. Johnson, Frederick S. Combs, Edward L. Lawson, all of Oklahoma City. Stockholders in the Metropolitan Street Railway Company in Oklahoma City are interested in the enterprise.

OKLAHOMA CITY, OKLA.—Anton H. Classen, president of the Oklahoma Railway Company, announces that the company has decided immediately to fit up shops and build its own cars. As soon as the weather is favorable work will be commenced on the West Main Street extension.

SHAWNEE, OKLA.—It has become positively known here that Alfred Hare, who until recently was president of the Exchange Bank, at Tecumseh, and who was instrumental in securing and building the Shawnee inter-

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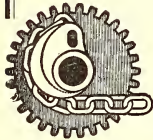


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TOLEDO, O.



terurban electric line, is interested in the building of the electric railway from Shawnee to Oklahoma City.

CHAMBERSBURG, PA.—On Dec. 27 an application will be made to the Governor by M. C. Kennedy, H. A. Riddle, C. M. Davison, Thomas D. Kennedy, Thomas J. Brereton and J. H. Tonge for a charter for the Caledonia Street Railway Company. The extension will commence at the terminus of the Chambersburg & Gettysburg Electric Railway at Caledonia, and will run into Gettysburg. The road will be about 13 miles long.

COUDERSPORT, PA.—Estimates of the cost of changing the New York & Pennsylvania Railroad, extending from Shingle House, Pa., to Canisteo, N. Y., a distance of 60 miles, from a steam to an electric line are being secured.

DERRY CHURCH, PA.—The car house for the electric railway now being built between Hershey, this county, and Campbellstown, Lebanon County, will be erected on the grounds of the Hershey Chocolate Company.

HARRISBURG, PA.—Final surveys for the proposed line of the Baltimore, Frederick & Hagerstown Electric Railway Company are being pushed. General headquarters for the surveying corps, which has been enlarged, have been maintained at Frederick, Md. Westinghouse, Church, Kerr & Company, of New York, have charge of the work.

HARRISBURG, PA.—A charter has been issued to the Alfarata Street Railway Company to build a line 12 miles long in Huntingdon and Blair Counties. The capital is \$75,000, and the directors are: John Phillips, W. G. Kenega, H. H. Knode, G. N. Spyster and S. I. Spyster.

HARRISBURG, PA.—Contractor John N. McCullough has closed his trolley-grading work at Hershey, this county, for the winter, but will continue his grading contract on the new trolley system between Baltimore and Washington.

HARRISBURG, PA.—The Governor has approved the merger of the Somerset County Street Railway Company and the Pennsylvania & Maryland Street Railway Company, under the name of the Pennsylvania & Maryland Street Railway Company, with a capital of \$40,000, to construct lines in Somerset County and into Maryland. Judge Kooser, of Somerset County, has granted the application of the Meyersdale & Salisbury Street Railway Company for a preliminary injunction restraining the Pennsylvania & Maryland Street Railway Company from putting down its track on rights of way claimed by the plaintiff in Elk Lick and Summit Townships, Somerset County. Neither one of the contending companies has put down any track as yet.

JOHNSTOWN, PA.—The City Council has considered favorably on second reading the ordinance granting a franchise to the Southern Cambia Street Railway Company, which will use about 1 mile of city highways in the building of its line from this city to Ebensburg, the county seat. The ordinance granting a franchise to the Johnstown Terminal Electric Railway Company was defeated on second reading, but, after a speech by John M. Rose, the representative of both these companies, it was reconsidered and passed second reading. Mr. Rose stated that the two measures were interdependent, being backed by the same people, who expected to spend at least \$500,000 in the building of these lines. The ordinance granting a franchise to the Johnstown, Ebensburg & Northern Electric Railway Company was referred to committee when called for final passage to give its backers an opportunity for another hearing. The ordinances granting franchises to the Johnstown, Woodvale Heights & Conemaugh Street Railway Company and the Arbutus Park Street Railway Company went through without opposition. A report was received from the City Solicitor and City Engineer setting forth the Johnstown Passenger Railway Company have no exclusive rights on any street, and that rules for the granting of privileges to competing companies are clearly set forth in an act of Assembly.

MEYERSDALE, PA.—A carload of rails for the Meyersdale-Salisbury electric line has arrived, and preparations for track laying are being made with all possible haste. The brick work on the power house is nearing completion, and work on the large car house has been started.

PHENIXVILLE, PA.—Dr. Charles H. Detweiler, of Reyersford, is interested in the promotion of a company to build an electric railway from Pottstown to Bridgeport, following the Schuylkill River, and passing through Spring City, Phenixville and Valley Forge.

POTTSVILLE, PA.—The Pottsville Union Traction Company has purchased 125 acres of land in Tumbling Run Valley for \$12,500, and will lay out a baseball park. The new purchase is located close to the company's summer park.

ROXBURY, PA.—Geo. B. Cole, Edward McPherson, Frank Holler, Samuel M. Kitzmiller, of Shippensburg, and Capt. George W. Skinner, of Chambersburg, are interested in a project to construct an electric line from Shippensburg to Roxbury, thence through the gap in the mountain by Gunter's Run to Amberson's Valley, around the knob to Spring Run, thence to Dry Run and Concord. It is stated that application will be made at once for a charter.

WEST CHESTER, PA.—Work upon the extensive shops and car house of the Philadelphia & West Chester Traction Company at Lanerch is being pushed rapidly. The building will be 216 ft. long and 124 ft. 8 ins. wide and fireproof. The shops will have two 12-ton electric traveling cranes, wheel-turning lathe and drill presses. The cost of the improvement will be about \$70,000. The company has received a petition from West Chester residents to extend its line west about one-third of a mile from the Green Tree Hotel, on Gay Street, to the westerly borough line, and the extension will be made, provided an ordinance be granted, free from restrictions. A branch line from Clifton will be extended through the borough of Aldan. The new terminal station of the company at Sixty-

Third and Market Streets is nearly completed and the tracks are laid. Materials for the signal system are ready to be installed immediately, so that on the opening of the elevated the company's terminal will be ready for operation. The seven new cars being built by the Jewett Car Company are expected to be ready for delivery about Jan. 1. They will be operated between West Chester and the Market Street Elevated terminal.

CHARLESTON, S. C.—Work has commenced on the construction of the Charleston-Summerville Electric Railway, which is being financed by General A. J. Warner, of Gainesville, Ga.

