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All matter intended for publication must be received at our office not later than Tuesday morning of each week, in order to secure insertion in the current issue.

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Sanders

The street car sander, like the railroad coupling, has been a favorite field for the exercise of misdirected inventive ability, yet if the average street railway man were asked his opinion as to the merits of the various street railway sanding devices, on the market, he would probably, to put it mildly, fail to wax enthusiastic as to their performances. Street railway sand-boxes have been devised and put on the market which should certainly be able to feed sand onto the track if anything on earth could under operating conditions, but we are rather inclined to think that a steam railroad man, with whom we talked the other day, is right in the assertion that the trouble with the street railway sanding devices is not so much in the devices themselves as in the care and attention given to the sand supplied and to the condition of sand pipes in general on street railways. On steam railroads, where a sand supply is usually not anywhere near as necessary as in electric railway operation, we find that a great deal of attention is given to this detail of operation. Nothing but fine screened sand is used, and the sand is thoroughly dried. Every precaution is taken to prevent moisture from getting into the sand after it is dried. While some electric railways have a well organized sand-drying department, and look after sand-boxes and sand supply with great care as a regular matter of business, there are too many where the sand supply is entirely a secondary consideration, and it is safe to say that street railway sanding apparatus will always be unsatisfactory as long as the sand supply is not looked after. Sand absorbs moisture very easily, and wet sand is sure to cause trouble sooner or later. Sand-boxes and feeding mechanisms are made which will feed almost any kind of sand, but the trouble comes in the pipe leading down to the rails, which is tolerably sure to become clogged if wet sand is fed through it, the difficulty being added to by the fact that the bottom of the sand pipe is likely to be wet with mud or covered with frozen mud and ice. With sanders, as with many other things, eternal vigilance is the price of reliability.

Preparations for Summer Traffic

Each recurring season brings its round of duties, alike to the husbandman and to the weary editor, and when we tear the June 15 leaf off our calendar and start on the "summer season," it behooves us once more to stir up our friend the manager on the improvement—nay, the sanctification, of his summer traffic. Talking the other day with our friend, Mr. Suburbs, we received an urgent invitation to come out and spend a day with him at Lonesomehurst-by-the-Sea, some 30 miles out of town. When we enquired the best route, he cordially advised the boat for the outward trip, but added, "Going home, you'd better take the electrics; it's a pretty ride down to Bundleheim, and takes only 90 minutes—then you can get an express for the city." Now, the distance from Lonesomehurst to Bundleheim is only 10 miles, and when we asked further instructions as to this beautiful ride in the electrics, this is what we got: "You take the green car that passes my corner every 20 minutes, and ride over to Sculpinville; then wait for a red car that runs to Bundleheim every half hour." We heard later that the road with the red car had passed a year's interest on its bonds, and was about to be reorganized. The situation is not altogether a fancy picture; it is typical of altogether too many beautiful suburban trolley rides. One waits around for awhile, catches a semi-occasional car, wanders across country on it for awhile, waits around a while more, and then catches on to the running-board of a crowded car that takes him the next stage, and so on ad nauseam.

The net result is bad for the public and even worse for the roads concerned, as travel, which would otherwise be profitable, is turned away by the inconveniences. The trolley ride is becoming an institution in American cities, but it is now too closely confined to certain definite routes, in the main to those over which through cars are run, or upon which the service is

so ample that little time is wasted in waiting. A scant service is effective only when it maintains a rigorous schedule and can be trusted to make certain and prompt connections with other lines. And in dealing with suburban traffic generally, and with summer excursion traffic in particular, large earnings come only when the service is made convenient for the public. We have often speculated on the probable result of applying the shrewd traffic-building methods of steam roads to these problems of summer transportation. Suppose half a dozen roads doing a summer resort business were to put their heads together and figure on the encouragement of travel. At certain hours of the day, morning and evening, their traffic is usually fairly heavy, but an active excursion business runs, as a whole, reversely to this regular traffic. For several months in the summer it is capable of being made highly profitable if skillfully handled. First, the public must be made to know the available routes, and, second, it must be made convenient for the public to take them. At present very few roads make public accurate information as to their service and connections. It is not enough to say that cars run over the lines to X every 20 minutes, and that at Y there is a connecting line to Z. A simple time-table, with all connections, ought to be available, so that one can figure out a trolley excursion with reasonable certainty beforehand, and not be seriously in error when he comes to try it.

Another feature of summer business ought to be the establishment of through excursion lines. In planning a trolley excursion, as things now are, one is extremely likely to find that a part of the route involves not only a change of cars but a change to a line which has a heavy traffic of its own, so that a party reaches it only to find a succession of overcrowded cars. Where there is a promising chance for excursion business, through cars should be run, and a friendly arrangement with connecting lines should make this possible by exchanging, within reasonable limits, track privileges. By so doing the through cars would be considerably expedited by the freedom from local traffic, and the real excursion business would be greatly encouraged. We have sometimes wondered, too, whether it might not be wise to make especial provision for excursion traffic in the way of reserving accommodations for a small extra fare, with or without the use of special chair cars. If a party could be quite certain that by getting special tickets it could be assured of finding at 1 p. m., Saturday, comfortable seats on a through car to Lonesomehurst, it would generally prefer to pay a small extra amount for the accommodation. Experience has shown that chair cars are crowded for even short runs on suburban excursion lines, and the same principle would hold for an electric road, with the additional advantage that it would encourage longer trips. All this means some extra expense and labor for the railway company, but we think it would pay. To be sure, railroad officials sometimes loudly assert that parlor cars do not pay, but if one of two competing steam lines should abolish its parlor car service in the supposed interest of economy, and cut down its through express service for the same reason, it would find abundant cause for repentance. And the situation in electric railroading has very similar characteristics, although the service is at present less completely developed. Doubtless, the first through express trains were greeted with prophecies of failure.

Tail Lights

Recent accidents have called forcible attention to the necessity for tail lights, which are independent of the supply of electric current, both for city and interurban cars. Tail lights, which will reveal the presence of a car when the trolley is off or the lighting circuit fuse is blown, are especially necessary on interurban cars, but there are plenty of places on most city lines where there is danger of rear end collisions if no oil tail lights are carried. The maintenance of a lot of oil lanterns is admitted to be a nuisance, as well as a fire risk, but it seems to be a necessary evil—at least until some cheap and reliable substitute for the oil lantern is available. As desirable as it may seem to do away with oil lights entirely on a city electric line, there is no evading the fact that they can only be omitted at considerable risk and at some inconvenience.

On most roads a conductor's hand lantern is needed for signaling over steam railroad crossings and for use in case the current supply fails, or in case of accident. Lanterns being maintained for these purposes, it is not a great additional expense to maintain tail lights in addition. It is conceivable that a city road, operating every mile of its track over well-lighted city streets, where a car would always be visible without regard to the lights it carries, and where the speed is low, might possibly safely dispense with oil lanterns of all kinds, but such conditions rarely exist.

Engine and Turbine Efficiencies

Reports of efficiency tests on turbines of various kinds and on reciprocating engines are coming in rapidly just now, but the accumulation of figures has not yet made any considerable change in the general data. The test of a 400-kw Westinghouse-Parsons unit, which we reported in our issue of June 11, raises, however, some interesting practical questions. As our readers will remember, this test gave some notable results from the use of superheating to a rather unusual extent, reaching 11.17 lbs. of steam per brake horse-power-hour on a moderate amount of overload. The recorded thermo-dynamic efficiency ranged from a little over 17 per cent to nearly 19½ per cent, referred to the thermal units actually present in the steam employed, these figures being comparable with the best results reached by reciprocating engines of the compound condensing class. So far as these results are concerned the outcome of the tests was highly satisfactory, but to the practical man no such formal tests are altogether satisfactory. It is, of course, commonly known that it is hard to keep up to test conditions in every-day running, but when this opinion is closely analyzed it is evident that the discrepancies commonly found are generally due to causes quite outside of the engine itself. Granting that the load conditions can be maintained, there seems to be no good reason why test conditions cannot be quite nearly duplicated in every-day operation.

Of course, it is well understood that the load conditions cannot generally be duplicated, but this is not of itself the vital point. Cost of power is the matter at issue in the operation of a steam plant, and this cannot be settled on the basis of thermo-dynamic efficiencies alone, important as these are from a theoretical standpoint. The fixed charges on the plant are of serious consequence, and even putting these aside it is the "demnition total" of the fuel and labor charges that counts with the management. The kind of efficiency test that one should most like to see would be one extending clear from the coal pile to the terminals of the generator, and including all the items. Of course, objectors will at once raise the point that this involves the efficiencies of the boilers, and even of the firemen, but these are items which have to be paid for and cannot be forgotten in the final reckoning. And particularly in the case of high superheating with independent superheaters, the

cost of the process must be taken into account. Nobody disputes the increased efficiency that comes to a heat engine from increasing the range of temperature of the working fluid directly, or by increasing the vacuum. But how about the cost of this gain in extra heat supplied to the steam itself and to the various auxiliaries, which latter take much more energy than the casual observer imagines? A point in superheating, or in increased vacuum, will evidently be somewhere reached at which the game will not pay for the candle. Where are these points?

Our impression is that they have not yet been reached, and we hope that such will prove to be the case. Nevertheless, it would be a very desirable addition to the data of steam engineering to have tests made upon a basis that would throw light on the cost of all the additional refinements that make for high efficiency. Never mind if various apparently extraneous items do creep into the list—they all get into the yearly balance sheet. Figures upon the practical efficiency of superheating to various degrees and by various methods would be particularly welcome. We know at the present time about what to expect from boilers in evaporative efficiency and in life—let us have similar data of performance and endurance from superheaters of the most approved modern types. And if reciprocating engines are concerned what is the effect of high superheating on the cost of lubrication and the endurance of the working parts? We have been getting wonderful data from abroad on triple-expansion engines, worked at a high degree of superheat, but some of these interesting details are lacking from the data published. What could we expect from first-class turbines under similar conditions? We do not find fault with the tests we have published—we consider them valuable, and hope there will be many more of them. In these days, however, when there is active and strenuous competition between steam engines and steam turbines, with gas engines beginning to take a hand in the game, information as to the total result to be obtained from 1 lb. of fuel of known thermal value is particularly to be desired, and equally important is a knowledge of the various items of expense that enter into each stage of utilization. The futility of basing opinions on interior thermodynamics alone is well shown in the case of the gas engine, which thus considered would be quite in a class by itself.

Practical Considerations in Steam Engine Selection

In connection with reciprocating engines, the paper published last week, on "The Use of Superheated Steam and of Reheaters in Compound Engines of Large Size," points out some interesting and valuable conclusions from an analysis of several tests made upon compound engines of recent design. A great many refinements in steam engine design have been developed by the engine builders, and have been largely adopted in power plant installations, but data as to the real value of many of these features have not been generally available. In this paper the data obtained from twenty-eight important tests of large vertical compound engines are analyzed, and as a result many striking facts and much needed comparisons are brought out and made clear.

Even the most cursory examination of Mr. Marks' paper would tend to indicate that the introduction of superheating is fated to revolutionize present steam engine practice. It appears more than probable that the use of cylinder jackets, according to our present ideas, as well as the use of reheaters between cylinders, will be found of little or no real value if superheated steam is used. The conclusion is clearly drawn in the analysis to the effect that the jacketing of high-pressure cylinders is of little value when superheated steam is used, amounting to only a few per cent; reheating is also found a source of loss unless its practical results are that of superheating the steam entering the low-pressure cylinder, by an amount of at least 30 degs. F., and is not really effective unless it superheats about 100 degs. F.; in the latter case it is stated that a saving of only 6 per cent to 8 per cent may be expected.

With such small savings as these it appears that there is altogether too little margin of economy to warrant the installation of the extra complication which would be necessary to bring about these results. Not only the cylinder jacket, but also the reheating receiver, is a source of trouble and annoyance in requiring considerable attention for maintenance. If the slightest leak develops in the reheater it must be cut out or subject the operation of the engine to unknown losses. In many power plants it has been found, under certain conditions of unfavorable operation, that reheaters operated to a serious loss of efficiency for the engine performance as a whole. In fact, it may be stated in this connection, that in a large power plant in the vicinity of New York City, in which a number of cross-compound, horizontal, slow-speed engines are used, the reheating equipment of the receivers was long ago removed, and the engines are now operating with the reheating shells operating merely as separator receivers—in this capacity they are very effective in ensuring the delivery of dry steam to the low-pressure cylinders, and their use is of considerable value.

The jacketing of high-pressure cylinders is undoubtedly still advisable for use upon engines operating with saturated or wet steam, and will be probably found to make reasonable showings of saving in most cases; but the jacketing of the low-pressure cylinder is, in the paper, shown to be absolutely unnecessary, particularly when superheated steam is used in the high-pressure cylinder, or an effective reheater is used. There are, undoubtedly, certain conditions under which the jacketing of the low-pressure cylinder may be effective in making a slight saving, but at the best, with the worst conditions of saturated steam and cylinder condensation, the net saving would be only a few per cent, so that the extra expense of the jacket and its care and maintenance do not seem to be warranted. In this case, as well as that of jacketing the high-pressure cylinder, it is more than probable that the steam could be used much more profitably if passed through the cylinders than into the jackets.

Another important fact, which was brought out by the investigation of the tests referred to, is that the variation, within ordinary limits, of the ratio of stroke to diameter of steam engine cylinders does not have any marked effect upon the economy of the engine—particularly when superheated steam is used. The size of an engine is, of course, in any case, an important factor in the determination of its efficiency, but it is interesting to note that variations of proportions for any given size have not effected any appreciable increase of economy of operation. Inasmuch as such variations of the ratio of stroke to diameter are of little or no value, one of the strongest arguments possible is offered for the use of the standard proportions for any given size and type of engine. The standards of the various engine builders are usually the best obtainable for each of their types, having resulted from continued investigations and long study of the subject, and cannot be excelled for ordinary power plant purposes. The results of these tests and analyses should be conducive to the abolition of specialized designs where the savings effected are doubtful.

THE POWER PLANTS OF THE NEW ORLEANS RAILWAYS COMPANY

The New Orleans Railways Company, which conduets a general power and lighting business in addition to its street railway operation, draws at present from some seven power houses, located, with one exeeption, along the Mississippi River. These have an aggregate output of something over 29,000 hp, and burn about an equivalent of 200 tons of eoal daily. On the basis of 2 lbs. of oil being equivalent to 3 lbs. of coal, one-half is oil and the other half is eoal. Previous to the consolidation of interests, now represented by the New Orleans Railways Company, two other stations were also in operation, one the property of the Orleans Railroad Company, of 600-hp eapaeity, and the other, the property of the Merehants' Eleetrie Company, of 1280-hp eapaeity. Both stations were loeated some distance from the Mississippi River, though eaeh near a so-called basin eanal, but being small in size as compared with the other stations, were abandoned not long after the merging of the properties. The former plant was built for a railway output, while the output of the latter was entirely alternating-current. The apparatus of both has been disposed of. Of the stations now maintained, the most interesting ones are the Edison Station No. 1, whieh supplies a power and lighting demand by means of both alternating eurrent and direet eurrent, the latter probably amounting to 70 per cent of the total output, and the so-ealled Annex plant, on Market Street, at the rear of two, adjoining, older stations on South Peters Street. These two stations are the subjeet of some extended reference in the present connection.

VIEW ON CANAL STREET, SHOWING FIVE LINES OF TRACK

Of the other stations, the St. Charles plant, formerly the property of the St. Charles Railroad Company, is entirely a railroad station, giving an output at 550 volts. It eomprises four units, three of 300-hp rating, driven from 14-in. and 26-in. x 36-in. Hamilton-Corliss engines, and one 600-hp unit, having a 22-in. and 44-in. x 48-in. Allis engine. The boiler plant eomprises 1500-hp, and is equipped with eeonomizers. The boilers are fitted for burning oil.

Another station for an all-railway output is located on the eorner of Tehoupitoulas Street and Napoleon Avenue. Here there are four belted units, eaeh of 200 kw, and driven from a 14-in. and 36-in. x 48-in. Lane & Bodley engine. There are 1200 hp in boilers, with arrangements for oil burning.

The third all-railway plant is located on the eorner of North Peters and Elysian Streets, known as the Claiborne station, and eontains three units, two of 450 hp and a third of 1275 hp. The boiler plant, aggregating 1800 boiler horse-power, is served by a staek 175 ft. high and 7½ ft. in diameter.

The fourth railway plant oeeupies approximately one-half the bloek on South Peters Street in front of the Annex plant. It is known as the main station, but eomprises a miscellaneous equipment of railway generators, belt-driven from a jack shaft, whieh in turn is operated from a number of eondensing engines. While this is the largest of the railway stations enumerated, having 4750 hp in engines, the new vertieal units in the Annex station are to carry the load taken by the main station, and also the load now carried by the Napoleon Avenue station.

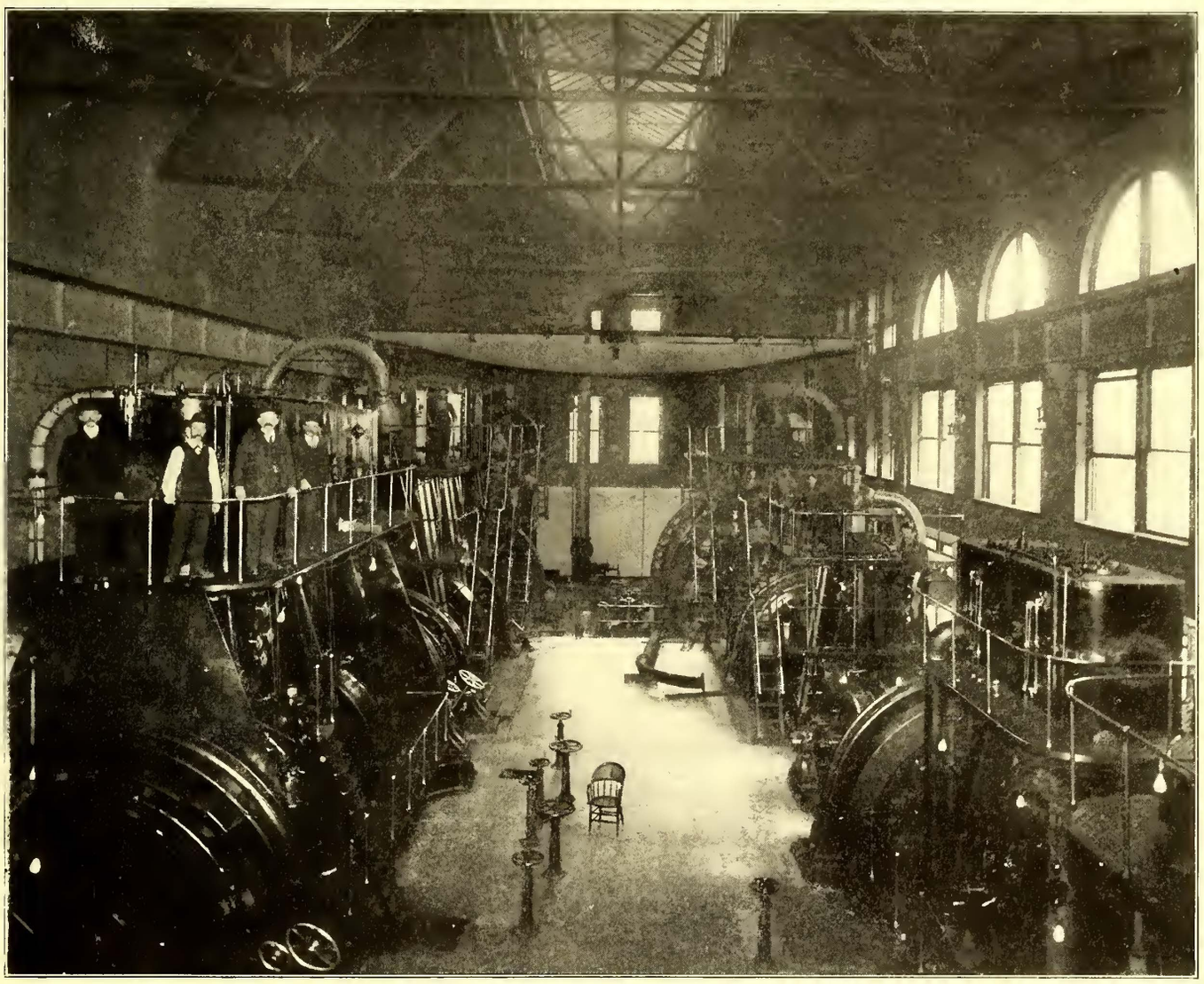
If the Edison Station No. 1, the plant for serving the general power and lighting demand of the eity, is regarded as being approximately in the center of the eity, it will be found that the St. Charles and Claiborne stations are about 7000 ft. distant from the Edison Station No. 1, and that the main station and the Annex are 8500 ft. distant, while the Napoleon Avenue station is over 3 miles from Edison No. 1. The abandonment of the latter will thus bring the generation of the railway current nearer to the business center of the eity. As explained in the description of the Annex plant, the designs contemplate the ereetion of a boiler plant alongside of the Annex building. Pending the installation of the high-pressure water-tube boilers, whieh will there be installed, the boiler plant of the main station will be utilized for supplying the required steam. This brief enumeration thus shows that there are at present five railway stations, with the early intention of doing away with two of them.

The seventh station, being also the second Edison station, adjoins the main power station. While Edison No. 2 and Main stations oeeupy the entire block along South Peters Street from Riehard to Market, they were originally owned by two independent eompanies. This station is commonly known as the munieipal lighting plant, as it generates direet eurrent for are lighting only. Its boilers are available for steam requirements of both plants, and the firing spaee is eontinuous aeross the fronts of both installations of boilers. There are eighteen 125-light Brush machines and one 125-light Wood machine, all belt-driven from a jaek shaft.

EDISON STATION NO. 1

Edison Station No. 1 oeeupies part of a bloek bounded by Union, Dryades, Gravier and Baronne Streets, and occupies a building 100 ft. x 140 ft. in ground area. This is of the class in which boiler and engine rooms are side by side, and its exterior, whieh is of buff briek, has been finished off with water-tables, trimmings to the windows and the usual arehitectural embellishments whieh are nowadays bringing public service power stations into a elass of majestic structures. Its generating equipment eonsists of two lines of vertieal steam-driven units, aggregating, all told, 7750 hp, and these deliver both direet and alternating eurrent for the general lighting and

power demands which the railway company controls in addition to the railway traffic. The station is operated condensing, and with a steam pressure of 200 lbs. per square inch. The interior of the engine room is in keeping with the appearance of its exterior. The floor is largely of marble mosaic, and there is a wainscoting some 12 ft. high from the floor line of white glazed brick, with a light blue dado near the top. Above the wainscoting the walls are yellow. The roof is of tiles, supported from steel roof trusses. The condensers are located below the engine room floor, which are enclosed on the main floor level by a polished brass railing. A 25-ton overhead traveling electric crane, built by the Morgan Engineering Company, of Alliance, Ohio, serves the engine room from one end to the other.



NEW ORLEANS RAILWAYS COMPANY'S LIGHTING STATION NO. 1.—BARONNE STREET

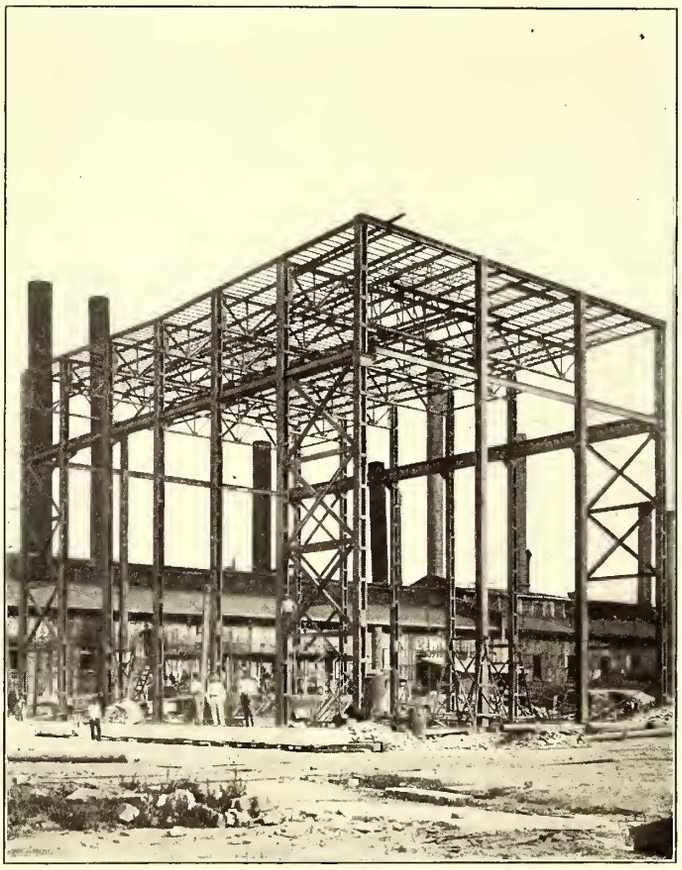
The boiler equipment comprises four batteries, of two boilers each, aggregating, all told, 4400 hp. Two batteries are fitted for oil burning and two for coal. Fuel economizers, of the Green type, are provided, located above the rear of the boiler settings, and the smokestack, which rises in one corner of the boiler room, starts a short distance below the connection from the economizer setting. Its construction in this respect is noteworthy, the stack being carried on a structural steel framework, which allows for utilizing the floor space underneath it. The stack is 9 ft. in diameter and 200 ft. high.

The boilers are of the Babcock & Wilcox water-tube manufacture. The oil-burning boilers have 224 tubes, 4 ins. in diameter and 18 ft. long, placed sixteen wide and fourteen high, and two 42-in. steel drums. Billow oil burners are employed, and these are supplied with oil from two small Snow pumps in the firing space of the boiler room, installed in duplicate. Steam is used for atomizing at 40 lbs. per square inch. The oil is drawn from four tanks buried in the yard outside the boiler room, each tank having a capacity of about 14,073 gals. These are filled from a pipe line from a 55-000-barrel storage tank, situated in outskirts of city. This storage tank receives its oil by barge from Beaumont oil fields. They are provided with float indicators with counterbalance extending above ground, so that the level of the oil can be learned at a glance, and each tank is provided with a vent coming through the ground, each vent fitted with a cap, which is screwed on just far enough to prevent its being shaken off by any slight exterior jar.

The coal-burning boilers have 192 tubes each, spaced sixteen wide and twelve high. As the boilers are regarded as of equal capacity this relation of the number of tubes will indicate that the oil-burning boilers require 16 per cent more heating surface. The coal is delivered in dump wagons, which discharge into a shallow hopper at one end of the boiler room, as indicated in the accompanying plan. The coal is weighed in this hopper and then passed through a crusher into a conveyor, which carries it to overhead bins from which it is spouted to the boilers. Each spout is arranged for weighing, so that the weight of coal delivered to each boiler can be recorded. The overhead coal storage of the boiler plant amounts to about 830 tons.