ORANGEBURG, S. C.—The South Carolina Public Service Corporation, which plans to build an extensive system of electric railway lines in South Carolina, is rapidly perfecting the preliminaries preparatory to the meeting of the company to be held in January, at which the plans will all be considered in detail and policies decided for carrying on the work. The main line will extend from Columbia to Charleston, and a resurvey of it is now being made with a view to reducing the grade. It is planned to operate the system as a high-speed interurban line, combining passenger and heavy freight traffic, the plan being to move standard steam railroad cars with electric locomotives. Power will be secured from the natural water ways along the route, and will be distributed by high-tension transmission lines through converter stations, and the usual d. c. feed to third-rail contact. The local short-haul passenger business will be operated with single-unit control, but the long haul and through business will be operated with electric locomotives and semi-converter coaches, conforming in every other particular to modern steam railroad standards. The main line will be constructed on private rights of way, but the company is securing franchises for local street railway service in the towns through which its main line will pass. These franchises include the right to sell light, heat and power. Connections will be made at various points along the line with the Southern Railway, Seaboard Air Line, Atlantic Coast Line, Branchville & Bowman, Columbia, Newberry & Laurens, Charleston & Western, Carolina, Blue Ridge, Pickens, Winnsboro Granite Company and Lancaster & Chester Railroads, all of which operate by steam, and with the Augusta & Aiken, Charleston Consolidated, Columbia Electric, Greenville Traction, Rock Hill & Spartanburg Electric, and Union & Glenn Springs Electric, which operates by electricity. The plan is to make Charleston the gateway of distribution and interchange of traffic intended for export or coastwise shipment. Ultimately, connections will be made with the coal fields of North Carolina and Tennessee and across the Blue Ridge Mountains, with a view to securing traffic from the Central and Western States. The common stock of the corporation will be \$10,000,000, but the amount of bond issue has not been determined. Construction contracts will be let, and orders placed for machinery and equipment as soon as the preliminary work has been completed, and the controlling factors fully determined. C. R. Van Eiten, of Orangeburg, S. C., and J. J. Timmes, of New York, are interested in the company.

NASHVILLE, TENN.—The surveying corps of the proposed Nashville & Chattanooga Electric Railway is about 5 miles from Nashville and expects to complete the survey from Chattanooga, which was commenced several months ago, within the next few days. The Nashville & Chattanooga Electric Railway is backed by a syndicate, which C. H. Fisk, of Detroit, Mich., has formed, and is the offspring of the project of the Great Falls Power Company.

SAN ANGELO, TEX.—Parties in this city are looking to the establishment of a street railway system here, to be operated by independent gasoline motors. Correspondence should be directed to P. O. Box 278, San Angelo.

SEDRÖ-WOOLLEY, WASH.—A company has been organized and work will be commenced at once to secure right-of-way for an electric railway which will run from some up-river point through this city by way of Burlington, Avon and West Mount Vernon to LaConner. A. W. Lynn, of San Francisco, is said to be the promoter, and among the Skagit County men who are active in its organization are A. E. Holland, C. E. Bingham, J. B. Alexander and H. L. Devin, of this city; Herbert Conner and W. E. Schrieker, of LaConner; Robert Moody, of Burlington, and Thomas Smith, of Mount Vernon, are said to be the leaders. Sedro-Woolley will be the principal place of business of the railway company. The corporation will have a capital of over \$1,000,000.

SPOKANE, WASH.—Officials of the Spokane & Inland Empire Company have inspected the route for the proposed line between Moscow and Lewiston, Idaho. E. A. Blackwell, vice-president of the company, announces that the engineering corps will prepare at once estimates of the cost of the 70 miles of line. He indicated it will be only a question of cost and grades. The line will give Spokane direct connection with the Snake River.

SPOKANE, WASH.—Isaac W. Anderson, of Spokane, has been elected chief executive officer of a company backed by Rhodes, Sinkler & Butcher, bankers, of Philadelphia, for the consolidation of fourteen electric power, traction and light plants at Eugene, Springfield, Albany, Cettage Grove,

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Corvallis, Seaside, Roseburg, Baker City and the traction company at Walla Walla, Wash., and Pendleton, Ore., Dallas and Albany, and gas plants at North Yakima, Wash., and Lewiston, Idaho. The plants are valued at \$6,000,000. It is understood others are to be taken over. A. L. Welsh, of Portland, Ore., is manager of the consolidated properties.

SEATTLE, WASH.—The City Council has passed the ordinances granting franchises over Westlake Avenue and over Second Avenue, Denny Way, Third Avenue, Roy, Wall and other streets to the Seattle Electric Company, over the Mayor's veto.

SPOKANE, WASH.—Conrad Wolfe, of Spokane, president of the United Copper Railway Company, announces 6 miles of electric railway will be built from Chewelah, Wash., to the mines, at a cost of \$40,000. The line will be used for hauling ore to the Spokane Falls & Northern Railway, giving the mines direct connection with the smelter.

SPOKANE, WASH.—The contract for the grading of the Cheney electric line from Jameson to Cheney has been awarded to Eslick & Hartnett. Work has already started and is to be completed within ninety days. The Washington Water Power Company states that it expects to have cars in operation over the Cheney line by July 1.

TACOMA, WASH.—The Puyallup Valley Northern Rapid Transit Company has been incorporated, with a capital of \$2,000,000, to operate a system of electric interurban railroads from Tacoma to Puyallup, Sumner, Auburn, Kent and Seattle. The trustees are: Fred J. Chamberlain, John Mills, F. S. Martin, W. R. Scott, Charles Fulmer, L. A. Chamberlain, of Puyallup, and August Von Boecklin, L. C. Stevenson and H. H. Blackburn, of Tacoma. The principal office of the company will be in Puyallup. It is announced that the franchises have been secured for the entire line and the survey has been made. Present plans are to begin building the line soon after Jan. 1. The proposed line will be about 40 miles long. It will connect Tacoma with Puyallup and Sumner by the most direct line, and from the latter place will run north through a thickly populated farming country to Seattle.

CHEYENNE, WYO.—Lee A. Reynolds, of Denver, representing a syndicate, has applied to the City Council for a franchise to construct and operate an electric street railway here.

NEWS NOTES

WINSTED, CONN.—A new scale of wages went into effect on the Torrington & Winchester Street Railway, Dec. 1. Nineteen cents an hour is paid to conductors and motormen the first year they are in the employ of the company, and that sum is increased one-half cent an hour each year for nine years, so that after eight years of service the employees will receive 23 cents an hour. The old wage scale was 29 cents an hour during the first year and 20 cents an hour flat thereafter.

TERRE HAUTE, IND.—John F. Joyce, of this city, a member of the incoming Legislature, has prepared a bill providing for a 1-cent-a-mile rate on interurban lines in Indiana. The announcement has created considerable interest and a strong protest from the Indiana Traction men. Representative Joyce defends his bill by saying that the Indiana Traction men have always claimed that interurban lines could be operated at half the expense of the steam lines, and it would therefore be equitable to provide a 1-cent-a-mile rate for traction lines and 2-cent-a-mile rate for steam lines.

PORTLAND, MAINE.—The Portland Street Railway Company has announced a voluntary increase of pay to its conductors and motormen, the amount being graduated according to length of service, from 8 cents per day to one-year men to 20 cents to those who have been in the employ of the company five years or more.

HELENA, MONT.—The Helena Light & Traction Company has increased the wages of its employees 10 per cent and has entered into an agreement with the men for three years. The system of suspensions for infractions of the rules is to be done away with and the merit system adopted.

COLUMBUS, OHIO.—The Supreme Court, in handing down a decision in the case of the State ex rel. Prosecutor R. H. Day vs. the Canton & Akron Railway Company, laid down two important principles. The railway company is required to sell on its cars round-trip tickets between Navarre and Massillon at the same rate they are sold at its stations in Massillon and Navarre. Originally the company did so, but abandoned it, and they could be had only at the terminal stations. This compelled persons boarding the cars at intervening points to pay full fares of 10 cents each way. The company had agreed with the city of Navarre for the 15-cent round trip rate to Massillon, so it seems that the courts affirm the right of a municipality to impose as a condition of a franchise within their limits a rate of fare over portions of their lines lying without the municipalities.

HAZLETON, PA.—The Lehigh Traction Company and the Wilkes-Barre & Hazleton Railway Company have granted their men a voluntary increase of 10 cents a day in their wages, effective Jan. 1. Under the new schedule, the maximum to be paid trolley men will be \$2 a shift, and employees of the third-rail system \$2.30 a shift.

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CHATTANOOGA, TENN.—The Chattanooga Railways Company has announced this scale of wages for its employees: One-year men, 18 cents per hour; two-year men, 19 cents per hour; three-year men, 21 cents per hour; four-year men, 22 cents per hour. For the four-year men this increase amounts to about 20 cents per day on runs of ten hours, which is the same as \$1.40 per week or \$5.60 per month.

MILWAUKEE, WIS.—The ordinance has been passed by the City Council requiring air-brakes on all street cars operating in Milwaukee. It was amended so that one-fourth of the total number of cars of any company operating in Milwaukee must be equipped with air-brakes within six months, one-half within one year, and the remainder before Sept. 1, 1908. The fine for not having the cars equipped at the end of six months and a year is \$200 and \$500 for each day.

FINANCIAL NOTES

LOS ANGELES, CAL.—The statement is made here that a gigantic merger of all of the electric railway and power company interests centering in Los Angeles is planned by Edward H. Harriman. The merger will be capitalized at \$100,000,000, and will include the Los Angeles Railway Company, the Pacific Electric Railway Company, the Edison Electric Company, the Pacific Light & Power Company, the Los Angeles Gas & Electric Company, the Los Angeles Railway Company, the Los Angeles Interurban Railway Company, the Los Angeles & Redondo Railway Company, the Port Los Angeles, Hueneeme & Malibu Railway Company, commonly known as the Rindge Road, and the street railway companies of Santa Barbara and Ventura.

BOSTON, MASS.—At the annual meeting of the Massachusetts Electric Companies trustees for the ensuing three years were re-elected. President Abbott stated that gross earnings since the close of the fiscal year Sept. 30 have increased 5 1/2 per cent over last year. For December to date gross earnings have shown an increase of 8 per cent over last year. These earnings compare with an increase of about 11 per cent last year over the same period in 1904. Asked when preferred stock dividends would be resumed, he replied that he felt confident that the trustees will not begin dividends until they feel sure that they can continue them without question. It has been suggested, and the matter is now under consideration of counsel that there may be some way of funding the accrued dividends on the preferred stock. It will probably be taken up at the time when cash dividends are resumed from the current earnings.

SPRINGFIELD, MASS.—The Springfield Street Railway Company, the Berkshire Street Railway Company and the Worcester & Southbridge Street Railway Company have petitioned the Railroad Commissioners for the privilege of increasing their capital stock. No amount, as yet, named.

MONROE, MICH.—The Trust Company of America, with headquarters in New York, has found an answer and cross bill in the Circuit Court at this place in the case of Gorman et al. against the Toledo, Ann Arbor & Detroit Railway, for which receivers were recently appointed. The Trust Company is trustee for the bondholders of that road. It claims that \$1,500,000 in bonds were issued and that interest on the same is due and unpaid. It asks that these bonds be decreed to be first lien upon the railroad property ahead of all other liens, and that an accounting be had and the property sold to pay them.

SAGINAW, MICH.—It is reported here that W. N. Coler & Company, of New York, are forming a syndicate to purchase the Detroit, Flint & Saginaw Electric Railway, now in the hands of a receiver. Coler & Company control the Jackson & Suburban Company, which has a close working agreement with the Detroit, Ypsilanti, Ann Arbor & Jackson Railway. It is said that if the syndicate purchases the road it will push it to completion. The Detroit Trust Company as trustee under the mortgage given by the Detroit, Flint & Saginaw Railway securing the bonds issued on the road, is trying to locate all of the bondholders. The total amount of bonds which are issued is \$40,500.

TOLEDO, OHIO.—The annual meeting of the stockholders of the Toledo, Railways & Light Company will be held in Toledo, Ohio, Jan. 17 next, and on the same day and at the same place a special meeting of the stockholders will be held for the purpose of leasing the plant of the Toledo, Ottawa, Beach & Northern Railway Company.

CINCINNATI, OHIO.—An answer has been filed in the Circuit Court here in the case of the bondholders of the Kenton & Southern Traction Company against the Dayton, Springfield & Urbana, in which it is sought to hold the latter company for the payment of the bonds. The answer states that on Feb. 28, 1906, the Kenton & Southern authorized the issue of \$500,000 bonds, although at that time it had no right of way, no roadbed, no rails or ties or anything else of the kind. The bonds were sold under the pretext of securing money to build the road. The Dayton, Springfield & Urbana guaranteed the lease, but never derived any benefit from the bonds or received any money from them. The Kenton & Southern was to have been constructed between Kenton and Bellefontaine, but only a short portion was built, and that wholly within the town of Kenton. The Dayton, Springfield & Urbana claims that the bonds are void. The further claim is made that A. E. Appleyard planned this bond issue for his own benefit, and that the scheme to have the Dayton, Springfield & Urbana guarantee them was fraudulent. Although a contract was made with the Great Northern Construction Company to build this road, it is claimed that no money was ever paid it for the work.

MANSFIELD, OHIO.—Thomas W. Latham and associates, of Cleveland, have purchased a controlling interest in the Mansfield Railway, Light

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& Power Company from Rudolph Klebolte & Company, of Cincinnati. The company owns the local lines, and the road between this city and Shelby, as well as the electric light property here. Mr. Latham has plans for a road between Mansfield and Newark, almost directly south through Mount Vernon, and it is now thought that this will be built. It will open a territory that has no interurban service at all now, and will also give the most direct line between Cleveland and Columbus that has yet been planned. The Cleveland & Southwestern extension from Seville will reach Mansfield, while the Columbus, Newark & Zanesville would furnish a route from Newark to Columbus.