Five of the generating units have a direct-current output and three alternating current. Units Nos. 1, 2, 3 and 4 consist

of E. F. Williams' engines, built by William Tod Company, of Youngstown, Ohio, and General Electric generators. The engines, Nos. 1 and 2, are triple expansion. No. 1 has 21½-in., 35-in. and 55½-in. cylinders and 36-in. stroke, and has a rating of 1200 hp at 100 revolutions. Nos. 2 and 3 are of the same capacity, 600 hp, but the engine of No. 2 has 14½-in., 23-in. and 37½-in. cylinders, while the engine of No. 3 is a three-cylinder compound engine with an 18-in. high-pressure cylinder and two 26½-in. low-pressure cylinders. Both engines run at 150 r. p. m., and each has a stroke of 28 ins. It will be noted that in engine No. 3 the ratio of low to high-pressure cylinders is 4.33 to 1. Each of these three units drives two 135-volt dynamos for the three-wire direct-current distribution system in use. The two dynamos of unit No. 1 have a capacity of 400 kw each, and those of units Nos. 2 and 3 of 200 kw each.



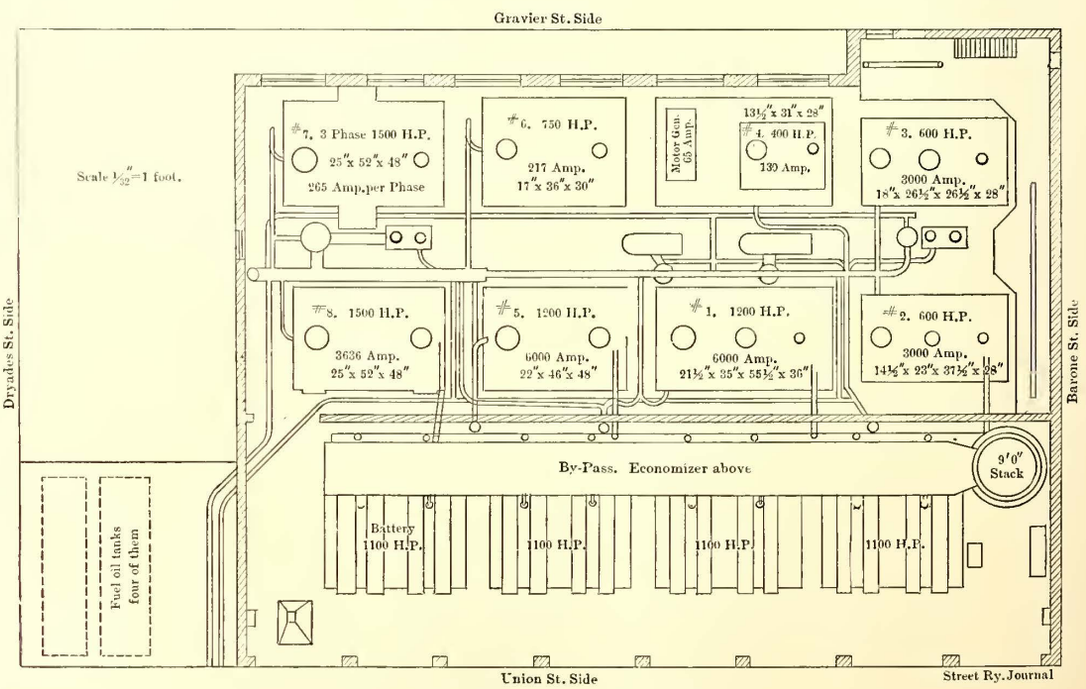
STEEL FRAMEWORK IN CONSTRUCTION JUNE 22, 1901—ANNEX PLANT

Units Nos. 5, 6, 7 and 8 consist of McIntosh & Seymour vertical compound engines and General Electric generators. Nos. 5 and 8 are direct current, but No. 5 has two generators similar to those on unit No. 1, while unit No. 8 has one electrical machine with a pressure of 275 volts, for use across the outside legs of the three-wire system. The engine of No. 5 has cylinders 22 ins. and 46 ins. in diameter and 48-in. stroke, and is rated at 1200 hp at 100 revolutions. No. 8 has cylinders of 25 ins. and 52 ins. in diameter and 48-in. stroke, and is rated at 1500 hp.

The three alternating-current units give an output of three-phase current at 2300 volts and 60 cycles per minute. Unit No. 4 is of 400 hp, or 300-kw capacity, and has a 13½-in. and 31-in. x 28-in. engine, running at 150 revolutions. Unit No. 6 is of 750 hp, or 500-kw capacity, and has a 17-in. and 36-in. x 30-in. engine, also running at 150 revolutions. Unit No. 7 is of 1500 hp, or 1050-kw capacity, and its engine is of the same size as that of the direct-current unit No. 8. Besides these steam-driven units there is a motor generator in the engine room which is arranged to receive direct current at 250 volts and deliver alternating current at 2300 volts. This has a capacity of about 150 kw.

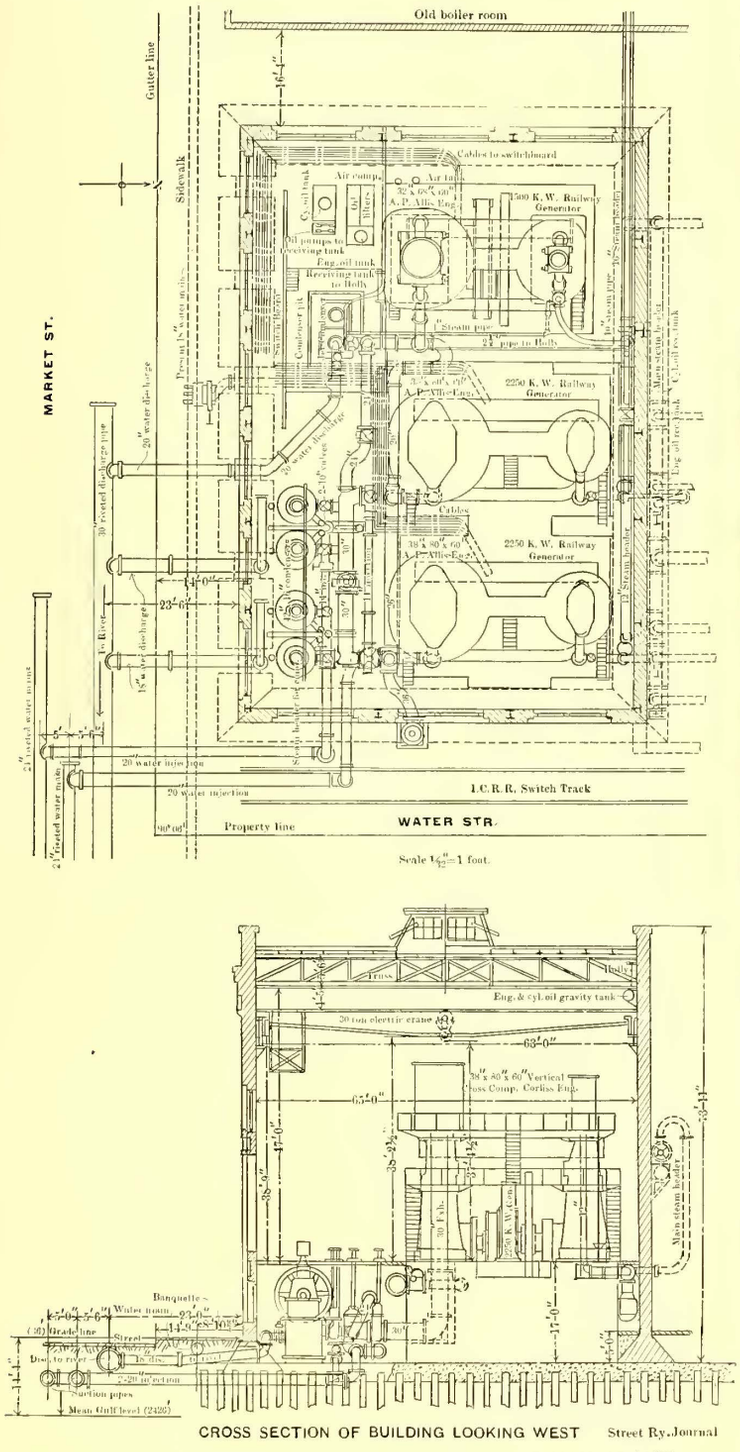
The condensing machinery is of the jet type, with air pumps of both the steam-driven and the electric-driven type. The exhaust, as well as the live steam piping, is carried in a basement under the engine room, which arrangement has lent much to the good appearance of the engine room. The live steam pipes, it may be stated, are provided at each engine with a Stratton separator, which is placed below floor. The exhaust pipes are all connected into a single main, to which all of the condensers may be connected. There are four of these, one for each pair of units. The condensers at opposite ends are of the twin Blake type, and the intermediate are electrically driven. One of these has a 22-in. x 12-in. Knowles triplex pump, driven by a 220-volt, 50-hp motor; the other has a 17½-in. x 10-in. pump, driven by a 25-hp motor. The condenser between units Nos. 7 and 8, which is designed to take care of any three engines, has 18-in. x 44-in. x 24-in. cylinders, and has a cone 60 ins. in diameter. The piping leading to this is controlled by an electrically-driven Chapman gate valve, on which is mounted a 1.5-hp motor.

The condensing water is taken from an artificial canal (connected with Lake Pontchartrain) by a long line of pipe. This contains a vertical loop, owing to the formation of the ground. A considerable quantity of air collects in the top of this loop, and a pump, in the yard outside the pump station, had to be installed to prevent the formation of an air lock. This pump is a 5¼-in. x 4¾-in. duplex pump, and maintains a vacuum of 16 ins. to 17 ins. The feed water is obtained from wells, which are located in a nearby street, and is lifted some 20 ft. to the



PLAN OF LIGHTING STATION NO. 1

wooden tank in the yard. For this purpose there is an air compressor, of the Laidlaw-Dunn-Gordon single-fly-wheel type, 12 ins. x 14 ins. x 12 ins. in size, which maintains a pressure of about 15 lbs. Water is pumped from the receiving tank to an overhead tank, and from this it flows by gravity to a Webster feed-water heater underneath the framework supporting the chimney, and thence goes to the feed pumps in the boiler room.

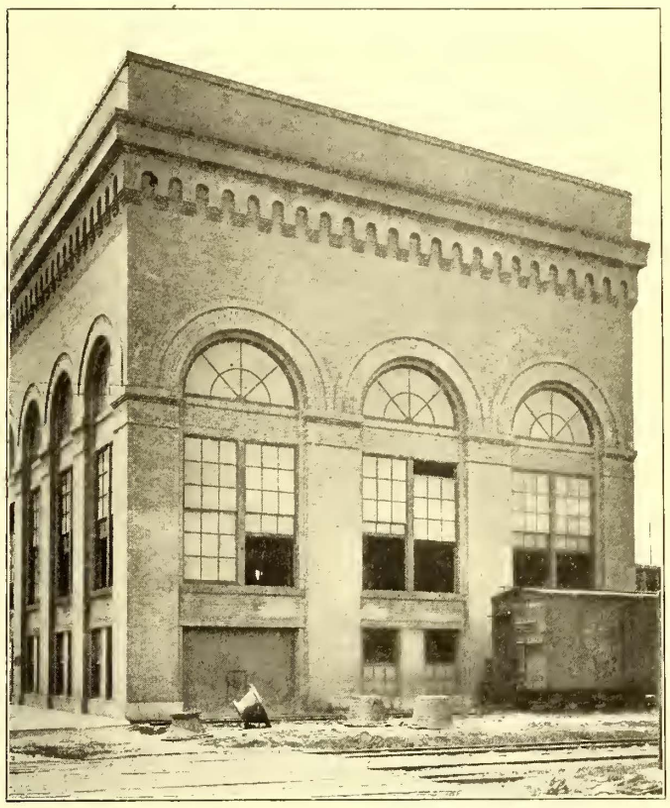


CROSS SECTION OF BUILDING LOOKING WEST Street Ry. Journal

PLAN AND CROSS-SECTION OF ANNEX RAILWAY PLANT

The feed-water heater receives the exhaust from the condenser air pumps and the feed and other pumps about the plant.

The equipment of the station, as described, covers an electrical plant which is in excess in its demand for steam over what the boiler plant was normally expected to produce. In other words, the boiler plant was installed with the provision of a relay, or idle unit, to allow for extensive cleaning or repairs of any other units. The demands for current, however, led to the installation in the engine room of additional machinery beyond what was originally calculated, so that at times all boilers have to be operated. This problem is to be solved by increasing the original rate of evaporation in the boilers by providing a second smokestack. It appears that the present chimney has insufficient cross-section to carry away the gases in case it were increased in height to raise its capacity. At the opposite end of the horizontal smoke breeching, into which all the boilers discharge, a chimney, a counterpart of the first one, is to be built, and contracts are about to be made for the work. Like the first stack, it will be supported above the boiler room floor on a structural steel base, so that passage room may be



RIVER SIDE OF ENGINE ROOM—ANNEX PLANT

maintained into the boiler house and the engine room at this point. The steel frame base rises some 24 ft. above the foundation castings, or about 19 ft. above the grate level. The total height of the chimney proper is 136 ft., or 156 ft. 11 ins. above the grates. It is built of steel, and is 9 ft. in inside diameter.

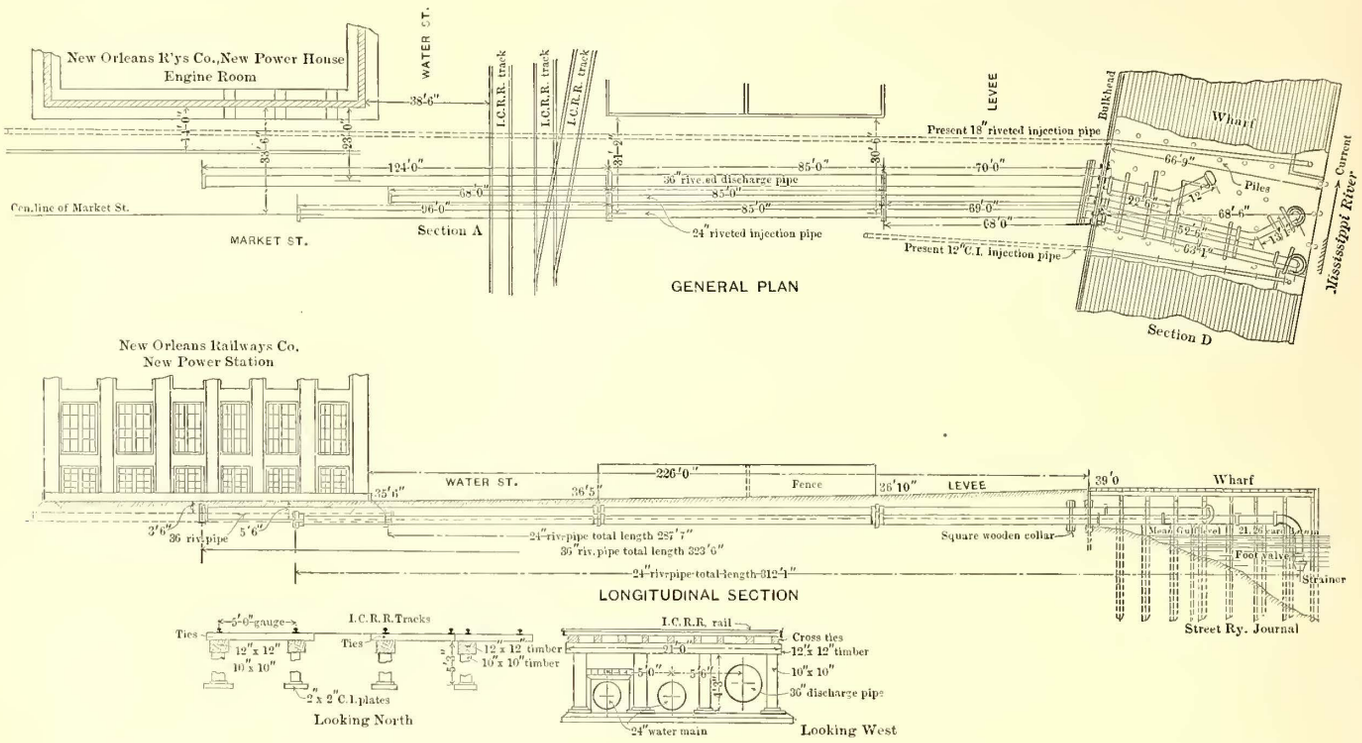
With regard to the equipment of the engine room it should be stated that the 500-kw single-phase generator of No. 6 unit is to be replaced by a 500-kw direct-current General Electric generator, with an output of 275 volts. A 50-hp motor-generating exciter set, with one Tirrill regulator for automatically maintaining the desired volt of the alternating-current output, is to be furnished, having a compound winding for increasing the voltage under heavy load conditions. Besides additions to the switchboard equipment an additional air compressor for deep-well feed-water pumping is to be installed, together with a boiler feed pump and a water-storage tank. In connection with the feed water, the fact that artesian well water is available for use in the boilers without any treatment whatever is of interest. The water is obtained from the 700-ft stratum under New Orleans, and gives the following remarkable analysis, the figures being grains in 1 gal.: Chloride of sodium, 6.16; carbonate of soda, 14.36; carbonate of potash, .14; silica, 1.57; organic matter, 1.75; total solid, 25.31; free carbonic acid, 1.36.

THE ANNEX PLANT

Of the various plants owned by the New Orleans Railways Company, the latest constructed is the South Peters Street and Market Street annex plant. This is a new railway generating station erected behind a lighting station on South Peters Street,

from the boiler plant of which it receives steam. It has space for1500-kw and two 2250-kw direct-current railway units, and the third is already in process of erection. It was arranged by E. B. McKinney, superintendent of power of the New Orleans Railways Company.

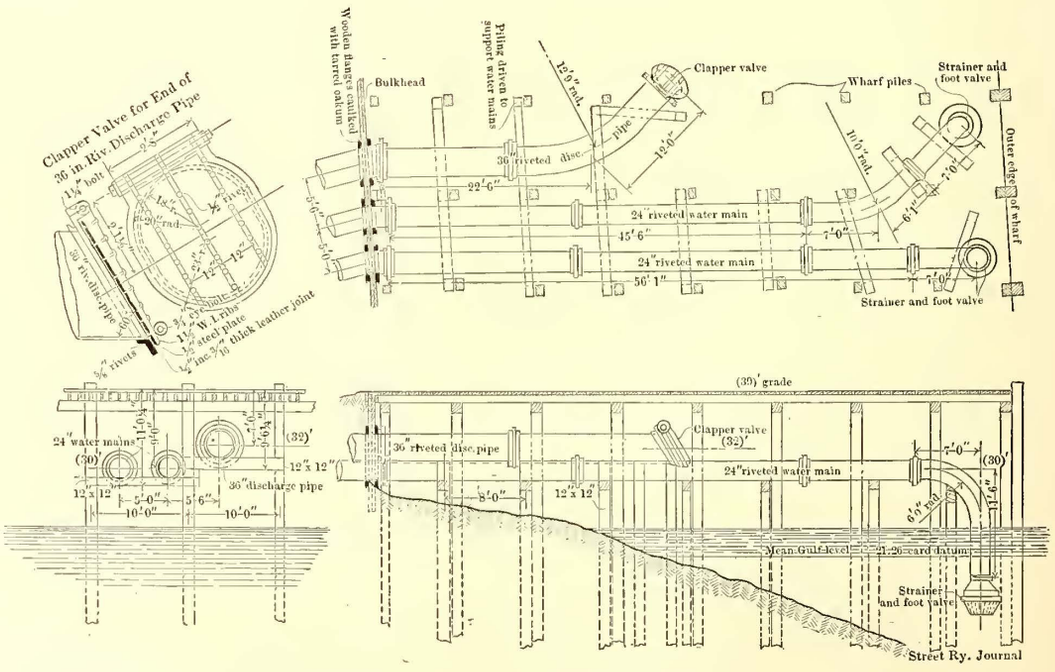
The generating units consist of an Allis-Chalmers vertical cross-compound engine of 32-in. and 68-in. cylinders and 60-in. stroke, and a General Electric 1500-kw direct-current machine, generating 550 volts at 75 r. p. m., and two Allis-Chalmers engines, 38-in. x 80-in. x 60-in. stroke, connected to two Westinghouse 2250-kw generators, generating 575 volts at 75 r. p. m. Steam pressure is ordinarily 125 lbs., and the vacuum ranges from 27½-ins. to 28-ins. The plant lies near the Mississippi River, and jet condensers are employed, each condenser having a pair of 30-in. x 48-in. x 28-in. double-acting pumps, made by Dean Brothers' Steam Pump Works, of Indianapolis. The discharge from the condenser has a temperature of from 98 degs. to 100 degs.



Showing Supports under Ill.Cen. Track overhead of Water Main

GENERAL PLAN AND SECTION, SHOWING ARRANGEMENT OF SUCTION AND DISCHARGE MAINS AT ANNEX PLANT

The building is of modern construction, lofty, well lighted and carefully designed, both with respect to recognized commercial refinements and to architectural embellishments, such as are now not unusual in the power generating stations of modern street railways. The foundations for the machinery not being carried far below grade level, the engine room floor has been placed somewhat above the street line and a basement formed around the foundations. The structure has a steel frame, but both the walls and the foundations are of brick work. The bricks are buff in color, with face brick on the outside. A noteworthy feature is the construction of the engine room floor. This is supported by brick arches, but these are covered with a double timber floor, consisting of ⅞-in. matched oak boards laid on 1-in. pine. The building is served by an electric traveling crane, of 30 tons capacity, built by the Whiting Foundry Equipment Company. The machinery frames are painted a dull, dark red, the roof trusses are a light brown, and the under side of the roof shows the tiles of which the latter is constructed. The floor is unbroken except for wells over the condensers, the steam machinery being operated condensing.

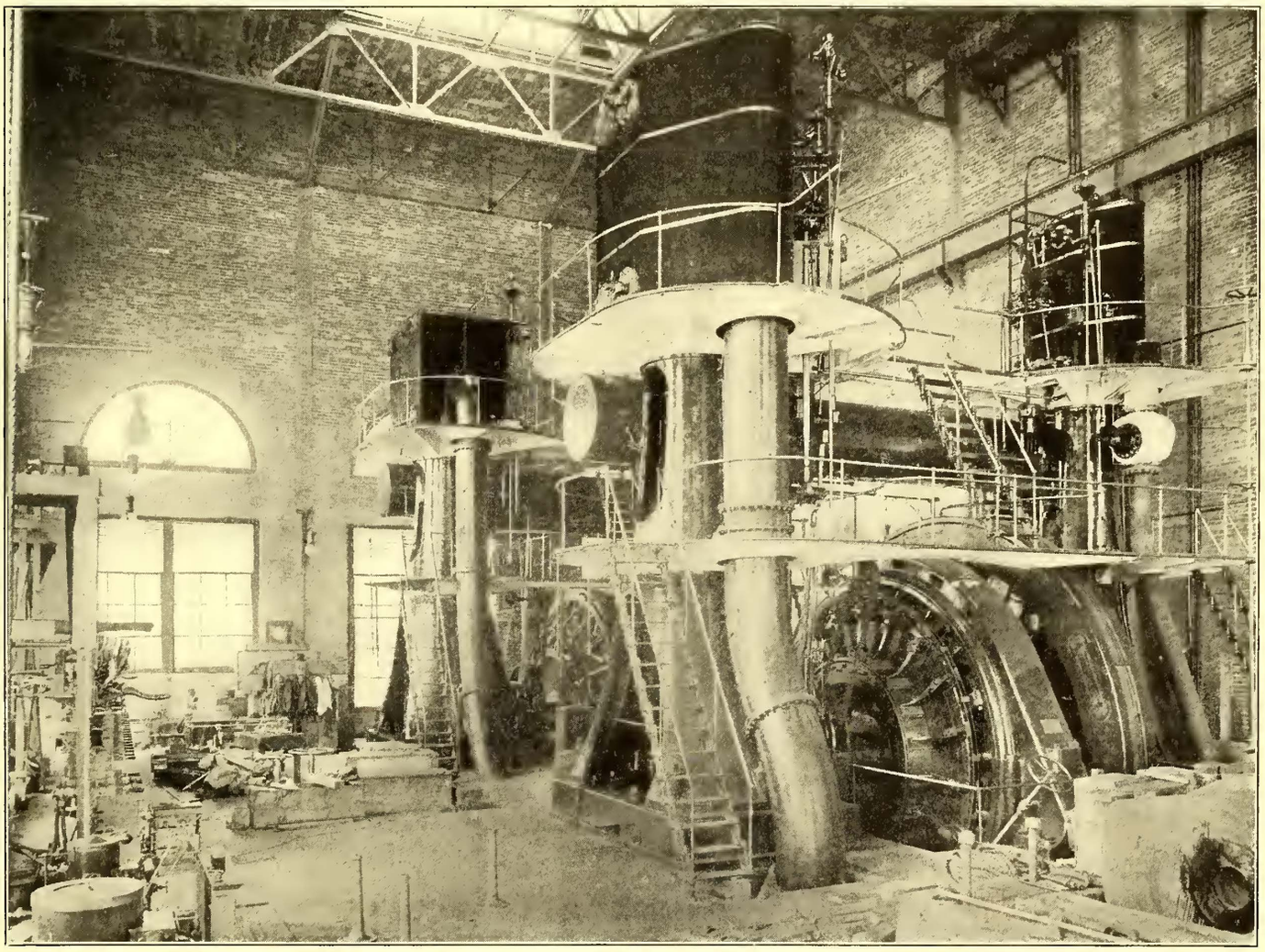


ENLARGED PLAN AND SECTION, SHOWING WATER MAINS UNDER WHARF, SUPPORTED ON 65-FT. PILES, ALSO CLAPPER VALVE FOR DISCHARGE PIPE

An oil circulating system has been installed for both the

engine and the eylinder oil. In the basement there are two 3-in. x 2-in. x 3-in. Worthington pumps, which deliver to two overhead tanks, one for the engine oil and the other for the eylinder oil. Each of these has a capacity of 325 gals. The engine oil gravitating to the basement is passed through a Turner oil filter of 744 gals. capacity, and pumped to the overhead tank for use over again. These tanks are supported against the inside wall of the station, some 65 ft. above the basement floor. In the basement there is also a receiving tank for eylinder oil, this of 425 gals. capacity.

The boiler plant from whieh steam is delivered is equipped for both oil and coal burning. For the oil the circulating system, controlled by the National Supply Company, of Chicago, is employed, including a 4½-in. x 2¾-in. x 4-in. Snow pump for pumping the oil. The oil is brought from tanks in the yard outside, and is at a temperature of about 93 degs. F., and is delivered to the burners under 45 lbs. pressure and atomized by steam at 22 lbs. or 23 lbs. The oil tanks are fenced in with a corrugated iron fence, so that outsiders have no access to them.



INTERIOR OF ANNEX PLANT ON MARKET AND WATER STREETS

SUCTION AND DISCHARGE PIPES

One of the many interesting features of the main power house of the New Orleans Railways Company is the manner in in which the waters of the Mississippi River are utilized for cooling water in the jet condensers of the plant, through two 24-in. suetion and one 36-in. diseharge pipes, the arrangement of which was made by Charles H. Ledlie, of St. Louis. The method of construction is shown in the accompanying diagrams.