SPRINGFIELD, OHIO.—Reports are current that a New York syndicate is working on a merger of the Springfield, Troy & Piqua, the Springfield & Xenia and the Washington Traction Company lines and the Home Light, Heat & Power Company and the Peoples' Light, Heat & Power Company, of this city.

SPRINGFIELD, OHIO.—Receiver Fred. J. Green of the Springfield & Xenia Traction Company made his final report a few days ago, and a distribution of 42½ per cent was ordered. The road has been purchased by a committee representing the bondholders. First mortgage bonds amount to \$528,816, and the proceeds of the sale were \$224,232.75, after the expenses of the receiver were deducted. Compensation of \$2,000 was allowed the receiver, and his attorneys were given \$2,500. As 492 bonds were presented in payment for the road, only \$3,125.50 will be actually distributed. As soon as interest accounts of about \$500 each are paid to John L. Bushnell and the Cincinnati Trust Company are paid the receiver will receive his formal discharge. The suit of W. L. Snyder has been settled.

CANADIAN NOTES

CALGARY, ALTA.—W. M. Alexander will apply to the City Council for a street railway franchise.

VANCOUVER, B. C.—Application will be made to Parliament at next session by the Burrard-Westminster Foundry Railway & Navigation Company for power to construct and operate an electric railway to traverse the southeastern part of the city, Hastings, South Vancouver, Burnaby, New Westminster and Coquitlam to Port Moody, returning by way of Hastings town site. Tupper & Griffin are agents for the promoters.

VANCOUVER, B. C.—Notice is given that an application will be made to the Parliament of Canada at the next session by the British Columbia Electric Railway Company, Ltd., for an act confirming a certain agreement dated July 9, 1904, made between the company, the Canadian Pacific Railway Company and the Right Honorable Lord Strathcona and Mount Royal and Richard B. Angus, whereby it was agreed, among other things, that the British Columbia Electric Railway Company, Ltd., should operate as an electric railway that portion of the Canadian Pacific Railway extending from Granville Street, in Vancouver, to a point called Greer's Beach, or Kitsilano.

EDMONTON, CAN.—The Council has refused an offer of the Canadian White Company to take over the street railway franchise, and has taken the first step toward the construction of the electric street railway as a municipal owned and operated enterprise by framing by-laws for the purchase of the rails.

MONTREAL, CAN.—The Capital Power Company's plant at Deschamps has been purchased for the Hull Electric Company, operating an electric railway between Ottawa, Hull and Aylmer, which required additional power.

FREDERICTON, N. B.—James Burgess, M.L.A.; J. F. Tweedie, M.L.A., and John E. Stewart, all of Victoria County, give notice that they will, at next session of the Legislature, apply for a charter to construct an electric railway from St. John to Grand Falls. The distance between the two points is 125 miles, and it is proposed to follow the western side of the river to Andover, then across Perth and follow the eastern side to Grand Falls.

FORT ERIE, ONT.—The Board of Railway Commissioners have approved of the location of the Niagara, St. Catharine & Toronto Railway from Fort Erie to Lundy's Lane.

HAMILTON, ONT.—The members of the Railway Board have made public their award in the wages dispute between the street railway employees and the company. The award leaves the men in practically the position they occupied before the strike, the wage schedule being but a slight increase on that drawn up by the first arbitrators. The motormen and conductors originally got 15 cents an hour for the first year, 16 for the second, 17 for the third and 18 afterward. They demanded 20 cents an hour for the first six months, 21 for the second six months and 27 afterward. The award gives the men 16 cents an hour for the first year, 18 for the second, and 20 for the third; 2 cents extra an hour is to be paid for Sunday work. Blacksmiths are to receive 20 cents an hour and shop men 15 cents for the first year, 16 for the second, 17 for the third and 18 afterward. The agreement is to continue in force until April, 1909.

FRESTON, ONT.—The freight car houses, with contents, belonging to the Galt, Preston & Hespeler Railway Company, have been destroyed by fire.

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Our offices in all above cities furnish expert railway operatives

AMONG THE MANUFACTURERS

THE OHMER FARE REGISTER COMPANY, of Dayton, Ohio, has issued a four-page folder, in which are set forth some of its patent claims.

THE INTERNATIONAL STEAM PUMP COMPANY, of New York, has been compelled, by the steady advance in the cost of raw materials, to increase the prices of its products.

H. F. VOGEL & CO., dealers in general railway supplies, St. Louis, Mo., have been incorporated, and the firm name has been changed to the H. F. Vogel Contracting & Railway Supply Company. H. F. Vogel is president of the company, and Nicholas LeGrand, secretary and treasurer.

THE ST. LOUIS CAR COMPANY has completed an order for eight fifteen-bench open cars for the Tampa & Sulphur Springs Traction Company. The cars are 40 ft. long over all. The vestibules are separated from the body of the car by bulkheads containing three drop sash. The interiors of the cars are finished in ash.

DOSSERT & COMPANY, of New York, manufacturers of the well-known Dossier joints and solderless connectors and terminals for wires and cables, will exhibit a full line of the Dossier appliances, including many new and novel features, at the coming Electrical Trades Exposition, Chicago. Their booth will be located in section F, space No. 8.

THE PHILADELPHIA & WESTERN RAILWAY COMPANY, Llanerch, Pa., is installing a complete heating and ventilating equipment in its new car house, which contains more than 600,000 cu. ft. space. The apparatus consists of an engine-driven fan with heater and distributing system furnished by the B. F. Sturtevant Company, of Boston, Mass.

SIX CLOSED CARS have been built for the Pittsburg Railway & Light Company, of Pittsburg, Kan., by the St. Louis Car Company. The bodies of the car are 28 ft. long. The interiors, which are finished in mahogany, are equally divided between smoker and passenger compartments. The platforms are 6 ft. long, and are provided at each end of the cars.

THE NEW VOLTAX WATERPROOFING COMPOUND, in its liquid form, is being extensively used on wooden reels. The N. J. Patrick Company, of Derby, Conn., has recently ordered from the Electric Cable Company, of New York, a considerable amount of this material. It is said that the ordinary wooden reel when exposed to the rain absorbs from 5 lbs. to 8 lbs. of moisture.