The position of the suction pipes is located up-stream, while the diseharge pipe is turned down stream to prevent the possibility of the discharged cooling water getting baek through the cooling pipe at a low stage of the river. The general diagram shows the locations of the old 12-in. and 18-in. pipes, also the method of supporting over the pipes the steam railroad tracks running along the river front, adjacent to the power house. The steady flow of the Mississippi River water into the pipes is often interrupted by the presence of fish in the strainers, causing them to become clogged, and requiring, as a rule, the services of a diver to clear the strainers. To avoid this trouble the foot valve and strainer are made tapering, as shown. Owing to this form the fish necessarily fall off of their own weight as soon as the use of the pipe is discontinued, which, of course, eliminates the usual necessity for a diver.

The second diagram also shows the method of supporting the suction and discharge pipes on piles, independent of any wharf support, which prevents any jar or strain on the pipes which might otherwise be caused by the landing of vessels at the wharf. The pipes are made of ¼-in. steel-riveted piping with flanges, in as long lengths as could be procured, and this character of piping was used in preference to cast-iron on account of the vibration of the ground, due to the peculiar quality of the soil in this section, and the continuous passing of steam railroad freight trains. The diagram also shows the effective and inexpensive clapper valve, which closes automatically during high water, and prevents a possible overflow.

MISCELLANEOUS

In connection with the foregoing statement of the power generating capacity of the plants of the New Orleans Railways Company, advantage is taken of the opportunity to reproduce among the accompanying illustrations a photograph of Canal Street. Here are shown the five lines of railway tracks, which stand on a level in the center of the street, that is a few inches

above the general street level. This, of course, has the advantage that wagons are not hauled along the street railway tracks to obstruct traffic. In conclusion, it will be of interest to record the following facts concerning New Orleans: It has a population of 300,000 people; 30 miles of dock facilities, and 700 miles of streets, of which 175 miles are paved.

E. C. Foster is president and manager of the New Orleans Railways Company; John G. Woods, the general manager of the railroad department; A. L. Black, electrical engineer; E. B. McKinney, superintendent of power, and F. C. Rojo, master mechanic. The provision of a new chimney in Edison Station No. 1 and the changes in the equipment of that plant are the work of Messrs. Sanderson & Porter, engineers and contractors, of New York City.

STREET RAILWAY EXHIBITS AT THE WORLD'S FAIR

In the last issue of the Street Railway Journal particulars were given of some of the most interesting exhibits at the St. Louis Fair. In this issue a number of other exhibits are illustrated and described. It has been impossible to complete the list of exhibits of street railway interest at St. Louis in these two issues, but others will be taken up in the next few succeeding numbers of this paper.

CONSOLIDATED CAR HEATING COMPANY

The Consolidated Car Heating Company's exhibit in the Transportation Building is arranged to show both steam and

EXHIBIT OF THE CONSOLIDATED CAR HEATING COMPANY

hot-water heating systems for electric roads. Several of the standard forms of Consolidated electric heaters are exhibited, and also new types of cross-seat heaters and heaters of special sizes. One part of the exhibit is devoted to quick-brake switches and switches for various combinations for regulating the degree of heat. A switchboard, as used on the new elevated cars of the Brooklyn Heights Railroad for the control of heaters, is one of the interesting features in the switch and regulator department of the exhibit. There is a new hot-water system for heating interurban cars. The fittings used with this hot-water heating system are similar to those used with this company's steam railroad car equipment. The exhibit is fitted up to represent the half of a steam or interurban coach.

LAGONDA MANUFACTURING COMPANY

Every engineer or user of steam who attends the St. Louis Exposition will, of course, be interested in the Steam, Fuel and Gas Building, in which is located the immense boilers of American, French, German and English manufacture, in all some 40,000 hp, which furnishes steam for power and other purposes for the entire Exposition. Not the least interesting display along this line is that made by the Lagonda Manufacturing Company, of Springfield, Ohio, whose space, 15 ft. x 20 ft., is directly in front of and midway of the line of boilers referred to above. Here the company has a very attractive display of its entire line of tube cleaners and other boiler room and steam specialties.

THE ALBERGER CONDENSER COMPANY

Two large condensers in the exhibitors' power plant, in the Machinery Building, have been supplied by the Alberger Condenser Company, of New York. One of these is the barometric type, and the other is a surface condenser. The barometric condenser is used for the 500-hp Allis-Chalmers engine, which is the largest in the building. This is located at the southwest corner of the block occupied by the big Allis-Chalmers engine. A single Corliss combination engine and vacuum pump, direct connected to a rotary circulating pump, is located at the southwest corner of the space close to the Alberger barometric condenser, air cooler and tail pipe which it supplies.

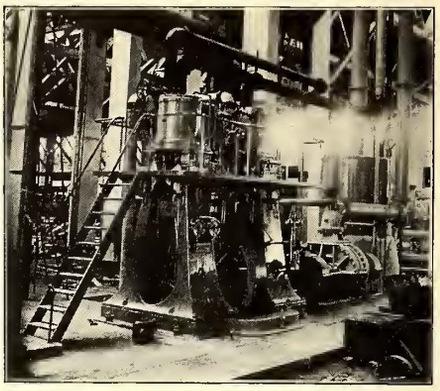


EXHIBIT OF THE ALBERGER CONDENSER COMPANY

The surface condenser equipment is intended for use with several engines operating the Intermural Railway plant, and consists of an Alberger surface condenser of 5000 sq. ft. of tube surface, horizontal Corliss dry vacuum pump, and a centrifugal circulating pump and engine.

THE BROWN-CORLISS ENGINE COMPANY

Two notable high-speed Corliss engines in the exhibitors' power plant are those of the Brown-Corliss Engine Company, of Corliss, Wis., which are driving 500-kw railway generators for the Intermural Railway. These are vertical, cross-compound condensing engines, running 138 r. p. m. Their rated horse-power is 750 with 150 lbs. steam pressure, and running at the most economical point of cut off. The cylinders are 18-in. and 36-in. x 36-in. stroke. The cylinders are made double ported, and ports are made large enough so that the piston heads partially cover the pockets at the end of the stroke.

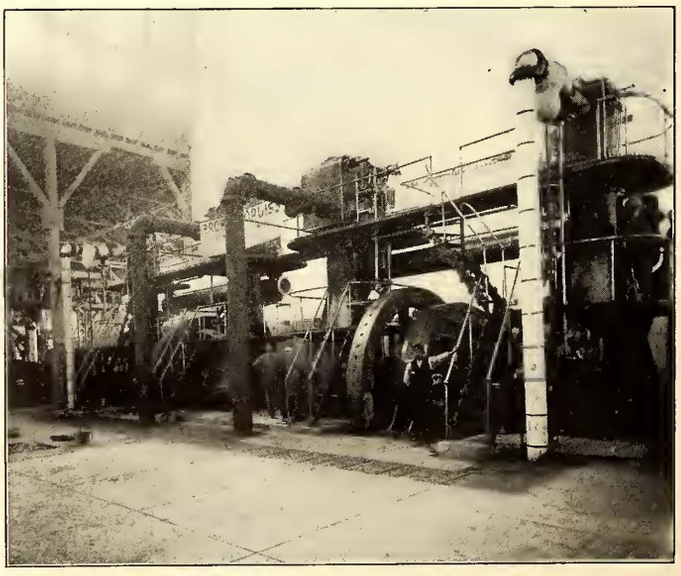


EXHIBIT OF THE BROWN-CORLISS ENGINE COMPANY

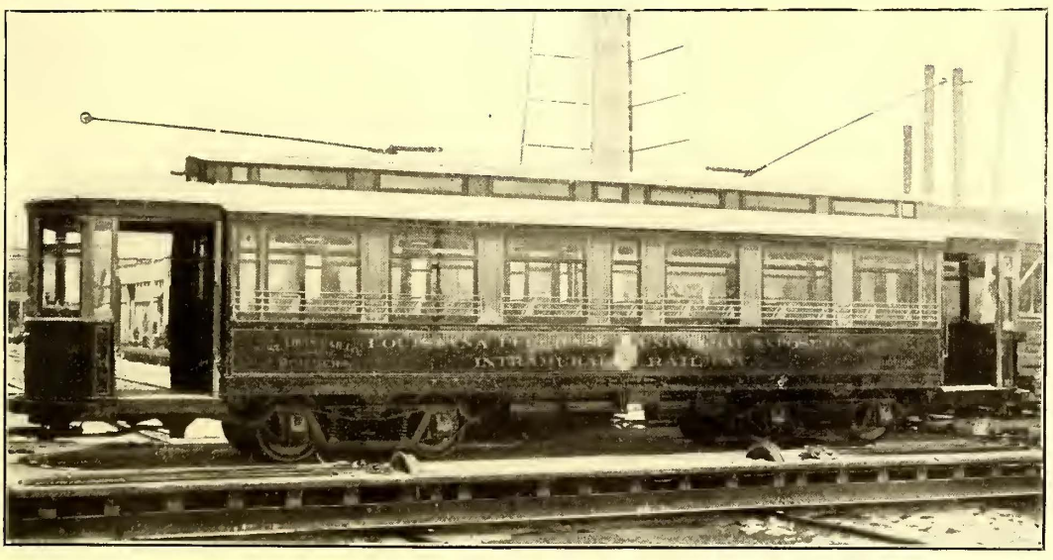
The movement of the valve gear and dash pot is very small. All these things tend to make possible quick action of valve gears and quick opening of steam ports necessary for a high-

speed Corliss engine. The clearance of the piston heads at the end of the stroke is 3.16 ins.

These engines have been giving continuous service for the Intramural, and although high speed for Corliss engines, apparently are not working up to their limit of rotative speed. The high speed of this unit, of course, makes it smaller than slower speed units of corresponding capacity.

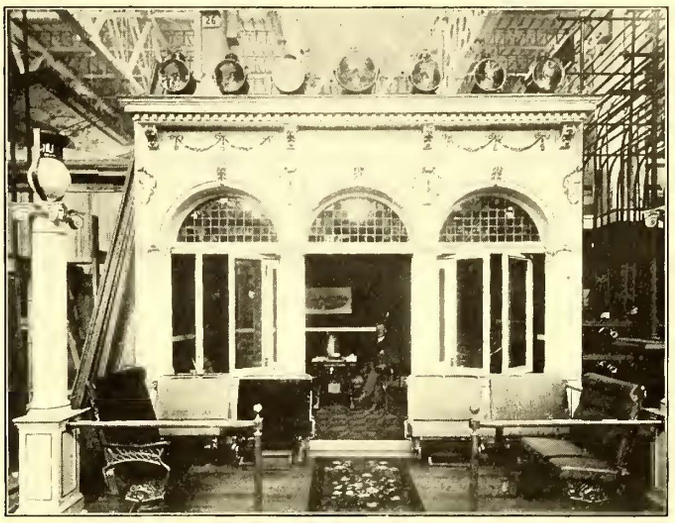
ST. LOUIS CAR COMPANY

The most extensive exhibit of electric cars and trucks to be found at the Exposition is that made by the St. Louis Car Company. This company has not only succeeded in getting together a very interesting historical collection, showing the growth and evolution of the modern electric car from the stage coach, but also shows a number of modern cars, differing considerably in their construction, but all good representations of certain types. The historical exhibit begins with an old stage coach (the father or grandfather of the interurban electric car) which saw service in the early sixties in the Louisiana Purchase territory. Next in order after the stage coach, is one of the old bob-tailed horse cars from Louisville, and next to it a most peculiar little narrow-gage bob-tailed mule car, now made in large numbers for large plantations in Cuba. Then comes the beginning of mechanical traction, represented by the first cable car. This car is complete with grip and brake mechanism. It was put in service on the Clay Street line in San Francisco in 1873. This is followed by the first electric car, built by the St. Louis Car Company in 1887, for the Topeka Railway. This car was in service until the first of this year, and is shown just as it was taken off the road, with light trucks and double-reduction motors. Next in line is a sample of a car built for export, of which over 500 have been sent to Argentine Republic. Two types of double-deck cars, one on single trucks and the other on double trucks, as used in Great Britain, are shown. The exhibit of modern American cars includes the standard car of the St. Louis Transit Company, the car of the Northwestern Elevated Railroad, of Chicago, the car built for the subway lines of the Interborough Rapid Transit Company,



INTRAMURAL CAR BUILT BY THE ST. LOUIS CAR COMPANY

of New York, a heavy trailer built for the Key Route in Oakland, Cal., and the heavy combination closed and open interurban car for the Pacific Electric Railway, of Los Angeles. The crowning feature of this exhibit is to be the magnificent private car built for President John I. Beggs, of the Milwaukee Electric Railway & Light Company. This car, which at present writing is not completed, will undoubtedly be the finest and most expensive electric car ever built. It is arranged in various compartments, so that a small party can live on this car just as on any steam railway private car. The different compartments are finished in various kinds of rare woods in very beautiful sections. The car is to have sleeping and parlor compartments and kitchen. It is made to the maximum length



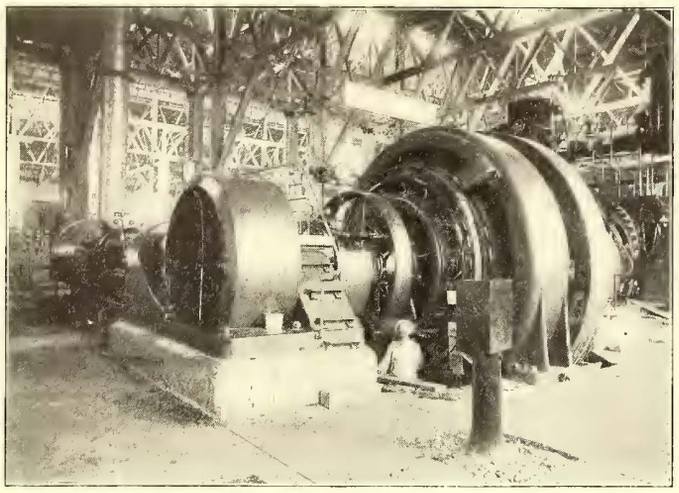
BOOTH OF THE ST. LOUIS CAR COMPANY

that can be operated over the city lines of the Milwaukee Electric Railway & Light Company, and is intended for high-speed interurban use.

Each end of the car is an observation compartment, finished in East India vermillion wood, with a motorman's cab at the left side. Each observation room has an upper and a lower berth, and in one of them is a typewriter desk. In the center is the dining room, finished in Philippine rosewood, with marquetry designs and inlaid lines throughout. A sideboard and fireplace add to the beauty and usefulness of this room. The circular table and chairs are of special design. The refrigerator extends through to the kitchen, and has a partition dividing it into two compartments. Besides the dining room, two observation rooms and kitchen, there are two compartments. One compartments has a sofa, upper and lower berth, dressing case and folding washstand. It is finished in Hungarian ash. The second compartment has a writing desk and folding bed, which folds up in a cabinet under a book case. This is finished in Prima Vera. The kitchen, which is finished in quarter-sawed oak, has a range 26 ins. x 30 ins., a refrigerator and linen lockers. The toilet room, finished in zebra wood, is equipped with washstand and closet. The passageways are finished in vermillion. Ceilings are full Empire, decorated to harmonize with the finish of each room. The bottom window sashes are arranged to drop. The upper sashes are gothic, with art glass. These sashes are stationary. The car is to be equipped with electric heaters and with Peter Smith hot-water heaters. The trucks will be St. Louis 23-E, M. C. B. type, equipped with four G. E.-74 motors, with type-M train control.

The other modern cars in this exhibit have all been illustrated and described in detail in the columns of the STREET RAILWAY JOURNAL in the past. The Northwestern Elevated car is a good

example of what is considered standard construction and arrangement for elevated cars. The New York subway car has some peculiar features in the way of fireproof construction and



CROCKER-WHEELER GENERATOR IN INTRAMURAL POWER PLANT

vestibules. The sheathing is of copper. The Key Route car for Oakland is a compromise between steam and street railway construction. The car for the Pacific Electric Railway is an example of the combination open and closed construction in use on the Pacific Coast. The St. Louis Transit Company car is a very wide city car, with an extremely long Dupont platform.

Besides the cars there is also shown a great variety of trucks made by this company. The M. C. B. type of heavy interurban truck is represented by the No. 23-B truck. The short wheelbase truck for city service, No. 47, in which this company takes much pride, and the Hedley truck for interurban and elevated service, No. 50, are also exhibited. The exhibit of general supplies, including bearings, trimmings, seats, arc headlights, arc lamps for interior lighting, brakes, shoes, brake handles and sand-boxes, is also very comprehensive. The company has a booth fitted up as an office for the reception of its friends. Another important part of this company's exhibit, which is not found in the Transportation Building, is the rolling stock of the Intramural Railway. All cars for the Intramural Railway were built by the St. Louis Car Company. These Intramural cars, which are representative of the car which has been built in

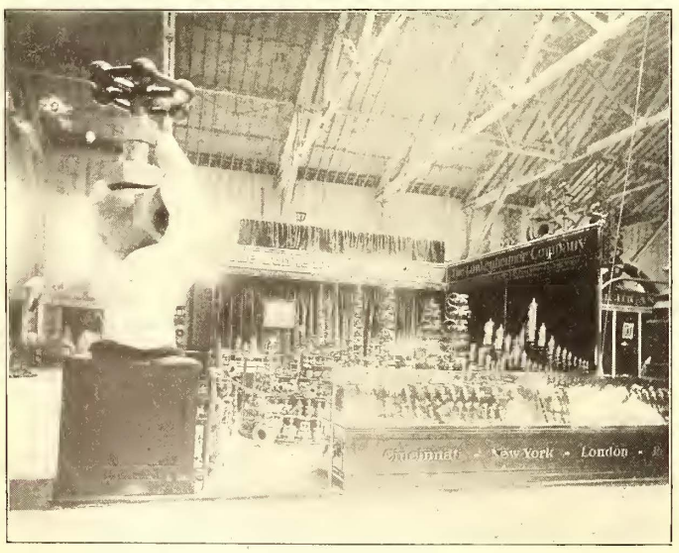


EXHIBIT OF THE LUNKENHEIMER COMPANY

large numbers for certain city systems for the past few years, are 44 ft. long over all, with 34-ft. bodies. They have the channel steel bottoms, on which this company holds the patents. They are the same as the cars used on the Chicago City Railway, being first designed for that company, and are intended to give a very low platform with a double truck. With the addition of steps (which are unnecessary on the Intramural, because of the station platforms) these cars become standard city cars.

THE CROCKER-WHEELER COMPANY

All the 500-volt direct-current railway generators in the Machinery Building which supply the Intramural Railway were supplied by the Crocker-Wheeler Company, of Ampere, N. J. This Intramural Railway power plant, which is a part of the exhibitiors' power plant in the Machinery Building, consists of six generators, driven by various types of engines. The largest generator, which is of 900-kw capacity, is direct connected to a Buckeye engine, running 100 r. p. m. Two generators of 500 kw are direct connected to Brown-Corliss engines, each running 135 r. p. m. One generator of 600 kw, running 85 r. p. m., is direct connected to a Lane & Bodley Corliss engine. One of 400 kw is operated by a Fleming 4-valve engine, running 150 r. p. m., built by the Harrisburg Foundry & Machine Works. One generator of 500 kw is operated by a Murray Iron Works Corliss engine, running 100 r. p. m. All these generators supply current through a railway switchboard, supplied by the Walker Electric Company, of Philadelphia. These machines all operate

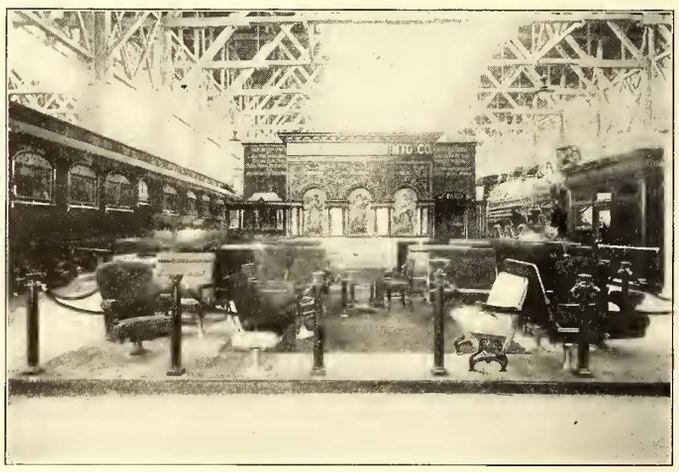


EXHIBIT OF THE HALE & KILBURN MANUFACTURING COMPANY

well as regards sparking and heating, and they have given a very satisfactory service since the opening of the Intramural.

THE LUNKENHEIMER COMPANY

The Lunkenheimer Company, of Cincinnati, shows a large number of the great variety of globe valves and other steam specialties which it manufactures. A new oil pump for cylinder and bearing lubrication is exhibited. The exhibit includes water columns of three types, adapted to be operated from the floor of the boiler run without the necessity of an attendant climbing a ladder. All types of pop valves, check valves and gate valves are shown, and the exhibit must be studied in its hundreds of details to be appreciated.

THE HALE & KILBURN MANUFACTURING COMPANY

A splendid exhibit of car seats for electric railways is made by the Hale & Kilburn Manufacturing Company in the Transportation Building. Thirteen different styles of electric car seats are shown, besides numerous steam railway seats. The electric car seats average about 30 ins. in width, that being the width in most common demand. The thirteen varieties of electric car seats range all the way from a wood bottom "walk-over," for use in very narrow summer cars, to high-back wide "walk-overs" for use in interurban cars, which differ only in width from those used by the steam railways. Some of the latter have 26-in. backs with head rolls. One of the neatest seats shown is what is called the "Neverbreak Walk-over," for steam and interurban service, with single foot rest shifted with the back. The Hale & Kilburn "walk-over" construction has

proved so well suited to the limited space available in electric cars that it has almost become the standard for electric car cross-seats. Just the combination of features to be used is entirely a matter of selection with the customer, as he can be supplied seats with or without arms, with several different types of base, or with double or single foot rests, shifted automatically or fixed in place. One of the most interesting things about this exhibit is the part containing the construction of Hale & Kilburn cushions. The rattan is backed by strong canvas, and the springs bear against this canvas through the medium of wide steel strips. The back of the booth is covered entirely with rattan seat material. Perhaps, after all, the best exhibit of this company is not in the company's booth itself, but in the numerous exhibition cars found elsewhere in the Transportation Building in which Hale & Kilburn seats have been used. All the cars in the exhibit of J. G. Brill Company have these seats, as have also the electric cars exhibited by the American Car & Foundry Company and the John Stephenson Company.

H. B. CAMP COMPANY

In the court of the Electricity Building the H. B. Camp Company has a neat exhibit of conduit ducts. One-half of a manhole is shown, with a Camp multiple-duct conduit entering it. Besides this, many samples of different duct sections made by the company are shown, including the Camp divided tile conduit, which can be used either as an unbroken tile or can be

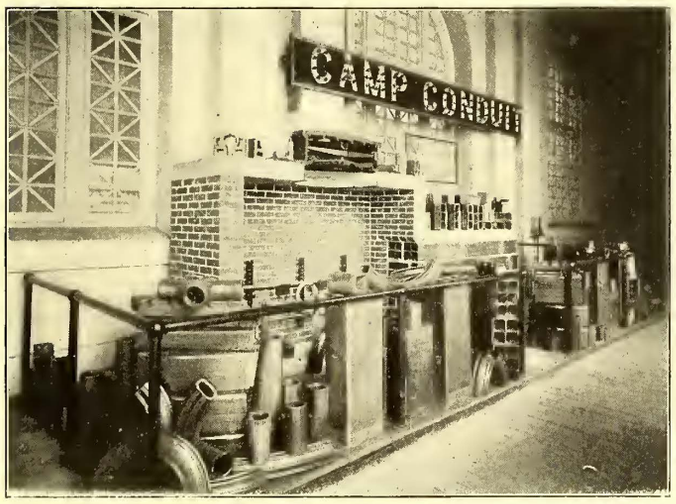


EXHIBIT OF CAMP CONDUITS

split open. Several kinds of bends and straight line conduits are included in the exhibit.

THE HEINE SAFETY BOILER COMPANY

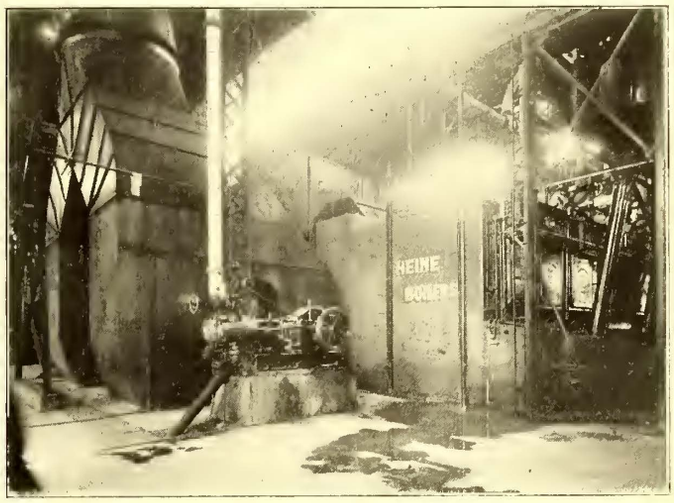
A large bank of water-tube boilers, made by the Heine Safety Boiler Company, of St. Louis, will be found in the boiler house, and an exhibit showing the construction of the Heine boilers and their different parts is located in the northwest corner of the Machinery Building. In the boiler plant there are eight single-shell boilers, rated at 400-hp each. These boilers are designed for a working pressure of 175 lbs. per square inch. Each boiler has 176 18-in. tubes and a drum 48 ins. in diameter. In common with all the boilers in this plant they are connected to induced-draft apparatus. They are equipped with Green traveling chain grates supplied with fuel from overhead coal bunkers.

Besides the eight boilers in the main boiler house, three 250-hp boilers of the double-shell type will be found in the power plant of the Ferris Wheel, and also some boilers of the single-shell type in the fuel test plant of the outside mining exhibit.

The company's exhibit space in the Machinery Building has a part of a full size Heine boiler showing the construction of the boiler heads, and also a complete model of a Heine boiler. The quality of steel tubing used in Heine boilers is illustrated by some tubing which has undergone some very severe treatment in the way of bending and flattening without breaking.

WESCO SUPPLY COMPANY

The exhibit of the Wesco Supply Company, of St. Louis,



HEINE SAFETY BOILERS IN POWER PLANT

covers an area of 5300 sq. ft., taking up all of Block No. 8 in the Electricity Building, and comprising a number of exhibits furnished by the several large manufacturing companies whom the company represents. One portion of the space is devoted especially to electric railway goods. Among the most important of these exhibits will be the line of overhead and construction material, furnished by the Electric Railway Equipment Company, of Cincinnati, who will also set up some practical machines for use in putting up trolley lines. The Leonhardt Wagon Manufacturing Company, Baltimore, Md., has one of its new improved revolving tower wagons on exhibition, made to appear ready for trouble work. The Globe Electric Manufacturing Company, of Cleveland, Ohio, has several of its arc and incandescent headlights on exhibition, showing some of them connected up and operating from a 500-volt circuit. In

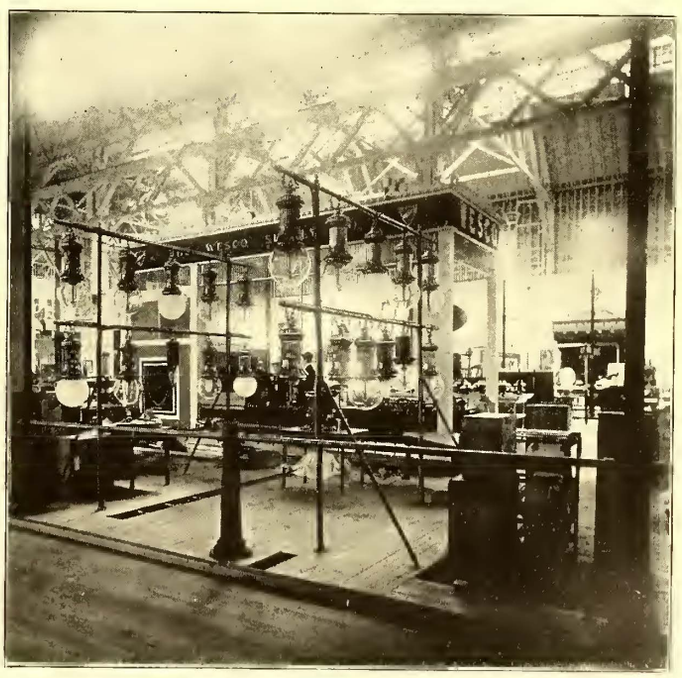


EXHIBIT OF WESCO SUPPLY COMPANY

addition to the above, other manufacturers of apparatus and electrical supplies used by street railway companies, have exhibits in this space. The Stombaugh guy anchor exhibit, by Matthews & Bro., and the wheel truing brake-shoe exhibit, shown in the Wesco space, were described last week.

RODGER BALLAST CAR COMPANY

Interurban construction men will be interested in the track ballasting cars of the Rodger Ballast Car Company in Transportation Building. Three Hart convertible ballast cars are

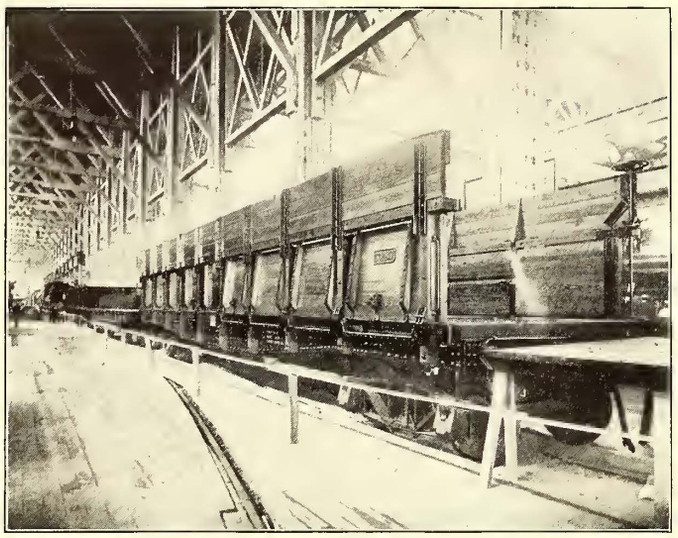


EXHIBIT OF THE RODGER BALLAST CAR COMPANY

shown. Two of these have sides hinged at the bottom, which can be swung out and down, so as to leave the car practically a flat car if desired. These cars have dump bottoms, which, however, can be closed if the car is to be converted into a flat car. The third car has bottom dump and sides hinged at the top, so as to swing out at the bottom. It can be used either as a bottom dump or as a side-dump car. It can be arranged to unload with a plow, according to the old method common with flat cars, and can, therefore, be put to practically all the uses of a gondola, dump and flat car. These cars are also in use hauling coal and material in the service of the Exposition.

THE CRANE COMPANY

The Crane Company has in the Machinery Building a large and very instructive exhibit of its well-known types of high, low and medium-pressure steam valves and fittings. At the main entrance of the space there are two immense valves; one an automatic relief valve, 36 ins. in diameter, for use in the exhaust of a steam engine operated on a condenser. The other is a 36-in. gate valve. Seven kinds of flanged joints for high pressure steam work, with wrought-iron pipe, are shown, which illustrate well current practice. The most popular and lowest in first cost is a semi-steel cast flange, screwed onto the pipe, the end of the pipe and flange then being turned off. The taper on the threaded end of the pipe and on the flange are the same. In another, and more expensive form of joint, the flange is shrunk onto the end of the pipe, and the end of the pipe is then expanded in the flange. The bearing surface between the flange and the pipe must be machined off for the shrinking operation; consequently, this is more expensive than the threaded construction. A third form of flange is one in which the pipe is cold rolled into a recess which turned in the flange. The pipe is expanded by the rolls into the recess. A fourth form of joint construction consists in welding the pipe into the flange. The four general schemes of fastening pipe flanges to the ends of the pipes are further modified by different forms of flanges. For customers who prefer it, flanges are made with a recess which will permit a copper ring to be inserted just outside of the joint, between the pipe and flange. This ring can be hammered into the recess, so as to caulk any leaks which might develop between the pipe and flange.

The most prominent feature of the exhibit, and one which shows the facilities of the Crane Company for pipe bending,

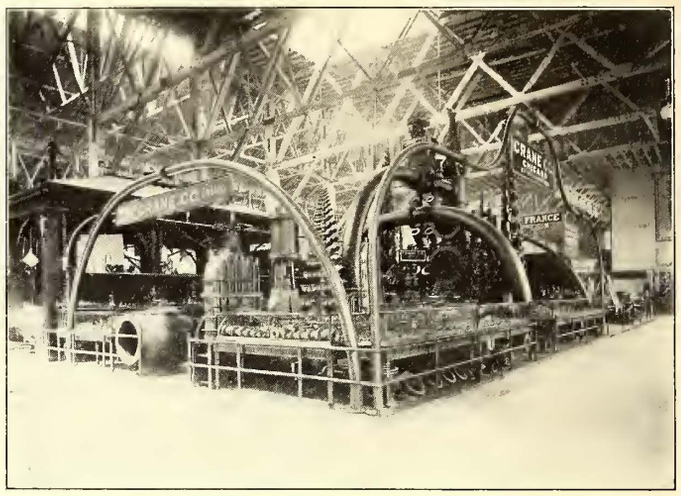


EXHIBIT OF THE CRANE COMPANY

is an arch made of two 20-in. pipes, bent to a curve of 10-ft. radius. Surmounting this arch is a vertically-operated globe valve, in which the opening and closing of the valve is accomplished with an electric motor. Such valves are intended for use in large steam plants, where, in emergencies, it may be desirable to shut off steam from a certain section of piping without going to the valve to do it, as, for example, when there is a bad leak or a breakage in the steam fittings of a boiler. Electrically-operated valves in such a case may save the complete shutting down of the plant.

The exhibit is very comprehensive. The company makes over 10,000 articles for steam, gas and water, and in this exhibit an example is shown of nearly every device or fitting made by the company. This does not mean that all sizes of any device are shown, but that a sample of one size is exhibited.

EXHIBIT OF THE BROWN HOISTING MACHINERY COMPANY

The exhibit is, therefore, truly representative of all the products of the Crane Company. These fittings are made for all pressures up to 2000 lbs. per square inch, the latter being the safety limit of double extra heavy pipes and fittings. It makes

automatic relief valves for use on hydraulic presses and testing machinery good for pressures up to 1000 lbs.

THE BROWN HOISTING MACHINERY COMPANY

In connection with the Yale & Towne Manufacturing Company, the Brown Hoisting Machinery Company, of Cleveland, Ohio, shows locomotive cranes of 10 tons and 15 tons capacity and much other hoisting and conveying apparatus, including trolleys and travelers, tramrail equipment, crabs and winches and a hand bridge crane. The Yale & Towne exhibit includes a great variety of hoisting blocks operated by electric motors and by hand. Those interested in hoisting apparatus for repair shops and car houses, or in the handling of heavy special work in track work shops, will find much worth seeing here.

LEONHARDT WAGON MANUFACTURING COMPANY

A tower wagon made by the Leonhardt Wagon Manufacturing Company, of Baltimore, is exhibited by the Wesco Supply Company in the Electricity Building. This wagon has the ladder type of tower which can be raised or lowered, and revolves so that the wagon can be placed at one side of the track with the tower over track if necessary. To support the platform when it overhangs the track, long supporting poles are provided which are attached to the rear of the wagon when the tower is in the position shown in the accompanying engraving. There are a number of details in connection with this wagon which are worth studying on the part of the superintendent of overhead construction.

THE HARRISBURG FOUNDRY & MACHINE WORKS

One of the units of the Intramural power plant in the Machinery Building is driven by a Harrisburg Foundry & Machine Works Fleming, 4-valve, tandem, compound, automatic engine of 600 hp. This engine operates at the high speed of 150 r. p. m., but is, nevertheless, very smooth in operation, and although it is located near Corliss engines having much lower rotative speeds, the high speed of the engine would not attract the attention of the casual observer. The engine has cylinders 15-in. and 40½-in. x 26-in. stroke. The governor is located on the shaft and acts on one of the eccentrics. There are three eccentrics. One of these eccentrics is controlled by the governor, and, therefore, controls the point of cut-off of the high-

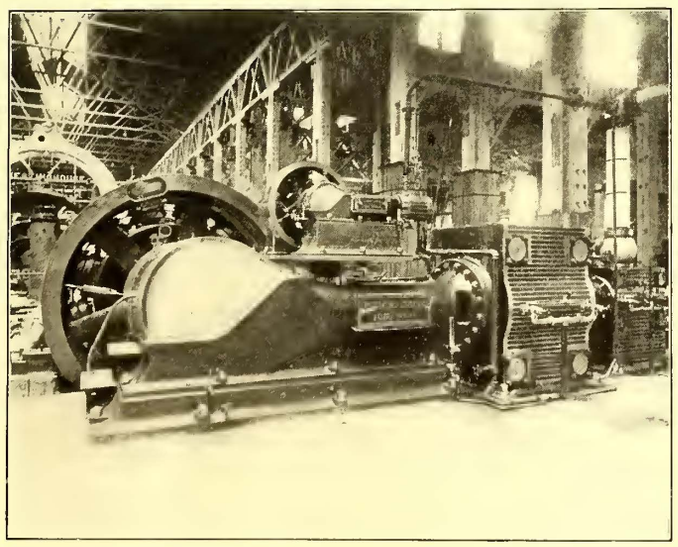


EXHIBIT OF THE HARRISBURG FOUNDRY AND MACHINE WORKS

pressure cylinder. The second eccentric is fixed on the shaft, and controls inlet valves of the low-pressure cylinder. These inlet valves, therefore, have the point of cut-off fixed. The third eccentric opens and closes the exhaust ports, four in each cylinder. The engine is automatically lubricated. The crank chamber is closed and partly filled with oil, the crank pin and guide rods are lubricated by the splash of oil in the crank chamber. Near the top of the crank chamber, above the lever and the main bearing, is a trough which receives some of the oil splash and delivers it by gravity to the main bearing.

THE AULTMAN & TAYLOR MACHINERY COMPANY

The exhibit of the Aultman & Taylor Machinery Company's water-tube boilers and chain grate stokers consists of eight 500-hp boilers, built to carry 250 lbs. steam pressure. Each boiler contains 5080 sq. ft. of heating surface, and is equipped

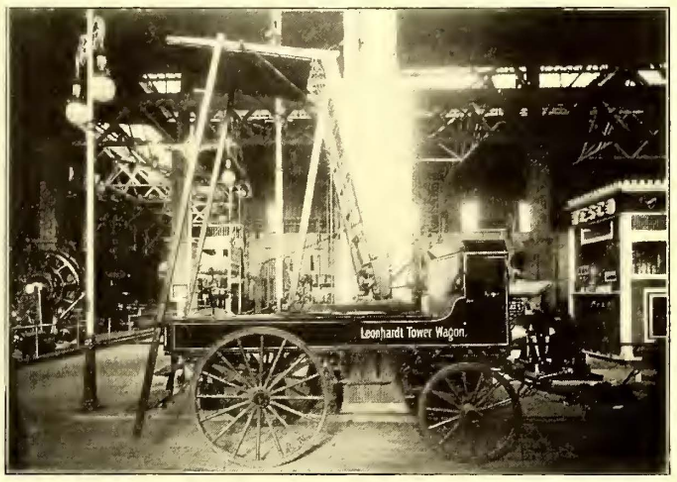


EXHIBIT OF LEONHARDT TOWER WAGONS

with the company's own chain grate stoker; also four boilers, 500 hp each, of 175 lbs. steam pressure, each equipped with a chain grate stoker; also have eight 400-hp boilers for 175 lbs. steam pressure, and containing 4000 sq. ft. of heating surface, and equipped with a chain grate stoker. All of these boilers are of the "Cahall" horizontal water-tube type, and each installation is equipped with an independent induced draft apparatus, and the coal is fed to the stoker hoppers by storage tanks and the conveyer system. The company also has three 250-hp "Cahall" vertical boilers, each boiler containing 2536 sq. ft. of heating surface, and each is equipped with a chain grate stoker. Each of these three boilers has an independent stack and is operated with natural draft. The above makes a total of 8014 hp of boilers and stokers, all of which are in operation, and are developing in the neighborhood of 12,000-boiler horse-power, and supplying steam for over 25,000-engine horse-power. This plant is said to be by far the largest boiler exhibit that was ever made, and it constitutes about 60 per cent of the entire exhibitors' boiler plant at the Exposition. The high-pressure boilers are used for operating the steam turbines that are located in the Palace of Machinery. All the boilers and stokers are located in the central portion of the Steam, Gas and Fuel Building, which is directly west of the Palace of Machinery.

In addition to the working exhibit, the Aultman & Taylor Machinery Company has a very large non-working exhibit, situated in Block 53 on the northwest corner of the Palace of Machinery. This exhibit consists of one 125-hp horizontal water-tube boiler, equipped with the company's superheater and chain grate stoker. The boiler is bricked up on one side, leaving the other side exposed, and the entire system can be examined. The company also has one cross-drum type horizontal water-tube boiler of 100-hp capacity, bricked up entirely on one side, and also one 100-hp "Cahall" vertical water-tube boiler, bricked up in similar manner. In addition to these three full-sized boilers, the company has all of the parts in unassembled condition, as well as a very pleasant office fitted up in this space.

THE NATIONAL CARBON COMPANY

An exhibit booth, constructed entirely of carbon, is the unique display made by the National Carbon Company in the Electricity Building. The posts and railings of this booth are made from large electric furnace and electrolytic carbons. The

carbon products in the booth include carbon brushes for railway motors and generators as well as carbon for the dozens of other uses to which carbon is put in electrical work.

HEADQUARTERS OF THE STREET RAILWAY JOURNAL

The booth of the McGraw Publishing Company and of the Street Railway Journal, are in Section 1 of the Electricity Building. This space is at the head of the main aisle. A large electric sign, bearing the name of the company, over the exhibit, can be seen at a distance of 500 ft. Directly under

HEADQUARTERS OF THE STREET RAILWAY JOURNAL

this are illuminated signs reproducing the cover pages of the four principal engineering periodicals, which cover the entire field of engineering, and are known to more than 50,000 readers. A comfortably furnished library is provided, with facilities for receiving mail sent in care of the company, writing material, etc., all of which are at the disposal of the subscribers of this paper. A register showing the visitors then at the Exposition is also maintained. Complete files of the following publications are available for the inspection and reference of visitors: "Electrical World and Engineer," Street Railway Journal, "The Engineering Record," "American Electrician," "Electrochemical Industry," "American Street Railway Investments," "Electric Railway List and Buyers' Manual," "Central Station List and Manual of Electric Lighting," as well as technical books on all branches of engineering.

THE D. & W. FUSE COMPANY

The D. & W. Fuse Company, of Providence, R. I., exhibits two boards in the Western Electric Company's exhibit, showing this company's different forms of cut-out boxes. One of these boards is devoted to open porcelain cut-outs with cartridge fuses mounted upon them, and the other panel is devoted to cut-outs enclosed in iron boxes. In the latter is included the iron fuse box intended for use on electric cars. This cut-out has heavy contact jaws, into which a large fuse cartridge is pushed, giving a contact similar to a knife switch. Many other fuses suitable for car lighting circuits, as well as the regular line of lighting circuit fuses, are shown.

MINIATURE RAILWAY COMPANY

The Miniature Railway Company, of New York, which makes and operates miniature steam railways for pleasure resorts, has several such railways operating parallel with the Intramural Railway, between the Intramural and the Pike. These tiny railways are built with 15-in. gage. The little steam locomotives are almost exact models of large locomotives, as far as their small size will permit. The locomotives weigh 3500 lbs., and are capable of pulling five canopy-top cars. The miniature railways are proving popular, especially with the children, and seems to be a very profitable attraction.

AN EXTENSIVE ENLARGEMENT OF POWER PLANT FOR THE BOSTON & WORCESTER STREET RAILWAY

The development of traffic upon the Boston & Worcester high-speed electric railway, which was opened for service through to Worcester early last summer, has been phenomenal, having reached, before summer was over, an amount which was almost double the maximum that was expected and provided for. In anticipation of inevitably heavier traffic conditions it was early this year decided to largely increase the capacity of the power plant in order to care for the extremely heavy loads due to summer travel. As stated in an article which appeared in our "souvenir" issue of 1902 (Oct. 4, page 550), describing this system, the present equipment consists of a 1000-kw generating unit and one of 500-kw capacity. This proved to be inadequate for operating the road under the unexpectedly heavy traffic that soon developed upon the system. In addition to this the condenser equipment was hampered in the summer months of last year by a lack of water in the steam from which the circulating water supply for the condensers was taken.

Additional generating equipment is to be provided in the form of a 2000-kw Curtis steam turbine, with direct-connected generator of the usual vertical type, which will be installed in the engine room adjacent to the present generator units. The turbine will deliver three-phase alternating current at 13,200 volts, and will be operated in parallel with the present generators driven by reciprocating engines for the long-distance transmissions. For the boiler room two additional Aultman & Taylor horizontal water-tube boilers, of 600-hp capacity each, are being installed.

Provision is being made for an extra supply of condenser circulating water by the installation of three cooling towers by the Alberger Condensing Company, New York. This water cooling apparatus is to be of sufficient capacity to be able to furnish the entire circulating water supply for the plant in case the river becomes practically dry. The cooling towers are of the well-known Alberger vertical steel-shell type, operated with draft furnished by induction motor-driven fans, and are each 24 ft. in diameter. As is well known, these towers use wood (cypress) slats, set upon edge, over which the water drips in flowing through. The cooling towers are located to the east of the engine room portion of the building, and are conveniently arranged for the piping connections to the engine room basement.

The three towers are designed to provide cooling water sufficient to permit the entire generating equipment of the station, including the turbine and both reciprocating engines, to be operated condensing when worked at full load under most unfavorable circumstances of hot, sultry weather conditions and high humidity. Their design was based upon the cooling under such unfavorable conditions of the circulation water from the condensers for the combined generating equipment of 3500 kw, being guaranteed to supply the circulation cool enough to maintain a 27-in. vacuum when 60,000 lbs. of steam are used per hour (assuming 20 lbs. per kilowatt-hour) in the station.

In addition, the sub-station electrical equipment at the main power plant, as well as also at Westboro, is being doubled in capacity. Another 500-kw General Electric rotary converter is being installed at each place, and a novelty is being incorporated in this equipment in the form of the single-unit, three-phase transformer, which type has not been extensively used in this country. These self-contained transformers are each of 550-kw capacity, in contradistinction to the 500-kw capacity of the rotary converters. The use of the single three-phase transformers, instead of three single-phase transformers, is an interesting departure in sub-station apparatus and will be watched with interest by those having to do with electrical transmission work.

REPAIR SHOPS FOR SMALL ROADS

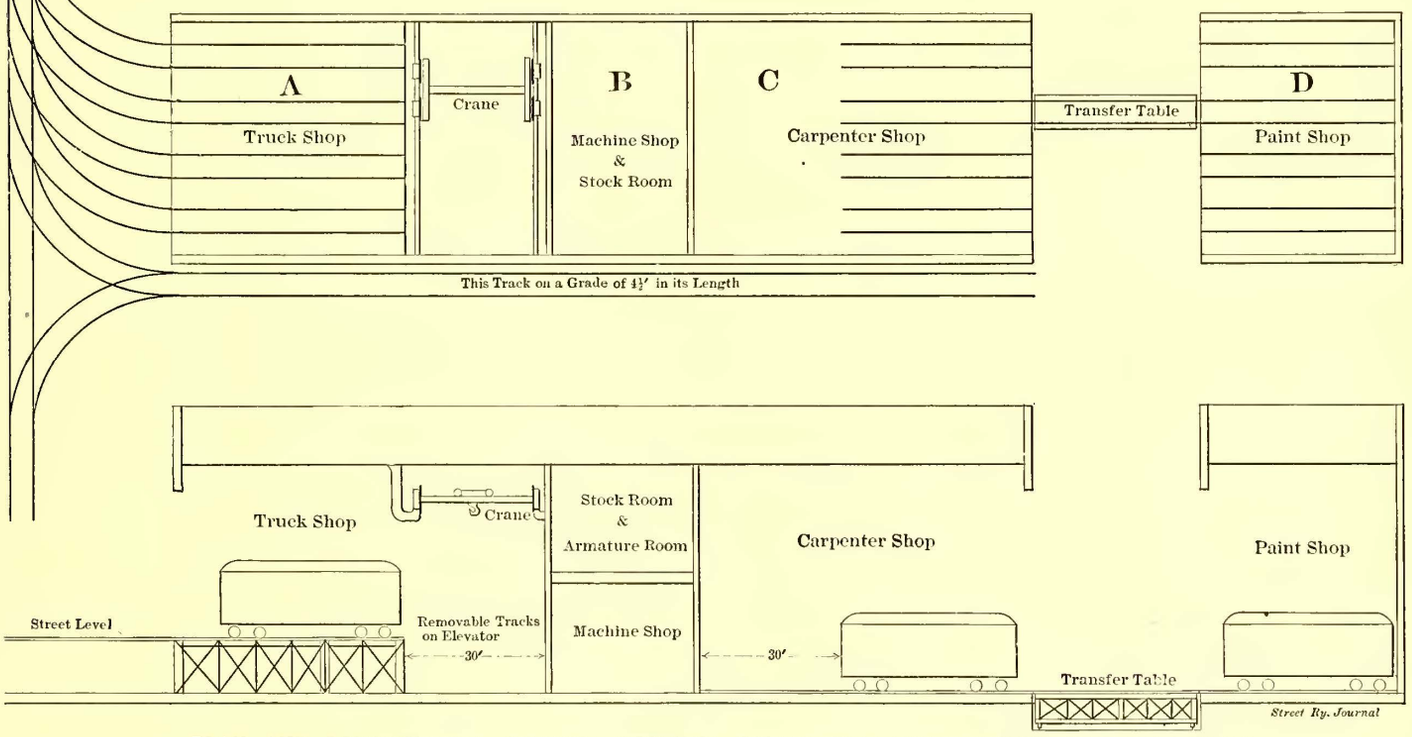
BY FRANCIS G. DANIELL

In the equipment and management of large electric railway properties the repair shop is an essential whose design is given the greatest attention, but on the small and medium sized road the facilities provided for repairs and renewals of rolling stock are too often neglected.

Nothing reflects so much on the management, or gives the casual observer such a poor opinion of the physical condition of a railroad property, as to see the cars in a dilapidated condition, with fenders bent, paint scratched, bolts loose on the trucks, and the accompanying rattle and grind of worn gears. In a great many cases the fault lies not with the men at the shop but with the "powers that be," who seem to think that as the repair department does not show any receipts in dollars and cents there should be the smallest possible expenditure for shop equipment, not realizing that money spent judiciously will effect a greater saving in proportion than is possible in any other way.

Little things which pay big returns are a blower for the forge, which will nearly double the output of the blacksmith shop, and a power grindstone, which will save one man whenever there is any grinding to be done. Another machine which will pay big interest is a winder for banding armatures, and which can be made out of an old lathe. The writer built one at a total cost of $30, which paid for itself in a month. Still another machine which will be a great saver is an hydraulic lift for removing axles from the trucks. In one shop which I have in mind, the cost of jacking up one end of the car, so as to run out the wheels, changing the gear and putting back under the car ready to run out, was from $9 to $12. When the proper arrangement of the pit was made and the hoist installed the cost was reduced to $3 or $4. The time was reduced in proportion. The cost of the hoist and its installation was about $200.

A great deal of time and money can be saved in a small shop where armature winding is done by having means of testing the armature before the hooding and banding is done. For a simple method as practical a way as any is to have an old motor frame set up so as to run the machine with a load. The



PLAN AND LONGITUDINAL SECTION, SHOWING CONVENIENT ARRANGEMENT OF REPAIR SHOPS

Power-driven machinery is the greatest factor of economy in these shops. While, theoretically, the current consumed may cost money, practically there would be no difference in the coal bill and no appreciable increase or expense anywhere. On the other hand, there is no limit to the different uses to which power can be put to good advantage in the shop.

Of course, the matter of shop equipment can be overdone, and this must be guarded against as well as the other extreme. For example, it would be uneconomical in most instances to undertake the manufacture of trolley wheels, the cutting of gears and pinions, or, in fact, the manufacture of any part which can be secured in the open market from a specialist. On the other hand, a great deal of work is now often sent to local machine shops which can be done at home, at a great saving not only in money but in time. Thus, the usual price for turning a commutator by a job shop, including transportation to and from the car house, is $1, and the work will ordinarily consume at least a day. This often means the loss of the car for a day and a half. If this job is done at home the actual time consumed will be 1½ hours, at a cost of 50 cents, and the car will be out of service only half a day.

best method is to drive another motor as a dynamo, and by using different frames two different types can be tested at once. The frames can easily be wired so as to run either one as the motor or generator at pleasure.

In designing a building, or group of buildings, to be used for repair shop purposes, the great object to be borne in mind is to arrange them so as to do away with all unnecessary handling of material, and with this in view the design shown in the sketch is submitted.

The plan, as shown, is divided into four parts, A, B, C, D. A and B should be located in the relative positions as shown, but C and D may be placed in any position to suit the land on which they are to be built. Room A is the truck shop. Room B is two stories in height. The lower floor is the machine shop. The upper floor contains the stock room and armature room. A good elevator should be provided for this floor. Room C is the carpenter shop, and room D is the paint shop.

Considering first the truck shop, the plan is to have the floor level at the entrance, 4 ft. below the track level, and have the cars come into the truck room on elevated tracks. The last

10 ft. of each track are arranged to be removable; that is, the rails can be dropped down to the floor level by means of an elevating mechanism capable of raising the weight of one truck and the part of the car supported on it. With a single-truck car, of course, this would be the entire weight of the car; with a double-truck car it would be one-half the weight of the car. As the height of travel would not be over 4 ft. the elevator can be arranged to work with screws and sprocket wheels, driven with a chain, one chain to drive all screws.

Across the rear end of the truck room there should be a traveling crane, with a capacity of about 1½ tons, which will lift any motor now in use. Of course, if it is thought desirable to lift the entire truck a heavier crane would be necessary.

The walls between A and B and between B and C should be fire-walls, on account of insurance.