THE POWER & MINING MACHINERY COMPANY, of Cudahy, Wis., in conjunction with the Snow Steam Pump Works, of Buffalo, N. Y., has opened a new sales office at 719 White Building, Buffalo, where will be

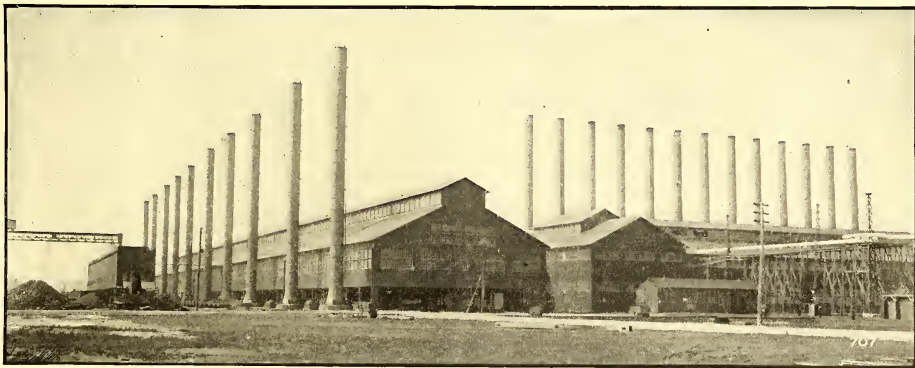
handled the several types of gas generating apparatus, such as the Loomis-Pettibone system, suction and pressure gas plants, built by the Power & Mining Machinery Company, and the Snow gas engines, built by the Snow Steam Pump Works. Seward Babbitt, the sales manager of the first-named concern, will make his headquarters at the Buffalo office, on account of the facility for conducting business from that point.

THE ROBERTS & ABBOTT COMPANY, engineers, Cleveland, Ohio, has found it advisable, due to its increasing work in the West, to provide facilities for handling the work to better advantage by establishing an office at Chicago, and W. D. Ball has been placed in charge of the work there, with offices in the First National Bank Building. Mr. Ball has been connected with a great deal of electrical and civil engineering work, principally for electric railways and hydraulic plants. The efforts of the Chicago office will be along the same lines on which the Roberts & Abbott Company has specialized, namely, interurban railways and hydraulic plants.

THE NEWMAN CLOCK COMPANY, of Chicago, specialist in time-recording devices and maker of the Newman portable watchman's clock, is distributing as a souvenir of the recent convention of the American Street & Interurban Railway Association, at Columbus, a picture of the Ohio State Fair Buildings, printed on coated paper, 18 in. by 10 in. It will be remembered that the exhibits at Columbus were protected by the Newman system. Both the director of exhibits for the association and John J. Maloney Detective Agency, which was responsible for the patrolling of the grounds, have acknowledged in letters to the company the material assistance the clocks were to them in their work.

AMONG THE MANY THINGS OF INTEREST in the December issue of the monthly bulletin of the Ohio Brass Company is a description of the new type of open-air, high-tension switch, which has been in use for several months on the 13,500-volt transmission lines of the Fort Wayne & Wabash Valley Traction Company. This switch was designed and installed by M. J. Kehoe, of the Ohio Company. The new switch is not intended as a substitute for oil-break or other types of switches as usually installed in sub-stations, but was designed particularly for installation at exposed points along high-tension lines, where another type of switch would require an expensive shelter.

THE NEW ERA MANUFACTURING COMPANY, of Kalamazoo, Mich., has been compelled to reprint its little booklet, "All About Babbitt Metals." The booklet deals with babbitt metal for all users, discussing the metal for street railway use under the heading, "New Era Street Railway Babbitt." The foreword says: If the plan outlined in this booklet is followed, it will secure for the consumers of babbitt metals the full value in



National Tube Company Mill, Loraine, Ohio

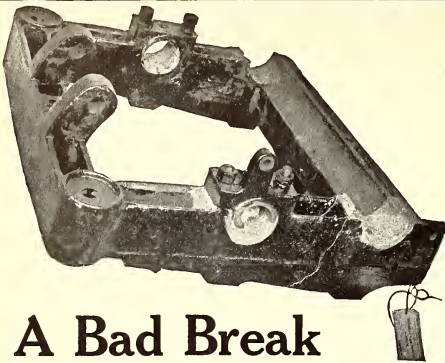
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1003-1005 Arcade Bldg., - - Philadelphia

service of the money they pay for the metal, by giving them the benefit of the best competitive prices of reputable manufacturers and making it “impossible for an inferior metal to be sold to them for more than its real serviceable value.” It is a little work that superintendents and master mechanics ought to have.

THE WESCO SUPPLY COMPANY, of St. Louis, Mo., has purchased the plant of the Davis Electric Manufacturing Company, of Springfield, Mass., including all machinery, together with all the finished and unfinished product, and is removing the plant to St. Louis, where it will continue the manufacture of the famous “Davis Switches,” as well as all of the Davis Company's other specialties. The five-story factory building at the corner of Eighth Street and Clark Avenue, St. Louis, has been leased for a term of years, and is being equipped with the latest and most modern machinery and other equipment for the manufacture of these specialties, as well as tablet boards, cut-out cabinets, switchboards, telephones and telephone accessories.

THE H. W. JOHNS-MANVILLE COMPANY, of New York, in order to handle to the best advantage its large and rapidly increasing business in the vicinity of New Orleans, will open a branch in that city Jan. 1. This will consist of a large retail store, offices and warehouses, located in the large three-story building at the corner of Baronne and Perdido Streets. This company is well known as the manufacturer of asbestos and magnesia products and electrical specialties. W. E. Carpenter, formerly well known as the local manager of the Western Tube Company, has been appointed as manager of the New Orleans branch. The company proposes carrying a large stock of its products constantly on hand, so that shipments can ordinarily be made from New Orleans stock.

THE PETER SMITH HEATER COMPANY, of Detroit, Mich., manufacturer of the “Smith” type of hot water heaters, announces that it has arranged to have the Electric Service Supplies Company, of Philadelphia and Chicago, sell the Smith product during the coming year. Heretofore the Smith Company has been selling its goods direct, and the season just closed has shown an increase of 100 per cent over last year. In anticipation of a still larger increase in its heater business, the Smith Company has purchased additional property adjoining its present plant, and in the spring will build a two-story addition, 100 ft. x 120 ft. The Smith heaters have been adopted as a standard by more than 150 different railway companies in this country, and their success has been universal. The Public Service Corporation of New Jersey is the latest to adopt the new magazine type of heater, and is now having 100 of them installed in its cars at the Camden shops.

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ANY SIZE OR TYPE PROMPT SHIPMENTS
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24 YEARS PRACTICAL EXPERIENCE

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Prompt Deliveries Facilities for Handling Large Work.

The Elliott Bros. Electric Co. 970-972 Hamilton St. CLEVELAND, OHIO

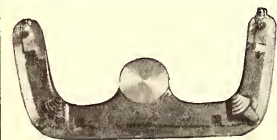
Truing of Commutators

without removing the armature

THE JORDAN COMMUTATOR TRUING DEVICE

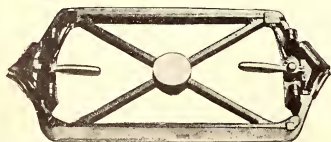
does the work properly—does not take large cuts which shorten the life of the commutator. Every power plant should have it. It prevents shut-downs delays, and adds three times to the ordinary life of a commutator. We can give you a list of satisfied users.

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200 K.W. General Electric, 4-pole.
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17 x 28 x 18 (2) Harrisburg tandem.
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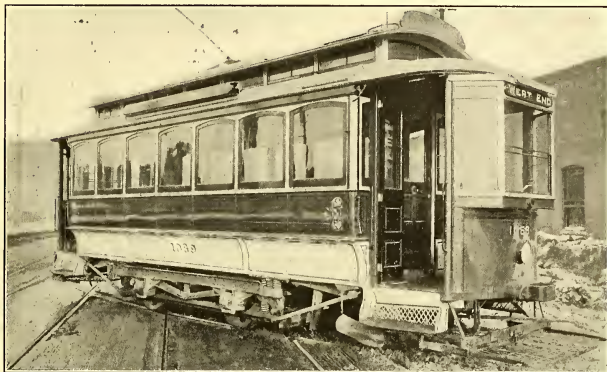
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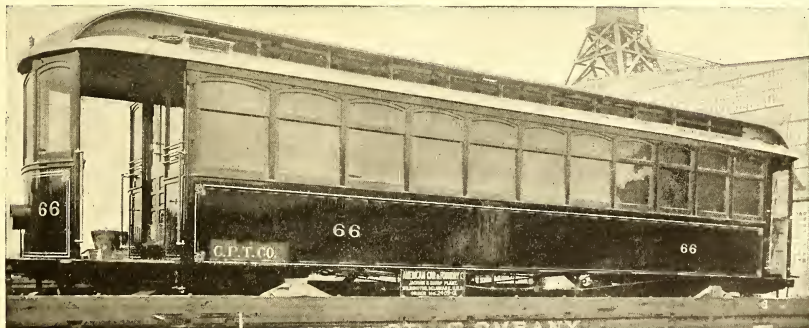
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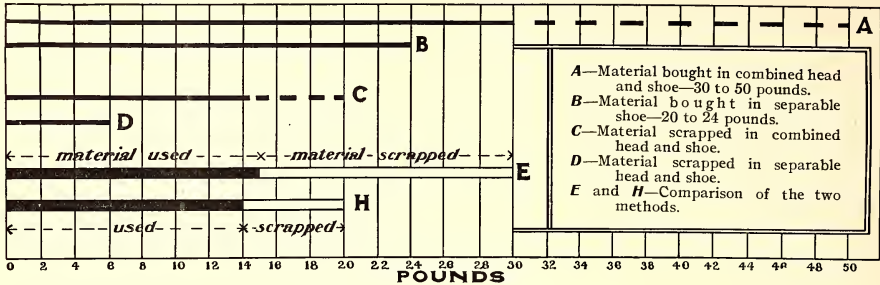
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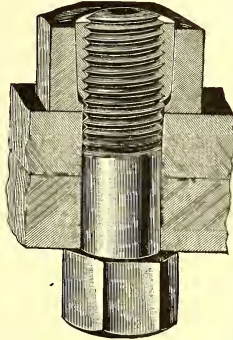
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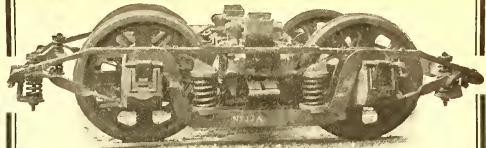
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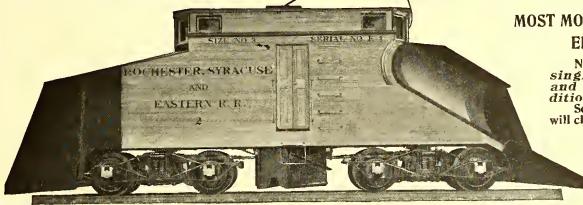
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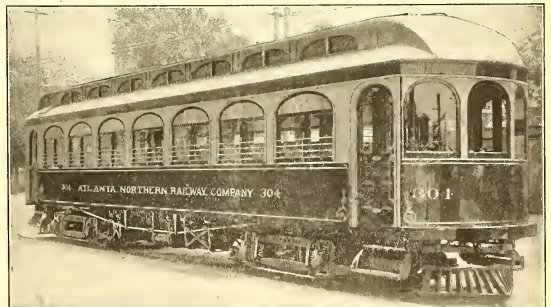
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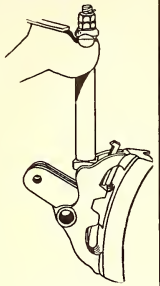
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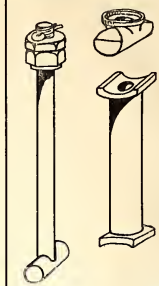
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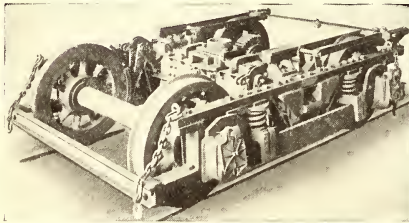
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Double Trucks for Street Railway, Interurban and Long Distance Service. Workmanship in conformity with best Locomotive practice. Trucks built to meet individual requirements. Purchasers' designs followed, if desired.