A Y, or loop, should be provided somewhere near the shops so that the cars can be turned around. In this way the truck wanted or the end damaged can always be run into the shop as desired.

The dimensions of the buildings should be such that the distance between the end of the tracks and the walls in A and C should be about 30 ft. The length of the tracks in these rooms should be governed by the length of the cars, so that each track will hold one car. In this way each car can be run out as soon as completed without waiting for any other.

As stated in the beginning of this article, the object in view is to get the work as near as possible to the machine upon which the work will be done. For example, let us bring in a double-truck car to be overhauled. The car is run in on one of the tracks until one of the trucks rests on the removable section of track. This end of the body is held in position by some means provided, preferably by rods or cables from above. The car being then in position the motor leads and brake rods are disconnected, and the truck is lowered to the floor level, and run out where it is under the crane. Here the motors are opened. The armatures are then taken out and run into the machine shop, where the commutators are dressed or sent up-stairs to have new hoods or bands put on if required. While the motor is being gone over any necessary repairs are made to the truck, brake rigging, etc.

To assemble the car the operations are simply reversed. The wheel press and boring mill can be placed at one side in A, so that the crane can be used for carrying the axles to them. The lathes, drill presses, planers, etc., should be placed on the lower floor in B, and provided with an overhead track with a capacity of 1500 lbs. This will lift any armature now in use.

In C the benches should be arranged along the sides, and the rip-saw, buzz-planer, band-saw, etc., put in the space between the ends of the track and the wall. This will enable any car damaged in collision to be brought in so that the damaged end will be near the machinery.

Any car which is put into the carpenter or paint shop will naturally stay in a longer time than those that go into a shop to be overhauled, so that a transfer table is perfectly satisfactory as a means of putting the car in the building.

As shown on the plan it is proposed to run a track alongside the building, and have the transfer table reach this track as well as the carpenter shop and paint shop.

RAILWAY PAPER IN GRAND RAPIDS

The initial number of the "Street Railway Weekly," published by the Grand Rapids Railway Company, of Grand Rapids, Mich., has appeared. Two receptacles have been installed in every car to retain the issues of the weekly, which is free to all patrons of the lines. The paper has all the departments of a metropolitan daily and a few additional, such as schedules of owl cars and hints about transfers.

INTERURBAN ELECTRIC RAILWAY PRACTICE IN INDIANA

Robert P. Woods, vice-president of the Indiana Engineering Society, recently read a paper before that society on the interurban electric railways of Indiana. He states that the first interurban electric road in that State was inaugurated on July 15, 1893, when the line between Brazil and Harmony, 3.3 miles in length, was put in operation. The first a. c. system was operated Jan. 1, 1901, on the line between Indianapolis and Anderson. There are now twenty-two systems, of which fourteen employ high-tension alternating current for distribution. Statistics of these lines are given on pages 936 and 937.

The turnouts are provided with spring switches and single or double-spring frogs, the latter sizes vary from a No. 7½, used with a lead of 66 ft., to a No. 10, having a lead of 82.50 ft. The former is the best adapted to a double bracket, single-pole form of construction, and the latter where cross-suspension is used at turnouts. One of the leading roads has taken out all spring switches, and substituted plain split switches, believing them more safe. The outer rail of curves is raised above the inner one from ½ in. to ¾ in. per degree of curve, depending on the speed of cars. Easement curves are used on the higher speed lines.

The following is a fair approximation of the proportions of the weights of T-rails now found in the various tracks:

Thirty per cent. weighing 60 lbs. per yard; 50 per cent. weighing 70 lbs.; 14 per cent. weighing 80 lbs.; 6 per cent. weighing either 40 lbs., 56 lbs., 66 lbs., 73 lbs., 75 lbs., or 90 lbs. Included in the foregoing is a small amount of girder rail.

Ties are uniformly 6 ins. x 8 ins., spaced 2 ft. apart; on some of the earliest trains ties were smaller, but substitution is gradually being made with standard sizes. The principal kinds are white oak, chestnut, cedar, burr and red oak. The cedar, however, are not used on curves. The rail-bonds are of all styles, the most prevalent being the concealed No. 0000 flexible copper bond about 10 ins. long.

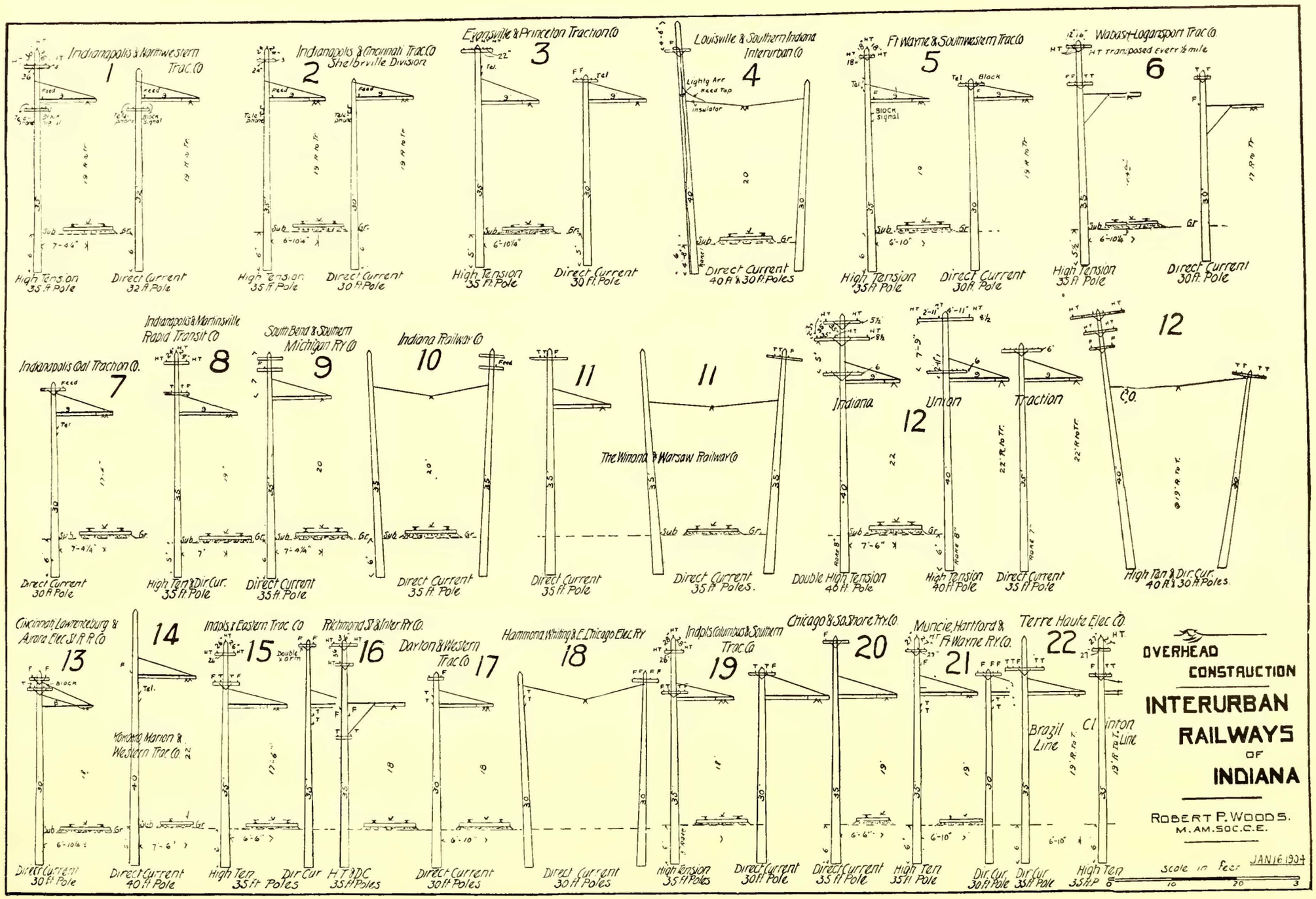
Copper cross bonds for connecting the rails have been omitted on some lines, but the more frequent practice is to place them from 300 ft. to 800 ft. apart.

The track is ballasted with gravel or stone, the former predominating. Six inches is usually placed under the ties, and to the top of the ties in the center of the track. On two of the high-speed lines the depth of ballast has been increased to 8 ins. and 9 ins.

In the overhead construction the bracket type is the principal arrangement on about 90 per cent of the entire mileage. The cross suspension is mostly in cities and towns. The poles are principally cedar, spaced 100 ft. apart; limited amounts of chestnut, cypress and Oregon pine, however, have found favor. It has been the evident intention to give the poles some rake, but it is difficult to tell from observation what the amount was originally on all the various lines. The practice now is to give a bracket pole about 7 ins. rake in 35 ft.

The practice of using timber bents and trestles to span small openings is gradually decreasing. Concrete arches and steel concrete arches are taking the place of the wood and small steel beam spans. Illustrating in part the extent of this change in practice, mention is made that the Union Traction and the Indiana & Northwestern each constructed thirty-three of these steel concrete arches, varying in span from 5 ft. to 20 ft., on their new work during the last year. A decided change is taking place in the stresses provided for steel spans; where a loading of 25-ton cars was formerly provided for a couple of years ago, the practice now is to provide for loads of 50-ton to 100-ton cars.

Railways of late are constructed almost entirely on private right of way, the usual width being about 50 ft. The general alignment and grades are becoming more like those of steam railroads.


Indianapolis & Northwestern Trac. Co
1
High Tension 35 Ft. Pole
Direct Current 32 Ft. Pole
Indianapolis & Cincinnati Trac. Co Shelbyville Division
2
High Tension 35 Ft. Pole
Direct Current 30 Ft. Pole
Evansville & Princeton Traction Co
3
High Tension 35 Ft. Pole
Direct Current 30 Ft. Pole
Louisville & Southern Indiana Interurban Co
4
Lightg Arr
Feed Tap
Insulator
Direct Current 40 Ft. & 30 Ft. Poles
Ft. Wayne & Southwestern Trac. Co
5
Block Signal
High Tension 35 Ft. Pole
Direct Current 30 Ft. Pole
Wabash-Logansport Trac. Co.
6
HT transposed every ½ mile
High Tension 35 Ft. Pole
Direct Current 30 Ft. Pole
Indianapolis Coal Traction Co.
7
Direct Current 30 Ft. Pole
Indianapolis & Martinsville Rapid Transit Co
8
High Ten. & Dir. Cur. 35 Ft. Pole
South Bend & Southern Michigan Ry. Co
9
Direct Current 35 Ft. Pole
Indiana Railway Co
10
Direct Current 35 Ft. Pole
11
Direct Current 35 Ft. Pole
The Winona & Warsaw Railway Co
11
Direct Current 35 Ft. Poles.
Indiana
12
Union
Traction
Co.
12
Double High Tension 40 Ft. Pole
High Tension 40 Ft. Pole
Direct Current 35 Ft. Pole
High Ten. & Dir. Cur. 40 Ft. & 30 Ft. Poles.
Cincinnati, Lawrenceburg & Aurora Elec. St. R. R. Co.
13
Direct Current 30 Ft. Pole
14
Yorkville, Marion & Western Trac. Co.
Direct Current 40 Ft. Pole
Indpls. & Eastern Trac. Co
15
High Ten. 35 Ft. Poles
Richmond St. & Inter. Ry Co.
16
Dir. Cur. H.T. & D.C. 35 Ft. Poles
Dayton & Western Trac. Co
17
Direct Current 30 Ft. Poles
Hammond, Whiting & E. Chicago Elec. Ry
18
Direct Current 30 Ft. Poles
Indpls. Columbus & Southern Trac. Co
19
High Tension 35 Ft. Poles
Direct Current 30 Ft. Pole
Chicago & So. Shore Ry. Co.
20
Direct Current 35 Ft. Pole
Muncie, Hartford & Ft. Wayne Ry. Co.
21
High Ten. 35 Ft. Pole
Terre Haute Elec. Co.
22
Brazil Line
Dir. Cur. 30 Ft. Pole
Clinton Line
Dir. Cur. 35 Ft. Pole
High Ten. 35 H.P.
OVERHEAD CONSTRUCTION
INTERURBAN RAILWAYS OF INDIANA
ROBERT P. WOODS. M. AM. SOC. C. E.
JAN 16 1904
Scale in Feet
0 10 20 3

No.	NAME	Mileage	Date of Openings and Lengths	No. Cars Schedule	Make	Length	Weight	Capacity	Heater	Toilet	Controller	Air-brake	Trucks	Motors	Loc. Power Station	D. C. & H. T. Voltage	Generators	Rotary Converters	Transformers
1	Indianapolis & Northwestern Trac. Co.	68.8	Indpls to Fkfort, Oct. 9,'03. 44 0 Fkfort to Lafayette, Dec. 2,'03, 24.2 Lebn to Crville (not open), 23.5	7 hourly	Jewett Laconia	60 ft 8¾ in	35 tons	66	hot water	yes	Multiple both ends	West'gh	Peckham No. 36 M C B	No. 73 G E 4-75 hp	Lebanon	550 to 600; 26400	3-800 k w a c Gen'l Electric	2-350 k w G Electric	9-300 k w air cooled
2	Indianapolis & Cincinnati Trac. Co.	29.0	Indpls to Shelbyv. Sept. 12,'02, 29.0	3 hourly	Jackson-Sharpe	44 ft 5 in		45	hot water	yes	Lorain 1 end	Christ's'n	Peckham No. 26 A A	No. 34 Lorain 4-50 hp	Shelbyville	600 : 16000	1-600 k w a c Bullock	1-250 k w Bullock	3-135 k w oil cooled
3	Evansville & Princeton Trac. Co.	28.3	Evansv to Princ. Dec. 13,'03. 28.3	4 hourly	St. Louis	42 ft 3 in	@22½ tons	42	hot water	yes	West'gh 1 end	West'gh	St. Louis No. 23 A	No. 56 Westg 4 55 hp	Ft. Branch	600 ; 10000	2-400 k w a c Westinghouse	2-300 k w Westinghouse	3-125 k w oil cooled
4	Louisville & Southern Indiana Trac. Co	6.4	Jeffersnv to N. Alb. May 16,'03. 6.4	2 half hourly	St. Louis	43 ft 4 in	@23 tons	50	hot water	no	Multiple both ends	West'gh	St. Louis	No. 57 G E 4-50 hp	New Albany	600 : none	1-500 k w Dir. Cur.	No AC	No AC
5	Ft. Wayne & Southwestern Trac Co.	45.0	Ft. Wayn to Huntg, Dec. 13,'01. 26 0 Huntg to Wabash. Sept. '02. 19.0	5 hourly	Stevenson Jackson-Sharpe	44 ft 6 in		46	hot water	yes	Lorain 1 end	Christ's'n	Peckham No. 14 AX	No. 34 Lorain 4-50 hp	Huntington	600 : 16000	2-500 k w a c Westinghouse	1-300 k w Westinghouse	6-150 k w o l cooled
6	Wabash & Logansport Trac Co.	33.2	Wabash to Peru, July 25,'01. 18.4 Peru to Logansprt, May 13,'03, 14.8	4 hourly	Jewett	40 ft 7¼ in	@20 tons	44	electric	some	G. Elect. both ends	National	Peckham No. 26	No. 67 G E 4-40 hp	Boyd Park	600 ; 13200	1-450 k w a c Gen'l Electric 2-250 k w d c Westinghouse	1-300 k w Westinghouse none	none
7	Indianapolis Coal Trac. Co.	14.0	Indpls to Plainfld, Sept. 15,'02, 14.0	2 hourly	No standard	car.			No power	station	n. both	cars and	power furnished	by the India	napolis City	Traction and	Terminal Company.		
8	Indianapolis & Martinsville Rapid Transit Co.	30.0	Indpls to Moorsv, Aug. 2,'02. 16.0 Moorv to Martinsv, May 1,'03, 14.0	4 hourly	Jewett	47 ft 0 in	@27½ tons	48	electric	yes	Lorain 1 end	Christ's'n	Peckham No. 14 A X X	No. 34 Lorain 4-50 hp	Mooresville	550 to 625; 13200	2-450 k w a c Gen'l Electric	2-200 k w Gen Elec	6-110 k w oil cooled
9	South Bend & Southern Mich. Ry. Co.	6.0	So Bend to State Ln, Aug. 3,'03. 6.0	2 hourly	St. Louis	41 ft 0 in	@16 tons	40	electric	no	G. Elect. both ends	West'gh	St. Louis No. 23 A	No. 49 Westg 4-35 hp	S. Bend, Osceola & Dunlaps	550 to 600; none	South Bend, 2-225 k w Westinghouse	No AC	No AC
10	Indiana Railway Co.	27.0	Goshen to Elkhart, Dec. '98, 11-0 Elkhart to So Bnd, Sept. '99, 16.0 (System 9 and 10 under one management)	3 hourly													1-225 k w. 1-300 k w Gen'l Electric Osceola, 1-225 k w G E 1-250 k w Westinghouse Dunlaps, 3—D Thomp-Houston	No AC	No AC
11	The Winona & Warsaw Ry. Co.	2.2	Winona to Warsaw. Aug. 8,'03. 2 2	2 ¼ hourly	Cincinnati open car	39 ft 8 in		65	none	none	West'gh both ends	Christ's'n	Peckham No. 14 B Z	No. 68 Westg 4-40 hp	Winona	550 : none	No. 62 about 65 k w d c 2-100 k w d c Westinghouse	No AC	No AC
12	Indiana Union Trac. Co.	163.3	Marion to Jonesboro, Sept. '93, 5.0 Andersn to Alexdr, Jan. 1,'98, 12.0 Alexdr to Jonsboro, Sept. '98, 16.0 Alexdr to Elwood, June '99, 10.0 Muncie to Andrsn, Aug. 1.'00, 18.0 Andrsn to Indpls, Jan. 1.'01. 36.0 Elwood to Tipton, Jan. 1,'03. 10.2 Indpls to Kokomo, Dec. 3,'03. 56.1	16 hourly 8 bi-hourly (limited)	St. Louis Cincinnati	52 ft 6 in 56 ft 0 in	30½ tons 35½ tons	52 58	hot water hot water	yes yes	West'gh 1 end West'gh 1 end	Christ's'n Christ's'n	St. Louis Baldwin	No.59C Westg 2-150 hp No. 85 Westg 4-75 hp	Anderson	550 to 650; 15000 and 30000	Westinghouse 2-1000 k w a c Westinghouse 1-450 k w Storage Battery	3-250 k w Westinghouse Westinghouse	15-250 k w 7-500 k w oil cooled
13	Cincinnati, Lawrenceburg & Aurora Street R. R. R. Co.	10.7	Aurora to State Ln. Apr 12,'00. 10.7	5 hourly	Of this, Indian Jewett	apolis to 42 ft 6 in	Broad Rip @25¾ tons	ple, six 44	miles was electric	opened none	d Sep. 11. G. Elect. both ends	1894. Christ's'n	Peckham No. 14 AEH	No. 57 G E 4-50 hp	Nor. Bend, O.	600 none	2-400 k w a c Westinghouse	No AC	No AC
14	Kokomo, Marion & Western Trac. Co.	9.5	Kokomo to Greentn, Oct. 4,'03. 9.5	1 ½ hourly	No standard	car.			No power	stati	on, both	cars and	power furnished	by the Koko	mo Street Ra	ilway and Powe	r Company.		
15	Indianapolis & Eastern Trac. Co.	63.0	Indpls to Grenfld, June 17,'00. 21.0 Grenfld to Knightn, June 1,'02, 13.5 Knightn to Dublin, June 15,'03, 17.5 Dunrieth to N Castle, Sep 7,'03, 11.0	hourly hourly bi-hourly bi-hourly	Kuhlman	52 ft 9½ in		54	hot water	yes	G. Elect. 1 end	Christ's'n	Dorner & Dupont	G. Elec. Lorain 4-35 hp	Philadelphia	575 : 13200	2-450 k w a c Siemens-Halske 1-150 Amp. Bullock Booster	3-300 k w Stanley	oil cooled
16	Richmond St. & Interurban Ry. Co.	19.3	Richmond to Centvl, Oct. 2,'01. 5.8 Centrvl to Dublin, Nov. 16,'03, 11.2 Cambrge to Milton, Nov. 16,'03. 2.3	3 hourly	St. Louis	42 ft 3 in	@22½ tons	42	hot water	yes	West'gh 1 end	Standard	St. Louis No. 23 A	No. 56 Westg 4-55 hp	Richmond	575 : 13200	2-300 k w a c Siemens-Halske	1-400 k w Bullock used as a generator	3-150 k w Wagner
17	Dayton & Western Trac. Co.	4.5	Richmd to Stat Ln, Aug. 15,'03 4.5	2 hourly	Kuhlman						both ends	Christ's'n	Peckham		Power furnis	hed by the Ric	hmond Street and Interurban Ry. Co. P	ower Station in	Richmond,
18	Hammond, Whiting & E. Chicago El. Ry.	13.3	Hamnd to E. Chicago, Nov. '93, 3.0	E. Chicago to	Roby, May 24,	'94, 6.3 mile	Hammond	to Fors	ythe, Apr	il, '97,	4 miles.	Single	truck Jewett cars	hourly sched	ule, power fur	nished by the	South Chicago City Railway Co. Power	Station in South	Chicago, Ill
19	Indianapolis, Columbus & Southern Trac. Co.	41.5	Indpls to Greenwood, Jan. 1,'00, 11.0 Greenwd to Franklin, June 5,'02, 19.5 Franklin to Colmbs, Sep. 21,'03, 21.0	5 hourly	Jewett	45 ft 0 in	@26 tons	46	hot water also elect.	yes	G. Elect. 1 end	Christ's'n	Peckham No 14 AEH	Stanley 4-50 hp	Edinburg	650 : 15000	1-500 k w a c Stanley 1-600 k w a c Stanley (latter being installed) 2-T H 4 Pole 90 k w	1-300 k w Stanley	3-150 k w oil cooled
20	Chicago & South Shore Ry. Co.	13.5	Laport to Mich. Cy, Feb. 1,'03, 13.5	2 hourly	Jewett	49 ft 4¼ in	@26½ tons	56	hot water	yes	West'gh 1 end	Christ's'n	Peckham No. 26 & 14 AXX	No. 56 Westg 4-55 hp	Laporte	550 : none		No AC	No AC
21	Muncie, Hartford & Ft. Wayne Ry. Co.	41.8	Muncie to Hartfd, Feb. 11,'03, 18.5 Hartfrd to Montplr, May 7,'03, 9.3 Montplr to Bluffton, Dec. 1,'03, 14.0	3 hourly 1 bi-hourly	Stevenson Niles	45 ft 5 in	@26 tons	46	hot water	yes		Christ's'n	Peckham No. 26	No. 57 G E 4-50 hp	Eaton	625 ; 15000	2-540 k w a c Gen'l Electric	2-400 k w Gen Elec	6-75 k w
22	Terre Haute Electric Co.	34.0	Brazil to Harmony, July 15,'03, 3.3 Brazil to T. Haute, Sep. 1,'00. 15.7 T. Haute to Clintn, Dec. 13,'03, 15.0	3 hourly 2 hourly	Stevenson Laconia	40 ft 6 in		46 38	electric	no	West'gh both ends	Standard	St. Louis MCB Brill No. 27 G	38B Westgh 4-50 hp	Terre Haute and Brazil	550 : 11000	Terre Haute, 1-300 k w d c Westghouse 1-300 k w d c Gen'l Elec., 1-200 k w d c Westinghouse, 1-300 k w 2 ph a c Westg. at Brazil, 80 k w d c Wood & 100 k w d c G E	1-300 k w 2 Ph West'ghouse	2-165 k w 2-150 k w oil cooled
		704.3																	

No.	NAME	H. T. Lig't Ar.	H. T. Oil Sw.	Engines	Exciter Units	Condensers	Heater and Purifier	Boilers	Stokers	Pumps	Trav'l Crane	Water Supply	Stacks	Location & Distance of Sub-Stations	Rotary Converter	Transformers	H. T. Lig't Ar.	H. T. Oil Sw.
1	Indianapolis & Northwestern Trac. Co.	yes	yes	3 Cr. Comp. Dir. Con. Hamilton Corliss 24inx48inx48in, about 1500 hp ea	1 Ide Engine 12inx12in	3 Wheeler	No. 9½ Cochrane	6 Stirling 500 hp each	Roney	3 Wheeler air and circul.	20 tons	pond fed by springs	1 self-sup. steel 6ftx8ft 6inx155ft	Augusta 16. Frankfort 15 3 Dayton 31.3 Crawfordsville 18	2 300 kw in each Genl Elec	3 250 kw in ea air cooled	yes	yes
2	Indianapolis & Cincinnati Trac. Co.	yes	none	1 Cr. Comp. Dir. Con. Atlas Corliss 18inx34inx36in, about 800 hp	1 Ide Engine 7inx10in	1 Wheeler	none	2 Stirling 400 hp ea	none	2 Dean	none	18ftx18ft well	2 steel 4ftx85ft	Bethel 17.6mi	1 250 kw Bullock	3 94 kw oil cooled	yes	none
3	Evansville & Princeton Trac. Co.	yes	none	2 Cr. Comp. Dir. Con. Lane & Bodley 18inx36inx42in @ 600 hp each	2 Buckeye 7inx10in	2 Jet System	Wainwright	6 Stirling 150 hp ea	none	2 L. D. & G.	none	creek and 9 artesian wells	3 steel 4ftx64ft	Evansville 14 2 mi	1 300 kw Westinghouse	3 125 kw oil cooled	yes	none
4	Louisville & Southern Indiana Trac. Co.	No AC	No AC	1 Cr. Comp. Dir. Con. St. Louis 20inx40inx48in	No AC	Worthingt. P'p none	Stilwell, Bierce	4 Aultman T. 350 hp ea	none	9½inx5inx10in	none	city supply		No AC	No AC	No AC	No AC	No AC
5	Ft. Wayne & Southwestern Trac. Co.	yes	none	2 Cr. Comp. Dir. Con. Hamilton Corliss 22inx44inx36in; 18inx36inx48in	1 Ide Engine 1 motor set	1 Wheeler with cooling tower	Cookson	4 Stirling 250 hp ea	none	Snider, Hughes	none	1 385ft deep well	4 steel 5ftx100ft	Lagro 14 2, Roanoke 10.3 Ft. Wayne 21.3 mi	1 250 kw in ea Westinghouse	3 75 kw oil cooled	yes	none
6	Wabash & Logansport Trac Co.	yes	none	2 Simp Allis Corliss belted 22inx48in, 400 hp 1 Cr Comp Slater DC 22inx38inx42in, 750hp	1 G Elc Marine	1 Evans	Cochrane	3 Aultman T. 2 350 hp, 1 500 hp	none	7inx14½inx8in 2 Warren 2 Dean	none	Wabash rivr and 3 wells	1 steel 4ftx170ft 2 steel 5ftx128ft	Peru 12.5 mi Logansport 25 mi	1 200 kw Genl Elec	3 75 kw in ea oil cooled	yes	none
7	Indianapolis Coal Trac. Co.																	
8	Indianapolis & Martinsville Rapid Transit Co.	yes	yes	2 Simple Atlas Corliss D. C. 28inx42in. 650 hp each	1 G Elc Marine 1 motor set	1 Buffalo Jet	Cochrane	3 Stirling 350 hp ea	Roney	4 Buffalo	none	creek	steel 4ftx90ft steel 5ftx115ft	Maywood 13 mi Martinsville 14	1 200 kw Genl Elec	3 75 kw in ea oil cooled	yes	yes
9	South Bend & Southern Mich. Ry. Co.	No AC	no ac	2 Simple Buckeye belted 26½inx36in. 650 hp ea	No AC	none	Open Heater	Shell Boilers 5 125 hp, 1 175 hp	none	2 Worthington	none	river	1 steel 5ftx110ft	No AC	No AC	No AC	No AC	No AC
10	Indiana Railway Co.	No AC	No AC	2 Simple Buckeye belted 22inx33in. 350 hp ea 1 Allis Chalmers Corliss belted 20inx42in	No AC	none	Open Heater Closed Heater	Shell Boilers 2 90 hp, 1 150 hp Shell Boilers	none none	2 Worthington 5¼inx3½inx5in 2 Dean	none none	1 well 4ftx4ftx18ft well	1 steel 5ftx90ft 1 steel 4ftx90ft					
11	The Winona & Warsaw Ry. Co.	No AC	No AC	2 Simple Ide. belted, 16inx32in @ 150 hp ea	No AC	none	none	2 Babcock & W 175 hp ea	none	5¼inx3¾inx5in 2 Worthington 5inx6inx7in	none	6ftx6ftx22ft 3 wells 7ft, 80ft, 100ft	1 steel 4ftx120ft brick 10ftx180ft	No AC	No AC	No AC	No AC	No AC
12	Indiana Union Trac. Co.	yes	none	3 Cr. Comp. Rice & Sargent Corliss D. C. 26inx30in, 48in, 2000 hp ea 2 Cr. Comp. Rice & Sargent Corliss D. C. 1500 hp ea	2 motor sets 1 Ball Engine	1 Blake 2 Knowles 1500 hp ea	yes	12 400 hp Bab. & W. 2 600 hp Babk. & W.	yes	Worthington Comp. Duplex	25 tons	creek and 3 deep wells		Marion 31.5, Alexandria 11 5 Muncie 18, Broad Ripple 59 Noblesville 42, Tipton 25 Kokomo 42, Logsprt 61, Peru 59 Fairmount 22.5, Elwood 15 Daleville 7, Ingalls 13 Lawrence 24.5	2 250 kw in each 1 16 kw Booster Store Battery of 264 cells, 168 kw capacity 1 250 kw in ea 1 8 kw Booster	4 175 kw in ea	yes	none
13	Cincinnati, Lawrenceburg & Aurora Street R. R. R. Co.	No AC	No AC	2 Simple Hamilton Corliss belted 28inx48in. 725 hp ea	No AC	none	Continental Filtr Stilwell B Heatr.	4 Heine 250 hp ea	none	4 Snow	none	Obio river	steel 6ftx126ft	1 Portable Sub Station No AC	S. Bat. 264 cls. 84 kw cap 1 250 kw No AC	3 87½ kw NoAC	No AC	No AC
14	Kokomo, Marion & Western Trac. Co.																	
15	Indianapolis & Eastern Trac. Co.	yes	yes	2 Comp. Condens. Russell D. C. 20inx35inx27in. 650 hp ea		L. D. & Gorden	Cochrane	4 Stirling 250 hp ea	none	L. D. & G.	none	creek	2 steel 4ftx40ft forced draft	Charlotte 13 Lewisville 27	1 300 kw in ea Stanley	oil cooled	yes	yes
16	Richmond St. & Interurban Ry. Co.	yes	yes	2 Buckeye Tandem belted 17½inx30½inx33in. 417 hp 1 Russell 20inx27in belted, 300 hp	1 motor set none	2 Wheeler	Stilwel. Bierce	2 Edgemoor 375 hp ea 1 Stirling 375 hp	Roney		none	river	brick 5ftx115ft	Cambridge 14.2	2 150 kw Genl Elec	6 75 kw Genl Elec	yes	yes
17	Dayton & Western Trac. Co.	Ind.																
18	Hammond, Whiting & E. Chicago El. Ry.																	
19	Indianapolis, Columbus & Southern Trac. Co.	yes	yes	1 Simple non-Condens Buckeye D. C. 750 bp, also 1 Cr. Comp. Condens Buckeye D. C. 900 hp being installed		not yet installed	Hoppe	Stirling 2 300 hp	none	4 Dean	none	river and wells	1 steel 5ftx150ft	Greenwood 20	1 300 kw Stanley	3 oil cooled	yes	yes
20	Chicago & South Shore Ry. Co.	No AC	No AC	1 300 hp Westinghouse belted	1 steam 1 motor set	none	Cochrane	1 300 hp Rohan	none	2	none	lake	1 steel 5ftx100ft	No AC	No AC	No AC	No AC	No AC
21	Muncie, Hartford & Ft. Wayne Ry. Co.	yes	yes	2 Cr. Comp. Condens. Cooper D. C. 22inx24inx42in. 750 hp ea	No AC two 45 hp	2 Wheeler	Cochrane	2 150 hp Stirling 3 300 bp ea	Jones Underfeed Am. Blower	Worthington 5 Duplex	30 tons	river	3 steel 41tx76ft	Montpelier 17.2 Bluffton 30.7	2 200 kw Genl Elec 2 200 kw Genl Elec	6 75 kw 3 75 kw	yes yes	yes yes
22	Terre Haute Electric Co.	yes	yes	2 Fitchburg 24inx30in D. C. 500 hp 1 A. & Sims 400 hp, 1 Westg. 250 hp belted at Brazil, 100 hp Westghouse and one 150 hp McCune, belted	none	none	Industrial Purifi. Stilwell B Heater	7 Cahill 250 hp ea 2 Climax 500 bp ea	none	7 Duplex	15 tons	city supply and deep well emergency	7 steel 3ft to 5ft D 60ft to 80ft high	Atherton 11.0	1 200 kw Westingbouse	2 125 kw oil cooled	yes	yes

The steam railroads resist all attempts of the traction lines to cross their tracks at grade. The former contend that the traction tracks should be overhead or under grade of the steam railroad. In an effort to relieve the situation the State Legislature approved an act in 1903 in relation to the crossings of the court to order the construction and assess the cost according to its judgment. The grade of the interurban track cannot be ordered heavier than 2 per cent by the court unless the company consents.

Some of the steam railroad companies appear willing to share

WIRE

No.	High Tension	H. T. Transpsitn	Feed Copr.	Feed Taps	L. Arresters	Trolley	Telephone	Telephone Transposition
1	3 No 4 copr	none	300,000 cm entire length	1,000 ft	half mile	1-0000 G Elec grooved	2 No 10 galv iron	1,000 ft
2	3 No 6 copr	none	000	half mile	half mile	2-00 Fig 8	2 No 12 galv iron	1,000 ft
3	3 No 4 copr	none	0000	1,500 ft	1,500 ft	1-00	2 No 12 galv iron	half mile
4	No AC	No AC	500,000 cm	1,000 ft	half mile	2-000 G Elec grooved	none	no telephone
5	3 No 6 copr 3 No 4 copr	none none	0000	1,500 ft	half to four-fifths mile	2-00 Fig 8	2 No 12 galv iron	East End 500 ft West End 1,000 ft
6	3 No 4 copr	⅛ mile	0000 to 500,000 cm	half mile	half mile	1-00 W. End 2-00 E. End	2 No 12 galv iron	E. of P. Sta. 2,000 ft W. of P. Sta. 500 ft
7	No AC	No AC	350,000 cm 500,000 cm	six miles	half mile	2-000 Fig 8	2 No 10 galv iron	1,000 ft
8	3 No 4 copr	1¼ mile	0000 entire length	one-fifth mile	one-fifth mile	2-00	2 No 12 galv iron	1,000 ft
9 10	No AC	No AC	0000 to 500,000 cm	one-fifth mile on S. B. & S. M. half mile on Ind. Ry.	one-fifth mile on S. B. & S. M. half mile on Ind. Ry.	1-00 circular	none	no telephone
11	No AC	No AC	0000	half mile	half mile	1-00 Fig 8	2 No 12 copper	500 ft
12	3 Nos 3, 4 and 5 copr	1 mile	00, 0000 300,000 cm 400,000 cm 500,000 cm 550,000 cm 600,000 cm	quarter mile	half mile	1-00 1-000	2 No 12 galv iron	1,600 ft
13	No AC	No AC	300,000 cm	2,000 ft	2,000 ft	2-0000 circular	2 No 12 copper	1,000 ft
14 15	3 No 4 copr	none	500,000 cm 0000, 300,000 cm 400,000 cm	quarter mile half mile	quarter mile half mile	2,0000 circlr 2-00	2 No 10 galv iron	1,000 ft
16	3 No 6 copr		0, 00, 0000 300,000 cm	500 ft	half mile	0, 00	2 No 12 copper	800 ft
17 18 19	3 alumin'm 3 No 4 copr	none	0000, 300,000 cm aluminum 300,000 cm	half mile	half mile	2-0 & 2-000 2-00	2 No 10 galv iron	1,000 ft
20	No AC	No AC	00 cop & alu-min'm 0 cop	quarter mile	half mile	1-00 Fig 8	none	no telephone
21	3 alumin'm 3 No 4 copr	6 miles	0,0000 & alum 300,000 cm	half mile	quarter mile	2-00	2 No 10 galv iron	1,000 ft
22	3 alumin'm 3 No 4 copr T H to Clin	½ mile	0000,500000cm & alu,0000cop	quarter mile	2,000 ft	2-00 Brazil 1-00 Clinton	2 No10 galv iron Clinton 2 No12 galv iron Brazil	¾ mile Clinton ½ mile Brazil

TRACK

No.	Rail.	Joints	Ties	Cross Bonds	Ballast	Cattle Guards
1	70lb T rail; 1 mi 73lb Girder in Cville	4 bolt angle bars	white oak cedar	800 ft	9 in. gravel	wood
2	60lb T rail	4 bolt angle bars	white and R. oak cedar	800 ft	6 in. gravel	wood
3	70lb T rail 2 mi 90lb T Evnsv.	4 bolt angle bars Weber	oak	1100 ft	to be 6 in. stone	none
4	75lb T rail; ½ mi of 90lb T r in Jeffsnv.	6 bolt angle bars	oak	800 ft	6 in. stone	vitrified clay
5	56lb T e of Huntgn 60lb T w of Huntgn	6 bolt angle bars	oak	4 mi'es	6 in. gravel	steel east end none west end
6	60lb T	4 bo't angle bars	oak, cedar walnut	4 mi'es	6 in. gravel (east end less)	wood west end none east end
7	70lb T	6 bolt angle bars	oak chestnut	600 ft	6 in. gravel	vitrified clay
8	70lb T	6 bolt angle bars	oak	¾ mile	6 in. gravel	none
9 10	70lb T	4 and 6 bolt angle bars	cedar on S. B. & S. M. oak on Ind. Ry.	1 mile	6 in. gravel	vitrified clay on S B. & S. M. steel on Ind. Ry.
11	60lb, T 72 Hight T in Warsaw	4 bolt angle bars	oak		6 in. gravel	
12	56lb T Mar to Sum 60lb T Sum to And 60lb T Alex to Elw 70lb T Mun to Ind 80lb T Ind to Koko 80lb T Tipn to Elw 80lb T Ko to P&Lo in cy 6 in 60 & 72lb T	4 bo't ang'e bars 6 bolt angle bars 6 bo't bars 4 bolt continuous joint on all 80 lb rail	oak	every 6 rail length	8 in. gravel	steel between And. and Mar.
13	70lb T	4 bo't angle bars	oak of all kinds	1000 ft	6 in. gravel	none
14 15	70lb T 70lb T	6 bolt angle bars	Bu and W. oak oak and cedar	500 ft ½ mi'e	to be 6 in. stone 6 in. gravel	none
16	60lb T Rich to Cent 66lb T Cent to Dub			none (to be 1000 ft)	6 in. gravel	
17 18 19	70lb T T 60lb T	6 bolt angle bars 4 bo't ang'e bars	oak oak oak and cedar	300 ft	none now 6 in. gravel 6 in. gravel	none none wood
20	66lb Tr & 70lb Relay	Atlas and Weber joints	cedar	500 ft	6 in. fine sand	vitrified clay
21	40lb T r 95lh gir in Muncie and Bluff'n	6 bolt angle bars	oak and cedar	½ mi'e	6 in. gravel	wood
22	70lb T Har to Braz 60lb T Clin & Braz Lines	4 bolt bars Weber	oak	none	6 in. gravel	none

BRIDGES

Poles	Kind	Stresses	Private Right of Way	Parks	Interlockers	Derails	Over and Under Grade Crossings
cedar 32 & 35 ft painted	steel and steel-concrete arches	50 ton cars in trains trucks 22 ft centers	all, 50 ft wide	none	none	6	1 overgrade, steel 1 under highway (N of Indpls) timber
cedar 30 & 35 ft painted	steel and small wood stringer spans	35 ton cars in trains trucks 20 ft centers	mostly, 32 to 50 ft wide	Acton	none	none	2 undergrades, steel
chestnut 30 & 35 ft	steel and wood stringer spans	50 ton cars in trains trucks 20 ft centers	mostly, 40 ft wide	none	none	none	t overgrd, stl & timber none
cedar 30 & 40 ft painted	steel, mostly timber trestles		partly, 32 ft wide	Glenw'd nr N Alb	1 to be instd at Prncton	1	1 undergrade, steel
cedar 30 & 35 ft painted	steel, timber trestles	35 ton cars in trains trucks 20 ft centers	mostly, 50 ft	none	none	1	2 undergrade, steel
cedar 30 & 35 ft	stee', timber trestles	25 to 50 ton cars	all, 50 ft W. of Peru on Hway E. of Peru	Boyd	none	2	none
cedar 30 ft painted	steel	4000 lb per lineal ft	all, 50 ft wide	none	none	none	none
cedar 35 ft partly painted	steel, (former steam R. R. spans	3000 lb per lineal ft	mostly, 50 ft wide	Bethany	none	1	1 undergrade, steel
cedar 35 ft	steel-concrete and timber	40 ton cars in trains for S. B. & S. M.	mostly, 50 ft wide partly, 50 ft wide	Osceola S Bend Elkhart	none	none	1 undergrade, concrete arch
cedar 35 ft painted	none		generally in highway mostly,	Lake Winona	none	none	1 undergrade
Oregon pine & cedar 30, 35 & 40	steel-concrete arches on lines buil't sinc · 1902 steel and timber trest'es prior to 1902.	Mun. to Ind. 30 tn cars in trains trks 30 ft ctrs except Wht riv at And for 40 ton cars. work since 1902 for 100 ton cars in trains truck centers 29 ft	30 to 50 ft wide	none	1 at Carmel	6	3 overhead, steel 3 undergrd including 1 at Lognsprt (not in) 1 at Bunker Hill and 1 in Marion
cedar 30 ft	steel and timber trestles		generally in highway	none	none	none	1 overhead, steel
cedar 40 ft	steel trestles	no standard yet	all, 40 ft wide	no e	none	none	none
cedar 35 ft	steel	35 to 45 ton cars in trains	⅔ of line on Hway, ⅓ private	Spg Lake	none		t underbighway, wood
chestnut 30 & 35 ft	steel, timber	35 ton cars in trains	mostly	none	rone	1	2 undergrd, 1 concrete arch, other steel
cedar 30 ft	steel	40 ton cars in trains	partly	none	none	none	1 overhead, steel
cedar 30 ft	steel		all in highways	none	none	none	none
cedar 30 & 35 ft	wood, steel		half of line in Hway half of line private	none	none	none	none
cedar 30 & 35 ft	wood, steel		mostly	Pine Lake	none	none	none
cedar 30 & 35 ft	wood, steel and concrete arches	3000 lb per lin. ft & con cent'ed load of 40 t cars	all, 50 ft wide	Eaton	2 hf or cabn interlock'rs	2	1 undergrade, steel 1 overgrade, steel
cypress 35 ft on Brazil line and cedar 35 ft on Clinton line	wood, steel		Brazil line on highway mostly, Clinton line priv'te	none	none	none	1 undgrade, stl, Brazil t overgr'de, stl. Clintn

R. R. GRADE CROSSINGS

No. in T'ns	trks No.	No. in cnty	trks No.	Avg Speed Miles per hour	Av. Rate of Fare per Mile	No.
8	18	2	2	Indpl-Laf (63.8m) 21.14 Lim " 27.5	1.52 1.52	1
		1	1	20.0	1.38	2
3	4	1	1	21.18	1 60	3
4	4	1	1	12 80	0·78	4
6	13	1	1	19 28	1 56	5
4	5	3	5	18.11	1·74	6
5	13			15.27	1.79	7
6	18			20.00	2.00	8
3	9	1	1	So B and S M 18.86	1.36	9
		1	1	Indiana Ry 19.06	1·48	10
1	1			9.00	2.23	11
33	55	4	5	Indpls-Mun (54m) 20.9 Lim " 27 0 Andsn-Mar (33m) 17.68 Alex-Tiptn (20.2) 23.30 Inds-Kok'm (56.1) 22.40 Lim " 24.93 Indpl-And (36m) 20.57 Lim " 25.41	1.57 1 85 1·36 1·49 1.60 1 87 1.67	12
3 Gaun tlet t rack	5	1 over bridg	1	15.60	1.92	13
1	1			12.67	1.58	14
4	7	1	1	Indps-Dblin (52m) 18.35 lim Ind-Rch (69m) 24-94 (Over Rys Nos 15&16)	1.44 1.88	15
2	2			Rchm-Dblin (17m) 17.00	2.00	16
				19.38	1.67	17
12	35	5	10	HtoR 10.64, HtoW 8.43	1·30	18
5	8	1	2	18.44	1.57	19
5	10	1	1	18.00	1.48	20
3	4	6	7	21.10	1.80	21
5	7	4	4	TH to Hmy (19m) 14.25	1.05	22
3	13			T H to Clin (15m) 15.00	1.67	

street railroads. This act authorized, in substance, the right to maintain a crossing at grade, but with a proviso that the traction company must install and maintain within six months after putting down the crossing a full interlocking works, with derails on both the electric and steam tracks. Either party has the right to request the Circuit or Supreme Court to order an overhead or under-grade crossing, full power being vested in the expense of these structures, but in the opinion of the author it would expedite matters and promote more of these constructions if the subject could be referred to a State Railroad Commission. At present no such body is provided for in Indiana, but it is quite likely one will be created in the near future.

Grade crossings with steam railroad tracks are frequent.

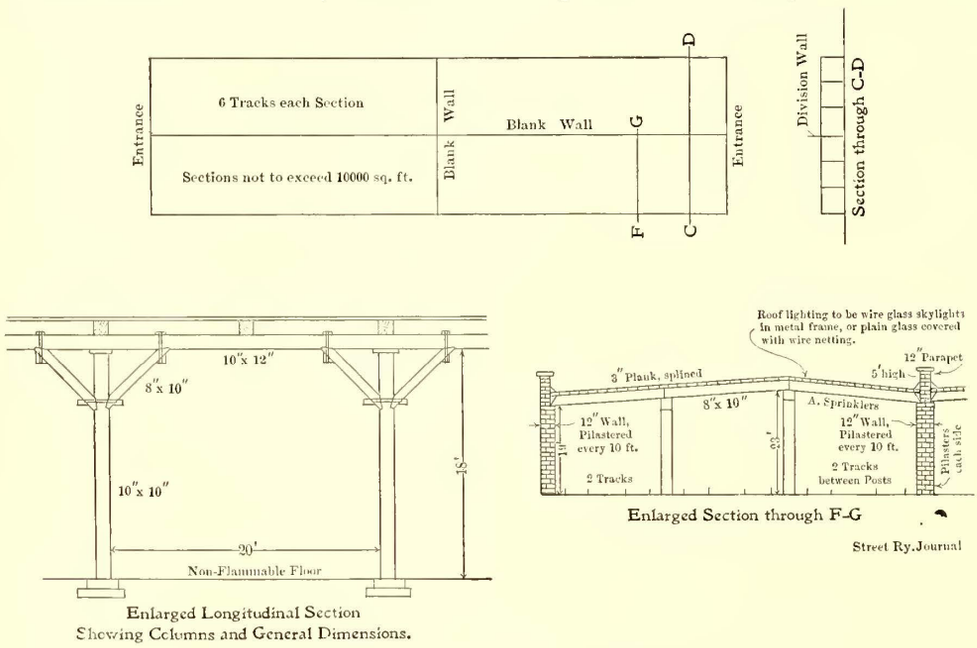
The interurban railways of the State cross the steam railroads at no less than 151 crossings and on 277 tracks; or an average of one grade crossing with two tracks every 5 miles; of these 116 crossings, with 232 tracks, are in cities or towns, and thirty-five crossings, with forty-five tracks, are in the country. In addition, there is a gauntlet track operated by the Cincinnati, Lawrenceburg & Aurora Electric Railway on the single-track bridge of the Big Four Railroad over the White Water River; each has an individual track, one overlapping the other for a distance of probably 1000 ft. A block signal is installed at the bridge, with a constant attendant operating it. In the State there are fifteen undergrade crossings, and nine overgrade, of the steam railroads, and two undergrade of highways. There are twenty crossings that have hand-operating derails, which are thrown by the traction car conductor. There is only one full interlocking station now in operation, but an agreement has been entered into for one more. There are two half or cabin interlockers installed. This device, as the name implies, is a compromise between an ordinary hand-operating switch derail and a full tower interlocker operated by a regular attendant. Ordinary switch derails are placed in the electric car tracks, about 60 ft. or 70 ft. from the crossing; none are in the steam railroad track, but semaphore signals are located on the latter about 500 ft. either way from the crossing; both are operated by levers located in a small cabin near the crossing. Normally the derails are open, and it is necessary for the conductor to enter the cabin and throw a lever, which sets semaphores against the steam trains. If a train is within 2000 ft. of the crossing the lever cannot be thrown, as a track circuit locks it. After throwing this lever the conductor throws another lever which closes the derail. In the operation of these levers the cabin door is locked, and the conductor cannot get out until after the car has passed over the derail, and the levers are returned to their normal position. It is barely possible that the trolley wheel might jump off the trolley wire while the conductor is locked in the cabin. This is an extreme view, yet it is worth consideration.

There is one hand-operating derail in the State, attached to which is a 1500-ft. or 1800-ft. track circuit either way from the crossing on the steam railroad, which locks the lever or switch-throw in case a train is within the distance mentioned, so that the electric car cannot proceed until the train has passed out of this section. The electric current for this circuit is supplied from the traction feed wires.

The speed of the lines that are over 20 miles in length varies between 18 m. p. h. and 27½ m. p. h. Those lines which have slower speeds are for the most part located in highways or have many railroad crossings to contend with. The highest speed development is on the Indianapolis & Northwestern limited service between Indianapolis and Lafayette. The distance of 68 8-10 miles from the terminus in the center of one city to that in the other is traveled at an average speed of 27½ m. p. h., including all stops. Special cars frequently make this distance in 2 hours and 18 minutes, or an average speed of 30 m. p. h. This is fast time when it is remembered that the route embraces 4 miles of track in the streets of Indianapolis, and 2 miles in each of the cities of Lebanon, Frankfort and Lafayette. The next highest speed is attained on the Indianapolis-Muncie division of the Union Traction, where the distance of 54 miles between termini is covered by the limited cars at an average speed of 27 m. p. h.

The average rate of fare on all the lines is 1.62 cents per mile. A few of the roads sell 1000-mile books for 1¼ cents per mile, while some sell round-trip tickets at a slight reduction.

Automatic block-signal systems are installed on the Indianapolis & Northwestern and the Fort Wayne & Southwestern Railways. On the Cincinnati, Lawrenceburg & Aurora Railway a manual block is in operation. Electric stop crossing signals are placed at stopping points on the Indianapolis & Northwestern. To signal a car to stop the person raises a small lever attached to a special post located nearby.



MILL FORM OF CAR HOUSE CONSTRUCTION

REDUCING THE FIRE RISKS ON CAR HOUSES

The article published in the Street Railway Journal for May 21, on "Electric Railway Car Houses—Construction and Hazards," has excited considerable interest in the subject of the best method of reducing the fire risk on this class of structure. In reply to several requests for further information as to the class of building recommended by the underwriters, the accompanying diagram is presented, not as an ideal structure from a fire resisting view, but as one which is much more desirable than many of those now in use. It is the intention of those interested in this work not to increase the cost of such structures, but to furnish at a lessened cost a structure better adapted to the purposes for which it is used. There is little doubt that a fire resistive form of structure made, for instance, with brick walls, cement or terra-cotta roof, with iron work thoroughly protected, as specified in the recent meeting of the National Fire Protective Association, would be of a slower-burning type, though up to the present time the cost of such a structure has prohibited its general adoption.

In certain ways the construction illustrated in the diagram herewith seems antiquated. It has been argued that in recommending it the fire underwriters are going back to the old horse-car days, when nearly, if not quite, the same form of building was in vogue. This is true to some extent, but not true when one considers that many, if not most of the old horse-car barns were two stories in height, and under no circumstances do the underwriters recommend a two-story car house, even of mill construction. When a company finds it necessary to build a car house over one story in height the proposition is an entirely different one, and will require special treatment.

The advantages claimed for the mill type of building illus-

trated is that it presents the least ignitable projections to a fire, admits of no concealed spaces, and all parts are readily accessible to a stream of water in the event of a fire. The heavy timbers and posting, it is claimed, will stand longer than any other type of construction approximating the same cost, and the roof will not fall in until it is entirely consumed. This latter circumstance will afford a chance of rescuing a few cars from the burning section, or at least holding the fire in check until the cars in an adjoining section can be run out to a point of safety.

Several car houses in the neighborhood of New York are being built after the design illustrated.

THE MEDICAL DEPARTMENT OF THE SAN BERNARDINO VALLEY TRACTION COMPANY

The San Bernardino (Cal.) Traction Company has established a medical department, consisting of three resident surgeons, for examining applicants, attending employees and for assistance in case of accidents. In the case of new employees it is the duty of the chief surgeon and his assistants, each in his own district, to examine the applicant and to issue certificates of health, upon written application, signed by any of the company's department heads, superintendents or foremen having charge of the employment of men. These certificates of health are issued in triplicate, upon forms provided. The examining physician retains one, sends one copy to the person having ordered the examination, and the third copy to the chief surgeon with his monthly report. No applicant, whether male or female, is employed in any department of the company's service without this examination. After the examination, if the certificate issued by the examining physician show that the applicant is "up to standard," he may be employed by the person ordering his examination. If not "up to standard," the head of the department must be consulted before the applicant is to be received into the employ of the company. Department heads employ applicants who are not "up to standard" only for weighty reasons, and conference with the office in such cases is required.

Another duty of the chief surgeon and his assistants is to give all employees all the medical attention that may be necessary by reason of injuries or any form of illness except as follows: (1) Venereal diseases, (2) acute alcoholism, and (3) such infectious diseases as small-pox, plague, cholera, etc, which the company is prevented by law from attending.