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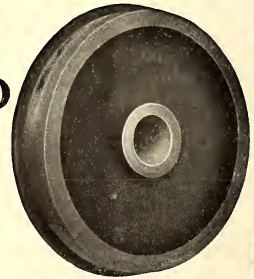
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mounted on axles and fitted with Motor Gears
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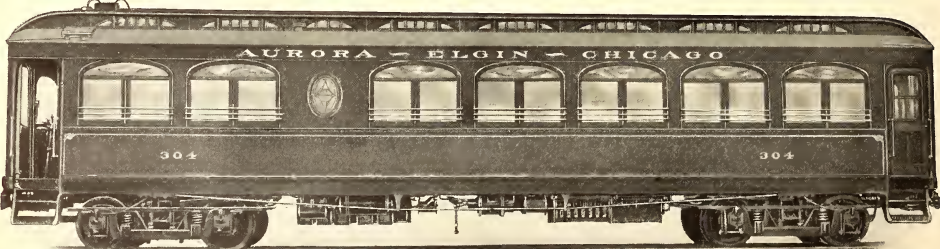
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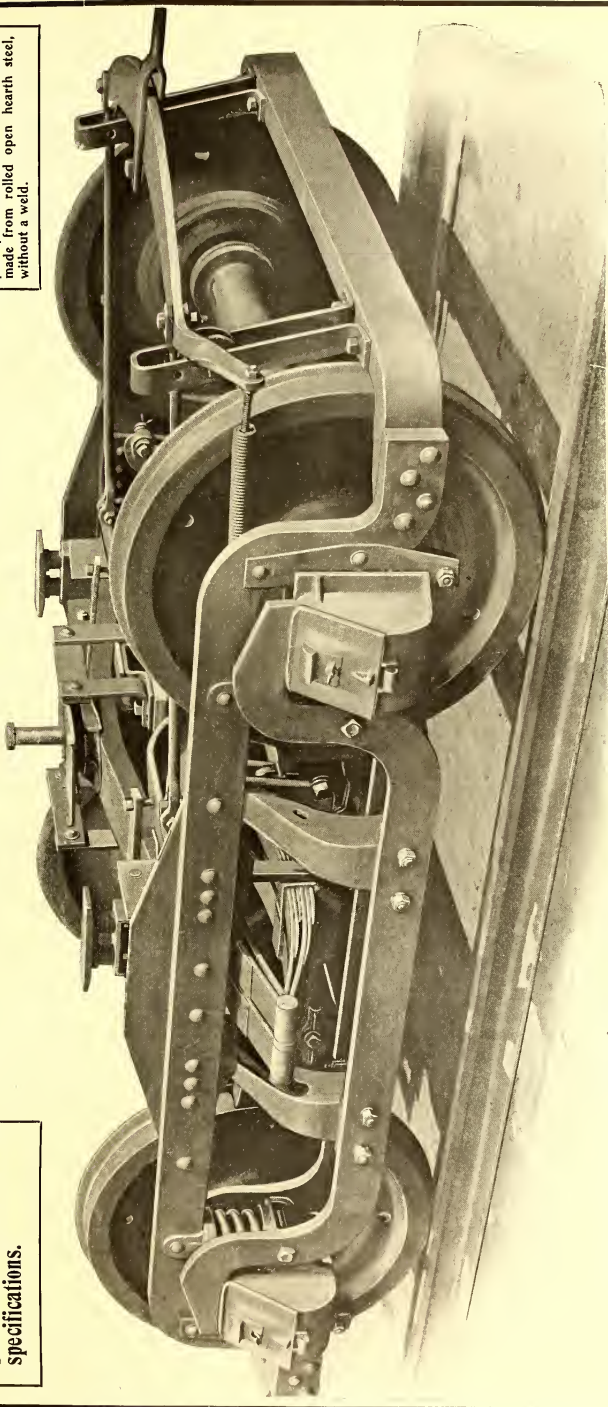
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Standard "High Speed" Interurban Double Truck "Solid Forged" without Welds

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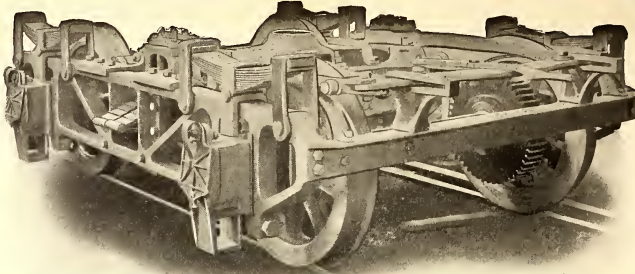
Our new plant is equipped with the most modern truck building machinery, and the very best quality of material and workmanship. The standard design of the M.C.B. standard principles are followed. Frames are made from rolled open hearth steel, without a weld.

TYPE C-60-A



THIS truck is one of twenty (20) for Pittsburgh & Butler Street Railway Company (a 60-mile high speed road operating over private right of way); Wheel Base 6' 8"; Rolled Steel Wheels 36" diameter; Forged Steel Axles 6" diameter, Rekeyseated for four (4) Westinghouse No. 132 A. C Motors; Weight of truck 8,600 lbs. per end (17,200 lbs. to the pair). It is designed to carry 64,000 lbs. at King Pins, with a tensile strain on the metal of one-fifth of its ultimate strength. These trucks are **SOLID FORGED, WITHOUT WELDS**, from low carbon open hearth steel, and are built by skilled mechanics.

STANDARD MOTOR TRUCK CO., Frick Bldg., Pittsburgh, Pa.



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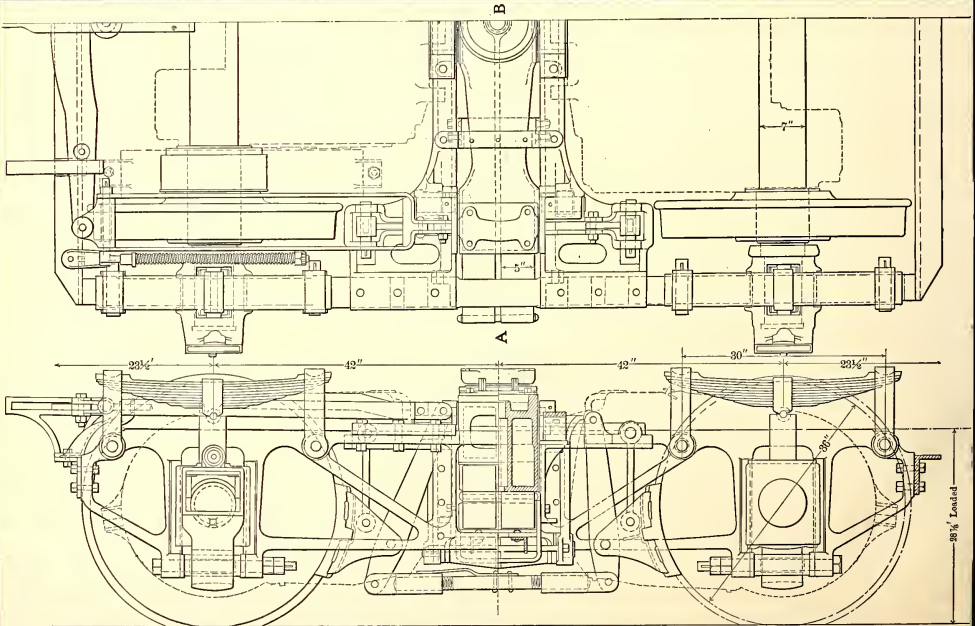
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NEW YORK CENTRAL ELECTRIC SERVICE

Combining cast steel side frames and transoms with corner bracket braces incorporated with transoms, and ends tied with angle tie bars, making a maximum of rigidity with a minimum number of parts. The spring hanger arrangement is of the locomotive type over the journal boxes. The truck bolster is of double box construction, of cast steel with integral center plate and carried on double elliptic springs on a spring plank hung from the transoms. These features are combined with a compact arrangement of brake rigging.

AMERICAN LOCOMOTIVE COMPANY

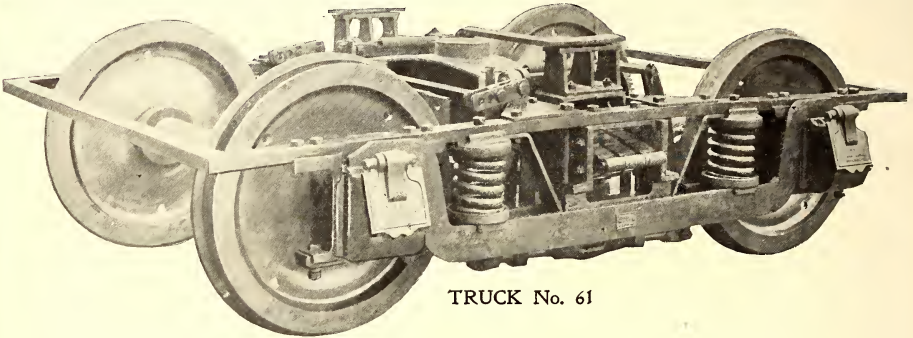
111 BROADWAY, NEW YORK



ST. LOUIS CAR COMPANY

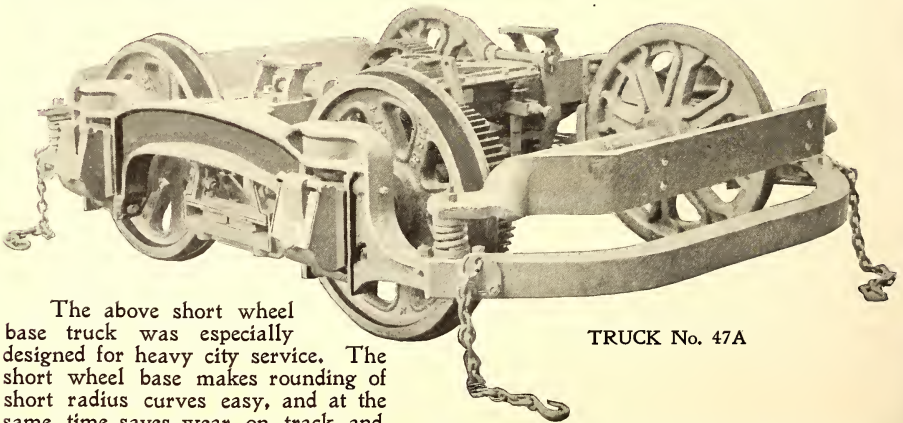
ELECTRIC and STEAM RAILWAY COACHES—TRUCKS
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St. Louis, Missouri



TRUCK No. 61

The above locomotive type machine fitted truck is especially adapted for high speed heavy motor service. All parts are thoroughly machined throughout. Solid forged top frames, made in one piece. Composite side frames. Inside hung brakes. M. C. B. Journal Boxes.



TRUCK No. 47A

The above short wheel base truck was especially designed for heavy city service. The short wheel base makes rounding of short radius curves easy, and at the same time saves wear on track and wheel. The frames are solid steel, machine fitted to angle iron end cross bars, making a very rigid frame.

Before placing your next order for a city or interurban truck, consider the merits of our No. 47A and No. 61.

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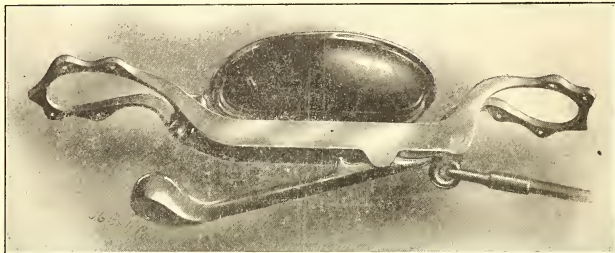
38 FT. COMBINATION OPEN AND CLOSED CAR.



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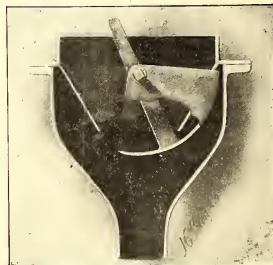
61 FT. 6 IN. PARLOR CAR.



Brill "Retriever" Signal Bell (Patented).

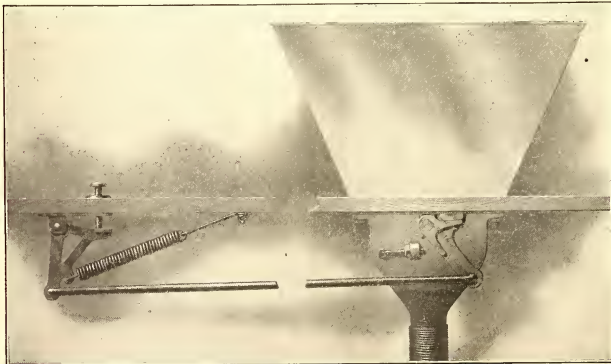
came weak, so that the weight and friction of a long cord was too much for them. The Retriever has a long clapper with a heavily weighted head, and at the other end a toe which bears against a trigger. This trigger starts with a small leverage, which jumps suddenly to a high leverage, sending the clapper up against the bell with an astonishing amount of energy. The pull of the trigger is less than a quarter of an inch, and no matter how gently the cord is pulled it is impossible to prevent a quick, sharp blow of the clapper. ¶ A sand box that does not keep the sand dry is practically useless. The sand that sticks to the sides of the hose forms a wick which lets the water, that is splashed up against the mouth of the hose, up into the box. It is impossible to prevent the sand-wick forming in the hose, but it is possible to prevent this wick having any connection with the sand in the box; and that is exactly how the "Dumpit" box is arranged. The smaller illustration shows that the box has a double hopper, and that the mouth

THE Retriever Signal Bell has the remarkable capacity of retrieving the cord instantly through three long cars as well as through a single car. It does away entirely with the old and common difficulty of not recovering the slack cord. The trouble in the past was that the clapper was not long or heavy enough and springs be-



Sectional view of Box, showing Oscillating Valve open. Side of valve broken away to show mouth of Hopper and Blade for cutting the sand.

of the inner hopper is closed by a rocker casting. When the sand is put into the box it fills this casting, and when the casting is filled, as the mouth is below the rim, the sand stops flowing down into it. When the operator pushes the rocker back, by foot pedal or hand lever, the sand flows out in a continuous stream. The special points about our box are, first and foremost, it keeps the sand dry; second, it is a continuous flow box; third, it is easily operated; and fourth, the construction is simple and compact.



Brill "Dumpit" Sand Box (Patented)