Treatment is rendered to employees, whether their injuries or illness are caused by reason of the company's work or not. In ordinary cases this attention consists of exactly such service, including simple medicines (but not prescriptions), dressing, drugs, etc., as is customary for the family physician or surgeon to give in a visit or office call. In such cases, where it is possible, employees are obliged to go to the office of the nearest regular company physician, not the emergency surgeon, except in cases of accident. When this is not possible the physician will go to them. In serious cases the directions of the physician or surgeon in charge as to whether or not the patient shall go to the hospital must be followed. The employee refusing hospital service, when offered him, forfeits the benefits of the medical department. In cases where major operative interference will be necessary, the patient may, upon order of the chief surgeon, be brought to Redlands. In such cases the service includes hospital, nursing, drugs, medical or surgical attention and dressing, it being specially understood that such care and attention is to be limited in all cases to twenty-one days, except by special order of the chief surgeon.

In case of accident to outsiders the chief surgeon, or his nearest assistant surgeon, must always be called, in order that he may offer such medical or surgical relief as is imperative, and that he may ascertain the extent of the injuries sustained. When accidents occur to employees or outsiders, those who have charge of reporting them to the general manager are instructed to consult with the company's local physician, and use his aid in properly filling out such reports as pertain to the injury, extent of injury, probable period of disability, etc.

In order to maintain this medical department the company contributes liberally, and each employee, from the presiding officer down, is required to contribute $1 per month or fraction of a month.

To assist in the prompt service of the department the company has published a map showing the location of the offices of the different physicians of the company, also the following order to employees:

ORDER TO MOTORMEN AND CONDUCTORS
(All Divisions)

A car carrying a physician and showing a Red Cross banner across the front dashboard, will have the right of way over the entire system. If you see this car approaching, you will get off the main line on the nearest switch and remain there until the car has passed you.

JOHN H. FISHER,
Acting General Manager.

AN IMPORTANT APPLICATION OF THE POSITIVE AUXILIARY CAR-LIGHTING SYSTEM

The demand for a system of positive lighting for electric cars, which will furnish lighting current when a trolley pole leaves the wire or the propulsion current supply is interrupted, is evidenced in the recent adoption of such a system by the Lackawanna & Wyoming Valley Railroad Company, the high-speed third-rail electric railway operating between Scranton and Wilkesbarre, Pa. This company has installed twelve auxiliary car lighting equipments of the automatic type, supplied by the Kinsman Electric & Railway Supply Company, of New York, for use upon its trains, partially to light cars at night when the current supply is interrupted. The disagreeable feature of the loss of light at night, due to such current interruption from any cause, as burning out of a fuse, opening of the circuit breaker, etc., has proved a serious inconvenience to passengers upon all electric railways, and should be avoided as far as possible.

The Kinsman system of auxiliary lighting has been described heretofore in these columns. It consists of an equipment for providing lighting current for the car from a small storage battery, which will be operative normally only when the propulsion current supplied to the car is interrupted. The passage of the propulsion current through the regular lighting system of the car is arranged to normally pass a charging current to the storage batteries for the auxiliary system, and, by means of an automatic switch, to keep the auxiliary lighting system cut out; whenever the propulsion current is interrupted, however, the automatic switch releases and throws the auxiliary lighting circuit onto the storage batteries, leaving them connected in and burning until the propulsion current again flows.

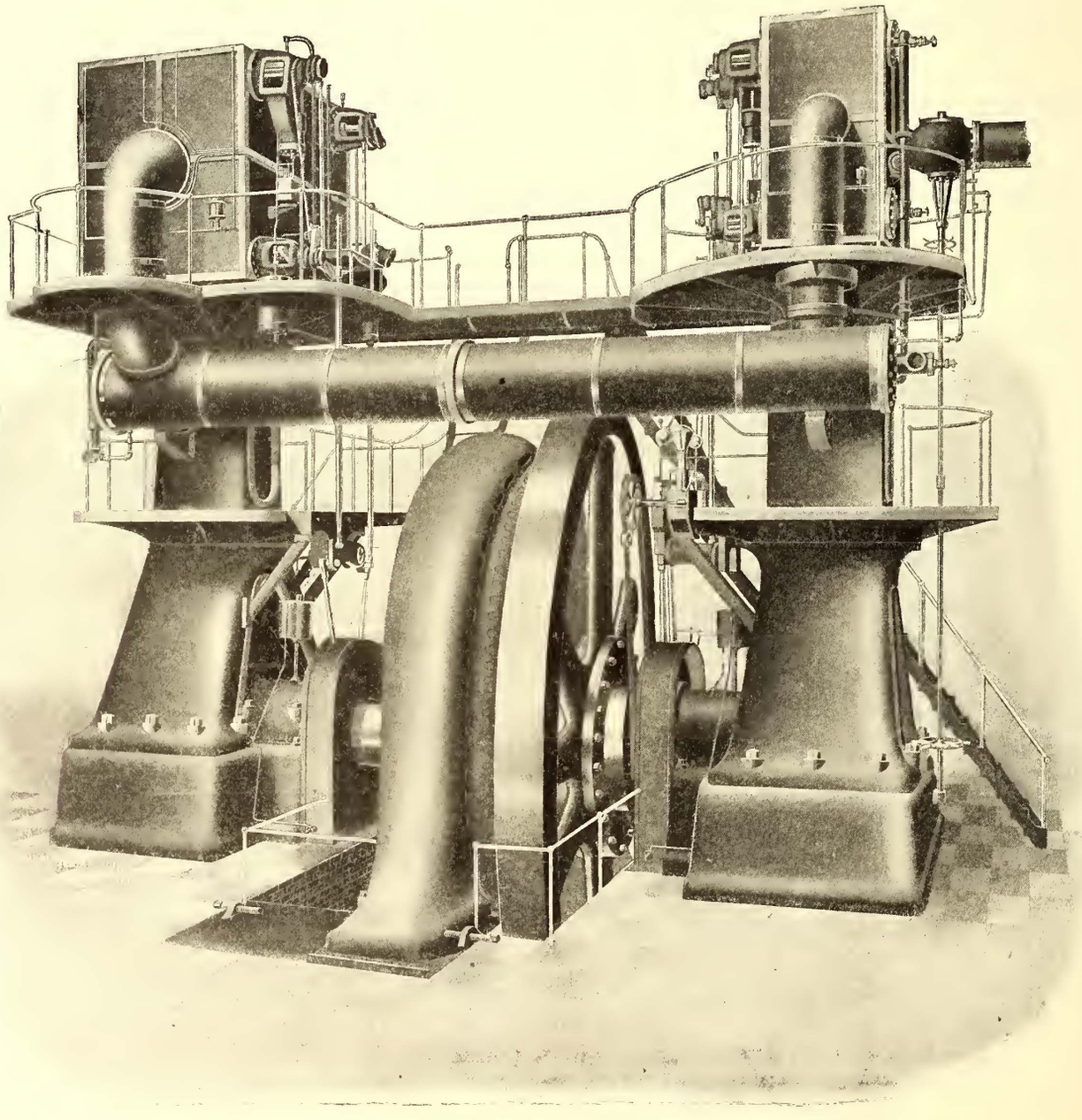
The system is convenient and economical, as only a very small battery is required in each car. Upon the Lackawanna & Wyoming Valley Railroad each car is equipped with a storage battery of six cells, each of 5-ampere-hours capacity; the batteries are enclosed in a box for convenience, occupying very little room and weighing only 60 lbs. in all. The arrangement of the auxiliary lighting circuit is such as to provide one lamp in the headlight and four lamps distributed through the car, two inside and two upon the platforms.

Several of the Kinsman equipments were recently shipped to the first electric railway company in Lima, Peru, which was described on page 851 of our June 4 issue. Here the conditions of operation are such that it is very dangerous for the passengers of a car to be without light at any time at night.

NEW HAMILTON-CORLISS VERTICAL CROSS COMPOUND ENGINE

The Hooven, Owens, Rentschler Company, of Hamilton, Ohio, has entered the field for vertical engines by bringing out a new vertical Corliss engine. This engine is of entirely new design, and is said to include all the features that the company's long experience has found to be the best.

The company has built a 2500-hp unit of this type, which will be exhibited at the Louisiana Purchase Exposition, direct connected to a 1500-kw alternator, manufactured by the National Electric Company, of Milwaukee, Wis. This alternator was described in the STREET RAILWAY JOURNAL of May 7.



REAR VIEW OF CROSS-COMPOUND VERTICAL ENGINE

The cylinder sizes of the Exposition engine are: High-pressure cylinder, 34 ins. diameter; low-pressure cylinder, 68 ins. diameter; stroke, 54 ins.; speed, 83 r. p. m.; main bearings, 25 ins. diameter by 42 ins. long; shaft in wheel and generator, 30 ins. diameter; crank pin, 11 ins. diameter by 11 ins. long; wheel, 22 ft. diameter; weight, 120,000 lbs.

The cylinders are made of close-grained charcoal iron, as hard as is practical to machine them. The exhaust chambers are separated from the cylinder walls by an air space. The arrangement is such that there is a 2-in. space between the cylinder walls and lagging for non-conducting covering. They are lagged with sheet-steel with bright polished angle-steel. The valves are located in the barrels to avoid the inconvenience of having to disconnect the valve gear when the heads are removed. The valves, however, have been placed in such a manner as to reduce the clearance to about the same as if they were placed in the heads by bringing the exhaust valves partly within the cylinder walls, although at no time do the valves enter the space swept by the piston, while the piston is allowed to sweep past the ports. The arrangement is different on the steam valve side. The ports on this side are so arranged that the incoming steam strikes the piston squarely on the end, thus preventing any side shock or pounding common to the vertical type of engine. Both steam and exhaust valves are double ported and have a very short travel. The valves are cored and made as light as possible.

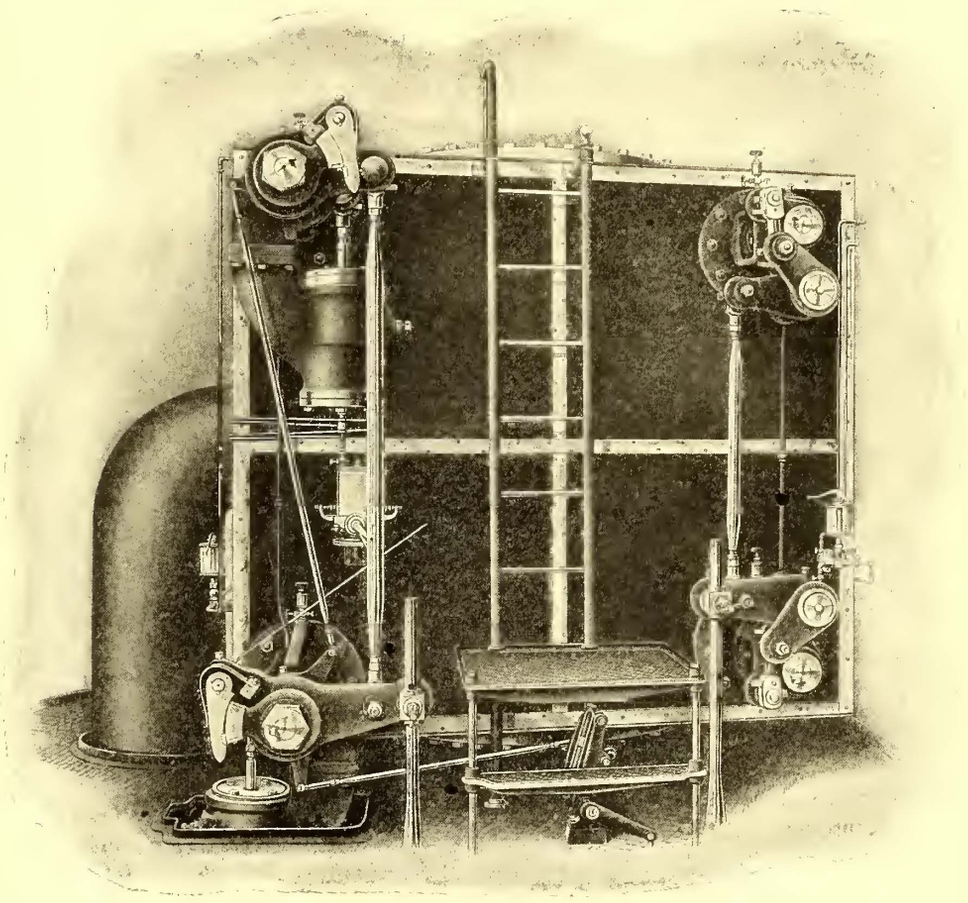
The bed-plate is of the box-section type, deep, massive and strongly webbed, with liberal bearing surface on the foundation. It is cast in one piece, and is carried around the crank at full height, forming a deep crank pit to retain oil. This base has easy lines and well rounded corners. The main bearing portion is bored and faced to receive the bottom box, which is of

the shell-type, and so arranged that it can be removed by raising the shaft enough to remove the weight from the box. This box is arranged for water circulation.

The wheel is made in eight segments, a section of the rim and one arm to each segment. These segments are carefully planed and fitted at the joints, and are bolted to the hub with turned steel bolts, holes being reamed for a driving fit. The rim is clamped together with steel arrow-headed links, which are shrunk in place. The hub is in two separate discs forced upon the shaft. These discs are drilled, reamed, and are bolted to the arms with turned steel bolts.

The "A" frame is cast in two pieces, strongly webbed, and is planed and fitted together and bolted with reamed fitting turned steel bolts. Its lower portion is of the box, or rectangular section, which gradually changes to a circular section as it reaches the top, giving very pleasing, but very strong lines. The openings on the sides are especially designed to receive oil shields which entirely enclose this part of the engine. The guide barrel is circular in form, slightly flattened on the sides where the openings come, which are also designed for perfect fitting oil shields and doors. This portion of the frame is also strongly webbed. The guides are separated from the walls of the barrel by an air space, and are bored from a common center. The barrel is faced at both ends at the same setting, which ensures perfect alignment. The pistons are cored and made as light as consistent with the proper factor of safety. They have a follower ring and one sectional ring, which is pressed out by spiral springs held in place by T-headed brass bolts. The pistons are forced on a taper and locked with a jamb nut and keeper. The cross-head is of steel, with cast-iron slippers, lined with best phosphor babbitt, peined in, bored and scraped to fit. Each slipper has a wedge adjustment which is entirely independent, hence the position of the slipper is not changed by its movement. The slippers are fastened to the cross-head by several steel bolts, thus relieving the wedge bolts of any extra strain, and are so arranged that they can be easily removed. Their construction is such that it is impossible for them to get adrift. Piston rods are fastened to cross-head by thread, jamb nut and keeper. The connecting rod is of the solid end pattern, and is five and one-half cranks long, with wedge adjustment at either end, so arranged that in taking them up the length of the rod and clearance spaces remain constant. The boxes are of bronze, babbitted, peined, bored and scraped to fit.

The valve gear differs somewhat from the company's regular type. The steam and exhaust valves are actuated by separate eccentrics, direct, without wrist plates. The necessary motion is obtained by the use of levers and links on each bonnet separately, thus greatly reducing the strains. The dash pots are hung from the bonnets and are close to the cylinder, making a very compact and self-contained arrangement. They are of the manufacturer's new noiseless pattern, with the weight of the moving parts greatly decreased, and are adapted for much higher speeds than usual. Both steam and exhaust cam rods have efficient unhooking devices, so that the valve gear can be worked by hand to facilitate starting and warming up. The valves are double ported, with very short travel, and, hence, have very little wear. The dash-pot levers are placed on the valve stems within the opening of the bonnet, and, therefore, are well supported on both sides to reduce wear. The releasing gear hooks and latch block trip plates have eight reversible wearing edges. All valve-gear connections are made to run as nearly noiseless as possible. The links have bronze connections with key adjustments. The governor is of the high-speed, center-weighted, fly-ball type, with motor and micrometer attachment for changing speed from switchboard to regulate for throwing in parallel. It is placed on the first gallery platform, and is easily accessible. Both cylinders are under control of the governor, hence the work is properly divided to suit the load. The range of cut-off is from zero to three-quarter stroke.



VALVE GEAR, LOW-PRESSURE CYLINDER

The intermediate rocker arm supports for eccentric rods are of the box section, strongly bolted to the guide barrel, and are reinforced by braces from the "A" frame.

The main bearings are lubricated by a continuous stream of oil, furnished by an oil pump driven from the eccentric. The oil is pumped from a tank, located beneath the floor, to two receivers, which are located over each main bearing cap. From there it flows by gravity to all parts of the journal. The bottom box of these journals is cored out and arranged for water circulation. The eccentrics, cross-head slippers, cross-head and crank pins are oiled from a gravity feed system by multiple sight-feed tanks located on the upper part of the engine. The cross-head slippers have wipers on the bottom end, which dip into reservoirs at the bottom end of stroke, insuring perfect lubrication of the guides. All the valve gears, rocker arms, etc., are lubricated by grease cups. The engine is thoroughly furnished with oil guards and shields to prevent oil from being thrown on the floor. The eccentrics are entirely

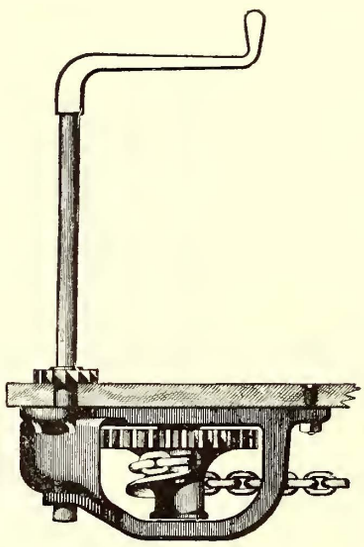
enclosed to prevent oil creeping along the shaft and coming in contact with the wheel and generator.

These engines will be made in sizes from 16 ins. x 32 ins. x 36 ins. to 48 ins. x 96 ins. x 60 ins., and will be adapted for all medium speeds, and any desired steam pressure, belted or direct connected. The company also manufactures horizontal Corliss engines in single cylinders, compound-triple expansion types for low-pressure duty and moderate speeds.

AN IMPROVED HAND BRAKE

Although the spindle brake is still extensively used, it has only been retained because many railway companies felt that they could not afford to equip their cars with costly power brakes. Many attempts have, therefore been made to design a hand brake which, while low in first cost, could be used satisfactorilyon heavy high-speed cars.

The National Brake Company (Incorporated), of Buffalo, N. Y., believes that it has solved this problem in designing its "Peacock" brake, which is illustrated in the accompanying cut. Although on the market but a very short period, it is already in use on several of the principal Canadian electric railways, and has also been given some thorough tests by the International Railway Company, of Buffalo, N. Y. The result of these tests was so satisfactory as to warrant the consideration of this brake for general adoption on the company's heaviest cars.



IMPROVED HAND BRAKE

The brake is adapted to any kind of car, from the single truck to the heaviest and fastest suburban type. It is durably constructed, has few parts, and is easily operated and applied, because the drum works on roller bearings. The speed obtained in taking up the slack chain and the great power gained when applying the brake are very valuable features. The spiral drum, with its eccentrically-geared cam construction, not only accomplishes these objects but extends sufficiently to provide for the taking up of any surplus chain caused by the car house men neglecting to keep the brakes properly adjusted. This last feature overcomes the only objection ever raised to the company's "National" brake, and its later type should, therefore, prove a very efficient hand brake for the most arduous service.

ACCIDENT INSURANCE IN ST. LOUIS

The employees of the St. Louis Transit Company will hereafter be protected by accident insurance, the cost of which will be borne partly by the employees and partly by the company. The plan of this fund became effective June 1; it was proposed by the company and adopted by the Missouri Street Railway Union, of which every motorman and conductor in the employ of the company is a member. Payment of compulsory dues of 50 cents a month to the union have ceased. In their place the men are given the privilege of voluntarily contributing a similar amount to the accident fund, but only those who do make such contribution are entitled to the benefits of the fund. In order to further the movement the company has agreed to contribute to the fund a sum equal to one-half of that paid in by the men. In addition to this the company will furnish free medical attendance in case of sickness or accident, and free legal advice should such be desired by a member of the fund who is in good standing. The union, however, will cease to pay benefits of $5 a week to members who are disabled either by accident or sickness. The administration of the fund will be left to the executive board of the union, but the company will be the custodian of the fund, and the company's auditor will keep the accounts. The executive board of the union will meet within ten days and decide upon what basis benefits shall be allowed.

The new arrangement was outlined to the employees in a circular issued by the company. According to this circular, which is signed by Robert McCulloch, vice-president and general manager of the company, no expense will attend the conduct of the union's affairs. Moreover, the circular says:

"If the officials of the Missouri Union devote time to the performance of duties, the company will pay for this time, making it plain that every cent contributed, together with an equal amount from the company, shall constitute a substantial relief fund for accidents, and if the condition of the treasury comes to justify it the scope of the benefits will be enlarged."

Because of the arrangement by which the company will audit and be the custodian of the accident fund and pay the officers of the union for the time actually devoted to union duties, most of the salaried officers of the union will be discontinued, the general president and others serving voluntarily. A secretary, however, will be paid. The auditing of the accident fund accounts by the company will relieve the union of a burden, for, heretofore, the auditing committee of the labor organization checked up the accounts every month, receiving compensation for its labor. There is also some talk among the members of the union of discontinuing the maintenance of general offices at the corner of Park Avenue and Eighteenth Street.

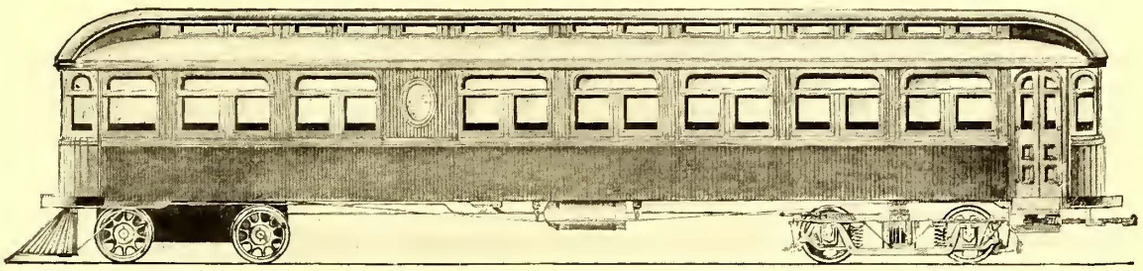
Though the sick benefit of $5 a week, which was paid wholly by the union, will be discontinued, the organization may continue the funeral benefit.

DEALING WITH THE ROWDY IN BROOKLYN

The question of how to suppress the street car rowdy is one that about this time occupies the attention of most managers operating lines to pleasure resorts. Last year several schemes were tried in different parts of the country for protecting passengers from insult and assault at the hands of the ruffian. In one city the company had the police meet its suburban cars at the city limits and take offenders into custody. This, so far as is known, proved fairly effective. In Brooklyn, where the hoodlums became particularly numerous and abusive, the citizens organized for protection, and in a number of instances did effective work, particularly at the beaches. This year, however, the Brooklyn Rapid Transit Company has essayed to grapple with the problem itself, and has decided on the "bouncer" as the most efficient means to the end. Accordingly, it has organized a force of seventy-five special policemen, some of whom will be uniformed. These men will be on duty during the rush hours, and all day during Saturdays, Sundays and holidays, when the pleasure traffic is heaviest. The "bouncers" are to travel in pairs, and when in civilian's dress will, so one report says, protest vigorously as citizens if any passenger conducts himself so as to disturb the public peace. If remonstrance proves futile, then the "bouncers" will do all their name implies. The end sought will be the peace of the majority of the passengers, and only in exceptional cases will arrests be made.

THE PROUTY-PIERCE GASOLINE MOTOR CARS

One of the companies that has been making substantial progress in the direction of a successful gasoline interurban car, is the Prouty-Pierce Locomotive Manufacturing Company, of Kansas City, Kan. There are many places where traffic will not warrant the investment in a complete electric equipment of a railway. It was thought that if a practical gasoline motor car, or locomotive, could be evolved it might make practicable the construction of railways in territories where neither steam nor electric traction have yet entirely filled the demand. The Prouty locomotives were first designed for contractors, logging and industrial railways. Such locomotives having been in successful use for some time, the company decided to enter a wider field with them, and adapt them for use either pulling interurban coaches as trailers, or placing them directly on one truck of an interurban car.



DOUBLE-TRUCK GASOLINE MOTOR CAR

Fig. 1 shows a combination passenger car such as it is proposed to equip with the gasoline motor, and Fig. 2 shows a passenger locomotive, similar to the switching locomotives now being built by the company. It is proposed to substitute in place of the ordinary truck at one end of the car a gasoline locomotive, allowing the locomotive to stand up into the car body through an opening in the car floor. This part of the car body would be closed off from the passenger compartment, and might be used for packages.

The gasoline locomotive is made very heavy, so as to adapt it to the roughest work and give good traction. The gasoline engine in this locomotive runs continuously one way. The form of clutch used on a locomotive of this kind is of the greatest importance, since a large amount of power must be transmitted from a constantly-running gasoline engine for the acceleration of a car or train.

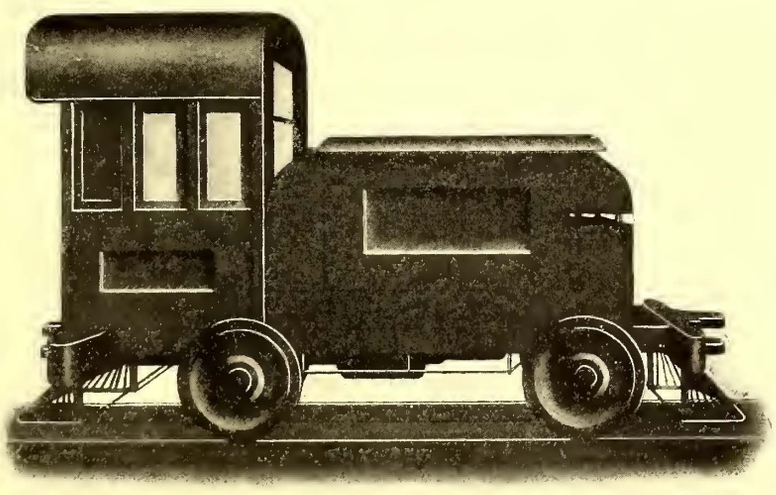


FIG. 2. GASOLINE LOCOMOTIVE

The power transmission on this locomotive is accomplished by what is called the "Prouty impinging reversible clutch." This clutch operates on a principle which was first employed by Mr. Prouty on his street car brake, which the readers of the STREET RAILWAY JOURNAL will recall as having been tried in Chicago several years ago. In this clutch the faces of the friction discs are forced together by a tapered roller, which is forced between the bevelled edges of one friction and another disc which is free to revolve. These tapered wheels operate the friction clutch by impingment, and not by thrust. The clutch is arranged so that the car is started and stopped smoothly, and is run in either direction. By reversing the clutch an effective brake is put on the motion of the locomotive.

The friction faces are lubricated with oil mixed with graphite. These faces are parallel surfaces well lubricated, and, as mentioned before, are forced together by the wedging action of the taper wheel mentioned. All the parts of the clutch, gearing and pinions are made of the best crucible steel, perfectly turned and cut.

Two speeds are provided for by means of gearing. Intermediate speeds must be obtained by varying the speed of the engine. The low-speed gear is used for starting and on grades. The general construction of the locomotive frame is peculiar, one axle is rigid with the frame of the locomotive. The other rocks on its center, causing all wheels to bear uniformly on the rail.

The gasoline engine is of the 4-cycle type. It is mounted vertically. One cylinder only is used. A very heavy balance wheel is provided. The valves are of large diameter, with slight lift. The exhaust valve is opened by a cam and the air intake valve by the vacuum. No carburetter or gasoline vaporizer is used in the intake pipe. Instead of this the gasoline is mechanically measured for each stroke, and is injected into the intake air with great force as the air is being drawn into the cylinder by the down stroke of the piston. This causes it to be vaporized, and also permits a low grade of gasoline to be used. The gasoline is carried on the truck in a tank with wheels over ½ in. in thickness, the tank being made heavy, since saving in weight is not an object. The gasoline moves only by mechanical action when the engine is running, and not by gravity, which tends to increased safety. The discharge of the gasoline into the air intake is controlled by an automatic governor. This governor keeps constant speed, so long as it is not touched, but it can be controlled by a lever within easy reach of the motorman, to increase or decrease the speed of the engine. The measuring and regulation of the gasoline being entirely mechanical, sudden changes in the weather have no perceptible effect on the working of the engine, and when once the adjustments are made, it is claimed that the adjustments need not be touched for months. The gasoline vapor is ignited by an electric jump spark. The engine is water jacketed, and the cooling water is rapidly circulated by a centrifugal pump, driven by the engines. Considerable interest has been manifested by some electric railway, and also some steam railroad men, in the development of gasoline motor cars for branch lines and extensions, where operation by steam or electricity is not profitable.

In a long editorial on the question of the "end-seat hog," the "Hartford Times" recently advanced the wonderful theory that the ordinance introduced in the Council of New York to restrain the hog "is all for the benefit of the trolley company."

FINANCIAL INTELLIGENCE

Wall Street, June 15, 1904.

The Money Market

The only important development in the money market of the week is the sharp decline in sterling exchange. It is notable that this has occurred in face of the lowest money quotations of the year in New York City, and in face of unmistakable assurance that these very easy conditions are going to continue. The one conclusion possible to draw from the week's exchange movement is that both Paris and London have all the gold they are likely to need, and that they will draw no more from America this season. This inference is, of course, strongly supported by the decline in the price of gold in the London market, and by the violent advance in the sterling rate at Paris. With gold exports no longer probable, the only thing that might conceivably have caused a firmer money market during the next two months, has been removed. Not until the accustomed drain of currency to the harvest territory begins need any change in existing conditions be looked for. The banks continue to add heavily to their already bountiful stores; last Saturday's statement showing a further increase in specie and legal tender holdings of $6,400,000, and an increase in surplus reserve of $3,800,000. The gain in cash is derived chiefly from the unemployed funds of the interior cities, but part of it is new gold transferred across continent. The surplus item now stands at the high point of the year; it is $35,562,000, compared with $9,477,000 a year ago, and $13,302,000 two years ago. In view of the fact that money has again become unprofitable to lend, we may expect to see the institutions outside the Clearing-House retire from the market and shift the lending function upon the member banks. Saturday's increase of $5,528,000 in loans undoubtedly reflected the beginnings of the process. Call money on the Stock Exchange renews at 1 and 1¼ per cent. Sixty-day rates have fallen to 1¾, ninety days to 2, and six months money to 3 per cent.

The Stock Market

A moderate advance in prices, with rather more activity in the trading, has occurred on the Stock Exchange this week. It has been based chiefly on speculative conditions, or, to put the case more specifically, upon the discovery that the market at the recent low level was very thoroughly sold out. A large short interest has been built up without any corresponding increase in the supply of real stock for sale, and these speculative sellers have been forced to bid up prices in order to cover their contracts. The rise has, perhaps, been helped by better crop reports, specially by the enormous acreage and high condition estimated for cotton. The government figures issued last Friday showed a somewhat reduced area of spring wheat, and a rather lower percentage as compared with a year ago. They also showed a small gain for the winter wheat crop during the month of May. There was scarcely anything in this exhibit to stimulate buying of stocks. With the cessation of gold exports and the rapid accumulation of bank reserves the investment demand for bonds has quickened considerably. Some rather striking advances have occurred in this quarter during the week, and this specially has assisted the growth of more cheerful feeling in the stock market. Railroad earnings reported for the month so far have shown up better than in some time past. The Republican victory in Oregon gave a more cheerful aspect to the political outlook. But all these outside matters would have been of insignificant importance in themselves had they not fallen upon a market sold to a standstill. It is the opinion among the majority of Wall Street observers that a rather better market is in store for the immediate future, but that there is little likelihood of any considerable advance or any very active speculation.

The city tractions have borne their full share in the week's improvement. A rather bullish feeling is discernible on Metropolitan, in speculative quarters which have lately acquired a considerable reputation for being right on the market. Philadelphia has sent a good many buying orders in the stock. The contention is now made that if the dividend were reduced from 7 to 5 per cent, the market would treat it as "bad news" over-discounted, and the price of the stock would advance to at least 120. Manhattan has been unusually active, selling "ex" the quarterly dividend of 1½ per cent and easily recovering it. The fact that the Interborough Company was able to pay a dividend to its stockholders out of Manhattan's surplus earnings, has served to draw investment attention more powerfully than ever to the merits of the elevated property. There is some talk that the stock may be listed on the London Exchange. Brooklyn Rapid Transit has been heavily bought by speculators impressed with the remarkable advance in the various bond issues of the company. Brooklyn Union Elevated 5s, Nassau Electric 4s and Kings County Elevated 4s have all enjoyed a very sharp raise on heavy dealings, while the new B. R. T. 4s have also been extremely strong. The investment position of the road is generally acknowledged to have become much more attractive since the recent changes in management.

Philadelphia

Without any noticeable developments, the traction list in Philadelphia has joined moderately in the general improvement of the week. Union Traction rose to 50 "ex" the dividend of ¾ per cent, which made its equivalent 50¾. This is the high record of the season. Philadelphia Traction was also conspicuously strong, gaining a half-point from 95⅞ to 96⅜. On the other hand, Philadelphia Electric and the Rapid Transit shares were weak. In the case of the first-named, there was a story of a rival company about to be formed which, however, did not receive a great deal of credence. The stock dropped from 6¼ to 5¾ and then hardened a trifle to 5 15-16. Rapid Transit declined from 12¼ to 11½ on the sale of 800 shares, but subsequently rallied to 12. Dealings in Philadelphia Company common were featureless, the stock selling at 38¾ and later easing at 38⅜. The preferred went at 44⅛ and 44. American Railways rose from 43 to 43½ and then receded to 43⅛, at which figure 100 shares changed hands.

Chicago

Dealings in the Chicago tractions have fallen off considerably, and prices in some instances have suffered by a clearer recognition that the recent court decision by no means ends the interminable question of the franchise extension. After 100 shares of City Railway had sold at 178 the bid was lowered so sharply that the offer of a small lot brought only 175. There were no sales at all of Union Traction shares. Three hundred West Chicago changed hands on the way up from 45 to 47 and back to 46. One hundred North Chicago sold at 80, 200 at 78, 120 at 78½ and a fractional lot at 79. In contrast to the uncertainty reflected in the market for the surface road securities, the shares of the elevated lines were very strong. Metropolitan common rose as high as 21¾, reacted to 21 and rallied to 21½. Five hundred of the preferred sold on a scale from 54 to 57. Three hundred Northwestern common were dealt in between 17 and 17⅝, and 200 of the preferred at an advance from 44½ to 47½. There was no explanation for this sudden exhibition of strength beyond the fact, which has been understood in inside quarters, that it was speculative conditions rather than poor company earnings which led to the recent low prices in these elevated securities. South Side was also stronger, recovering from 89½ to 90½, on the announcement that, providing the company's stockholders approve of the bond issue plan, $8,000,000 of the 4½ per cent bonds have already been placed through various bankers in New York and Chicago. Lake Street was firmer, getting up from 3 to 3½.

Other Traction Securities

Another very sharp advance in Boston Elevated is the feature of the week's Boston dealings. The stock rose from 143 to 147½, on a fairly large volume of sales, 500 shares changing hands between 144¼ and 146, and 300 between 146 and 147½. Appreciation of the growing investment value of the property, backed up by some active investment buying, is what the advance has chiefly reflected. Massachusetts Electric issues have been dull, the common stock unusually so, a few hundred shares between 18⅝ and 19¼ being the extent of the trading. The preferred has sold at 70. West End common went at 91, and the preferred was notably strong at an advance from 111 to 112. On the Baltimore Exchange the United Railway securities have again been under some pressure, the income bonds falling from 45 to 44⅝, while the stock dropped to 5¾, after 500 shares had sold at 6. The general 4s were firmer than the others, rallying from 89¾ to 90¼. Other Baltimore transactions comprised Baltimore Traction 5s at 112½, City & Suburban (Washington) 5s at 98½, Atlanta Consolidated 5s at 106½, City & Suburban (Baltimore) 5s at 112½, Toledo Traction 5s at 101⅞ and 102, Rochester Railway 5s at 109, North

Baltimore Traction 5s at 116 to 116½, Baltimore City Passenger 4½s at 101, and Knoxville Traction 5s at 101¾. On the New York curb the main incident of the week has been the rise in Interborough Rapid Transit from 111½ to 119¾, at which figure it sold on Monday. About 5000 shares have changed hands on the advance. The movement is associated with the active operations in Manhattan Elevated on the Stock Exchange, and is partly ascribed to a better appreciation of the remarkable earnings situation of the property, and partly to the preparations for listing the securities in London. Three hundred St. Louis Transit sold at 13⅞ and 14. Washington Railway & Electric was strong, 800 shares of the common stock selling at an advance from 15 to 16, and the 4 per cent bonds rising from 77½ to 78¼. Nassau Electric 4s on heavy dealings gained 2⅝ points, from 80¼ to 82⅞.

There was a strong demand for Cincinnati Street Railway in Cincinnati last week. The stock has been selling around 139 for several weeks past, but the sudden demand advanced it to 144 during the week. Sales aggregated about 1300 shares. Cincinnati, Newport & Covington preferred was quite active at 85½, and the common sold at 29½ for two lots. The first 5 per cent bonds of this company brought 109½ for $28,000 worth. There was considerable demand for Cincinnati, Dayton & Toledo stock, but little was offered for sale; the price advanced from 20 to 22 on two sales. Northern Ohio Traction 5s sold at 99 for $7,000 worth. Detroit United was comparatively inactive, two small lots selling at 61.

In Cleveland there was a strong demand for Cincinnati, Dayton & Toledo stock. Cincinnati people have been doing the buying, due to the report that the property is about to become affiliated with the strong interests that control the Cincinnati city lines. One Cincinnati house is said to have bought 5000 shares at private sale in Cleveland. Sales were made at from 21 to 23¾, but the holders seemed unwilling to let it go at these figures. Syracuse Rapid Transit sold at 24 for a round lot, one point below previous mark. Aurora, Elgin & Chicago 5s sold at 75 for $5,000 worth.

Security Quotations

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

	Closing Bid	
	June 7	June 14
American Railways	*43	43
Aurora, Elgin & Chicago	a13½	a14
Boston Elevated	142¾	147
Brooklyn Rapid Transit	47	48⅝
Chicago City	170	175
Chicago Union Traction (common)	a6¾	5¼
Chicago Union Traction (preferred)	28	a30
Cleveland Electric	71¼	70½
Consolidated Traction of New Jersey	65	66
Consolidated Traction of New Jersey 5s	105	105¼
Detroit United	60⅞	61
Interborough Rapid Transit	111¾	118¼
Lake Shore Electric (preferred)	a40	a30
Lake Street Elevated	3	3¼
Manhattan Railway	144	*148⅜
Massachusetts Electric Cos. (common)	18¼	18¼
Massachusetts Electric Cos. (preferred)	*70	70
Metropolitan Elevated, Chicago (common)	21	20½
Metropolitan Elevated, Chicago (preferred)	52¾	56
Metropolitan Street	110⅝	114½
Metropolitan Securities	75	80
New Orleans Railways (common)	8¼	9
New Orleans Railways (preferred)	26¼	27½
New Orleans Railways, 4½s	74	—
North American	81	84
Northern Ohio Traction & Light	12	13
Philadelphia Company (common)	38⅜	38¼
Philadelphia Rapid Transit	12¼	12
Philadelphia Traction	95¾	96¼
St. Louis (common)	13¼	13½
South Side Elevated (Chicago)	89	91½
Third Avenue	116	120½
Twin City, Minneapolis (common)	93¾	93½
Union Traction (Philadelphia)	50	50
United Railways, St. Louis (preferred)	57	57
West End (common)	90	90½
West End (preferred)	111	111

a Asked.

Iron and Steel

Reports from the iron and steel trade are still by no means encouraging. Consumption of foundry iron is on the decline and concessions in prices are looked for. The outlook is not good for business in steel rails, beyond the summer months, for which period the mills seem to be pretty well supplied with orders. Trade in structural material is very slow and disappointing. Quotations are as follows: Bessemer pig iron $12.85, Bessemer steel $23, steel rails $28.

Metals.

Quotations for the leading metals are as follows: Copper 12¾ cents, tin 27¼ cents, lead 4¼ cents, and spelter 4 15-16 cents.

REPORT OF THE LISBON ELECTRIC TRAMWAYS

The report of the Lisbon Electric Tramways for 1903 was presented at a meeting of the company held June 9 at London. The report shows that after charging off interest and sinking fund on the debentures of the "Companhia Carris de Ferro de Lisboa," there is a net profit to the sum of Rs.516,904,264, which in sterling, gives the sum of £91,803-4-7, which is carried forward to the credit of the London profit and loss account; and after payment of interest on debentures, and other charges, besides London office expenses and directors' remuneration, there remains a balance of £59,814-13-4, which, added to the balance of £6,080-12-10, brought forward from last year, gives an available balance of £65,895-6-2. Out of this amount, the arrears of preference dividend accumulated during construction to Dec. 31, 1902, amounting to £12,000, have been paid, and also the dividend of 6 per cent for the year of 1903, amounting to £25,533-3-8. The directors have also transferred the sum of £20,000 to depreciation reserve account, leaving the sum of £8,362-2-6 to be carried forward to the next year's account.

The business of the company continues steadily to expand, as is shown by the receipts for the year under review, which will be seen to amount to Rs.1,115,722,067, sterling equivalent, £198,133-12-10, as against Rs.966,547,142, sterling equivalent, £166,283-19-4, in 1902, being an increase of Rs.149,174,925, sterling equivalent, £31,-849-13-6.

There has been expended during the year on construction the sum of £19,667-18-5, which includes the cost of an additional unit to the power house.

PACIFIC ELECTRIC TO HANDLE FREIGHT

Much interest has developed lately in Los Angeles over the announcement that the Pacific Electric Railway Company is making preparations to handle freight. Already considerable freight business is done by certain interurban lines. Now the Pacific Electric Railway Company proposes to enter the field systematically, and has established a regularly appointed traffic department. To the position of traffic manager Joseph McMillan, heretofore chief clerk to General Manager Schindler, has been promoted. The duties of the new position will come naturally to Mr. McMillan, for he was district passenger agent of the Southern Pacific in Texas before he was brought to Los Angeles by Epes Randolph, when the latter was general manager of the Pacific Electric Railway Company.

"Our passenger business has grown so rapidly that we need one man at the head of that department," said General Manager Schindler to a representative of the STREET RAILWAY JOURNAL. "In connection with our passenger business we are handling considerable freight, which is turned over to us by the steam roads. Eventually we shall do much business in this direction, but it is simply to be a natural development. Without any ado about the matter, we are simply preparing ourselves to take care of all the business that comes our way."

The report that the company has placed a large order for freight cars to be used between Los Angeles and Long Beach, Whittier and Glendale, is denied. Undoubtedly the report originated in the fact that thirty-two new passenger coaches have been ordered for the heavy summer travel to the beaches.

Mr. McMillan says that any freight cars the company may use will be built in its own shops in Los Angeles.

The National Electrical Contractors' Association will hold its fourth annual convention Sept. 14, 15 and 16, 1904. A special convention train will leave the Grand Central Station, New York City, Saturday, Sept. 10, at one o'clock, p. m., for St. Louis, Mo. Communications relating to trains and rooms should be addresssed to Alexander Henderson, Master of Transportation, 527 West Thirty-fourth Street, or Milton C. Roach, General Eastern Passenger Agent, 1216 Broadway, New York City.

TROUBLE OVER APPRAISEMENTS UNDER NEW OHIO LAW

State Auditor Jones, of Ohio, is having trouble in regard to the distribution among the various counties of the appraisements of interurban lines. Under the Bruce bill, which was passed in the recent State Legislature, through the efforts of the Ohio Interurban Railway Association, power houses, terminals and other valuable buildings are distributed over the entire line instead of being taxed in the county in which they are located. In urging the passage of this measure the interurban roads argued that a power station or sub-station was as much a necessary part of the track or rolling stock as the car or rails. Some of the counties which heretofore have had all the taxes derived from power stations or similar buildings are talking of bringing suit to have the Bruce law declared unconstitutional.

FINANCIAL REPORT OF RECEIVERS OF CHICAGO UNION TRACTION COMPANY

The receivers of the Chicago Union Traction Company have issued the following report:

INCOME ACCOUNT, WEST CHICAGO STREET RAILROAD COMPANY

(Six months ended Feb. 29, 1904.)

Car earnings—		
Passengers	$2,622,951	
Chartered cars	333	
Mail	11,631	$2,634,915
Miscellaneous earnings—		
Advertising	11,250	
Rents	3,313	
Sale of power	2,441	
Miscellaneous	54	17,058
Gross from operation		$2,651,974
OPERATING EXPENSES		
General—		
Salaries	$34,943	
Damages	194,813	
Legal expenses	48,434	
Insurance	10,714	
Various general expenses	45,248	$334,152
Maintenance way and structures		149,153
Maintenance equipment		226,435
Transportation—		
Operation of power plant	$288,962	
Operation of cables	121,272	
Operation of cars, all expenses	787,899	1,198,124
Total operating expenses		$1,907,865
Net earnings from operation		744,108
Miscellaneous income—		
Interest on deposits	$150	
Income from securities owned	4,046	
Rent of leased lines	5,000	
Miscellaneous	10,246	19,443
Gross income less operating expenses		$763,554
Deductions from income. Taxes accrued—		
Real and personal property	$37,478	
Capital stock	23,793	
Car licenses, etc.	22,679	
Interest accrued—		
On funded debt	302,410	
On real estate mortgages	4,599	
On floating debt	31,742	
Rent, leased lines, accrued	260,982	
Other deductions	154	683,840
Net income		$79,711
Reserve for depreciation	$339,213	
Proportion of deficit Chicago Consolidated Traction Company	132,685	471,899
Deficit		$392,188

INCOME ACCOUNT, NORTH CHICAGO STREET RAILROAD COMPANY

(Six months ended Feb. 29, 1904.)

Car earnings—		
Passengers	$1,477,387	
Chartered cars	228	
Mail	3,742	$1,481,357
Advertising, rents, sale of power, etc.		17,845
Total income		$1,499,203
DISBURSEMENTS		
General expenses	$159,490	
Maintenance way and structures	109,622	
Maintenance equipment	142,260	
Transportation, operation of power plant	178,557	
Operation of cables	69,266	
Operation of cars, all expenses	431,251	
Total disbursements		$1,090,449
Net from operation		$408,753
Miscellaneous income—		
Interest on deposits	$81	
Income from securities owned	2,312	
Rent of leased lines	.....	
Miscellaneous income	9,071	11,465
Gross income, less operating expenses		$420,218
Deductions from income—		
Taxes accrued—real and personal property	$44,741	
Capital stock	26,744	
Car licenses, etc.	11,773	
Interest on funded debt accrued	115,590	
Interest on real estate mortgages accrued	450	
Interest on floating debt accrued	70,513	
Rent, leased lines accrued	103,735	
Other deductions	83	373,631
Net income		$46,587
Reserve for depreciation	$163,008	
Proportion deficit of the Chicago Consolidated Traction Company	74,939	237,948
Deficit		$191,360

CHICAGO CONSOLIDATED TRACTION COMPANY—INCOME ACCOUNT

(Six months ended Feb. 29, 1904.)

Car earnings—		
Passengers	$640,175	
Chartered cars	306	
Mail	2,160	$642,642
Miscellaneous earnings—		
Advertising	2,100	
Sale of power	633	
Other miscellaneous	329	3,063
Gross from operation		$645,706
OPERATING EXPENSES.		
General—		
Salaries	$7,665	
Damages	47,327	
Legal expenses	4,326	
Insurance	1,778	
Various general expenses	4,845	65,942
Maintenance way and structures		70,547
Maintenance equipment		49,527
Transportation—		
Operation power plant	$130,111	
Operation of cars	246,298	376,410
Total operating expenses		$562,427
Net earnings from operation		$83,278
Miscellaneous income—		
Interest on deposits	$219	
Income from securities owned	135	
Other miscellaneous	39,893	40,248
Gross income, less operating expenses		$123,527
Deductions from income. Taxes accrued—		
Real and personal property	*$10,450	
On earnings	1,166	
Car licenses, etc.	3,702	
Interest on funded debt, accrued	292,915	
Interest on floating debt, accrued	4,068	
Rent, leased lines, accrued	39,750	331,151
Total deficit		$207,624
Distribution of deficit among guarantors—		
North Chicago Street Railroad Company, gross income	$74,939	
West Chicago Street Railroad Company, gross income	132,685	207,624

* Credit.

The percentage of gross income consumed by operating expenses has grown in the past four years as follows:

	Year June 30, 1900	Six months, 1904
West Chicago	50.1	71.9
North Chicago	46.9	72.7

For North and West Chicago combined, year ending:

	Per cent
June 30, 1899	49.3
June 30, 1900	50.3
June 30, 1901	54.0
June 30, 1902	58.4

FRANCHISE CONDITIONS IN LONDON

Testimony given before the Royal Commission on London Traffic, June 3, by J. Clifton Robinson, managing director of the London United Electric Tramways, indicates the restrictive conditions of tramway promotion in England, by which the local borough authorities compete with each other as to the amount which the tramway company must pay to pass through their boundaries. Thus the London United Electric Tramways, whose system all lies within what is geographically the confines of London, is obliged to negotiate with some thirty different public bodies. Their exactions since 1898 for street widenings and improvements—being "the price of local authorities' assents"—amounted to £745,500, apart from the capitalization of numerous wayleaves, which amounted to a further £241,000. This was equivalent to over £20,000 per mile of tramway, irrespective of construction and equipment. For the extensions which the company proposed to make this year—but which it dropped owing to the extortionate prices placed by the local authorities on their assents—the company was asked to carry out public improvements costing £642,630, in addition to certain widening works, involving an expenditure of £217,932. In Brentford, one small district where the company asked for permission to build ¾ of a mile of track, the requirements of the Urban District Council represented an outlay at the rate of £608,000 per mile. Altogether, the proposed new tramways which the London United had to abandon, owing to the action of the various local authorities, represented a total of about 60 miles.

The Royal Commission is a body appointed by Parliament to consider the advisability of establishing an impartial tribunal which would deal with all questions relating to London traffic, and this proposal was advocated by Mr. Robinson.

REPORT OF NEW YORK CITY RAILWAY COMPANY

A consolidated statement follows of the earnings and expenses of the Interurban Street Railway Company (present name, New York City Railway Company), for the year ending Dec. 31, 1903, including the Metropolitan and Third Avenue systems, but excluding the Central Crosstown Railroad Company, the property of which was not leased to the Metropolitan Company until April 1, 1904:

Gross receipts	$21,221,519
Operating expenses	10,990,602
Net earnings	$10,230,917
Other income	1,373,793
Total income	$11,604,710
Deduction from income	8,191,106
Surplus available for rental payable under Metropolitan lease	$3,413,604

The following is a condensed general balance sheet of the Interurban Street Railway Company (present name, New York City Railway Company), as of Dec. 31, 1903:

ASSETS

Cost of road and equipment and stocks and bonds of other companies	$14,223,634
Third Avenue Railroad Company, profit and loss, as of June 30, 1903	227,670
Supplies on hand	266,801
Cash on hand	265,966
Cash on deposit to pay coupons and rentals	233,972
Prepaid insurance	40,500
Open accounts	11,401,370
Profit and loss (deficiency)	68,092
	$26,728,004

LIABILITIES

Capital stock, common	$7,921,200
Stock and notes due Met. Sec Co. under sub	10,754,800
Loans and bills payable	273,956
Interest on funded debt, due and accrued	34,583
Other interest due and accrued	11,083
Taxes, accrued	557,129
Rentals, due and accrued	1,883,507
Employees' deposits	13,809
Coupons due, not presented	2,645
Due for wages	69,193
Audited vouchers	534,414
Open accounts: Met. St. Ry. Co., on account of $23,000,000 payable under lease $4,052,000	
Sundry accounts 85,106	4,137,107
Reserve for controlled companies as of June 30, 1903	534,578
	$26,728,004

The following is a condensed general balance sheet of the Metropolitan Street Railway Company, as of Dec. 31, 1903:

ASSETS

Franchise and property	$53,789,705
Construction	1,619,166
Construction to be distributed	64,838
Investments	10,889,714
Bills receivable	799,836
Due from Interurban Street Railway Co., under contract, payable as and when required by the Metropolitan Street Railway Co. for construction purposes	4,052,000
Material and supplies	663,439
Morton Trust Co. (Belt bond redemption account)	6,000
Cash	18,641
Open account, undistributed items, etc	61,420
Bond sale account	100,000
Advances to companies leased and controlled for construction and equipment	23,976,806
Due from companies and individuals	200,741
Total	$96,242,306

LIABILITIES

Capital stock	$51,997,400
Scrip outstanding	2,600
Funded debt	37,030,000
Due to companies and individuals	897,224
Due for material and supplies	532,336
Real estate mortgages	950,000
Bills payable	100,000
Bonds due and unpaid	6,000
Profit and loss (surplus)	4,726,746
Total	$96,242,306

The following is a condensed general balance sheet of the Third Avenue Railroad Company as of Dec. 31, 1903:

ASSETS

Cost of roads and equipment	$43,211,373
Other permanent investments	100,000
Bills receivable, representing advances to controlled companies	10,996,883
Advances to controlled companies, not included under bills receivable	4,333,170
Supplies on hand	154,862
Due by companies and individuals on open accounts other than traffic	25,978
Cash on hand	39,708
Cash on deposit to pay coupons	829,375
Open accounts	48,385
Prepaid insurance	7,305
	$59,747,041

LIABILITIES

Capital stock, common	$15,995,800
Funded debt	40,000,000
Loans and bills payable	1,175,000
Other interest, due and accrued	9,197
Coupons due, not presented	829,375
Due for wages	8,641
Employees' deposits	1,197
Due companies and individuals on open account	1,579,907
Taxes accrued	118,825
Profits and loss (surplus)	29,100
	$59,747,041

ANNUAL OUTING OF THE NEW ENGLAND STREET RAILWAY CLUB

The annual outing of the New England Street Railway Club will occur on June 21, and a most attractive programme has been prepared. Members will leave Boston at the North Station at 8:50 a. m. for Lynn, where electric cars will be taken to the Salem Willows. Here a ball game will take place between two selected nines representing, respectively, the railway men and the supply men. Those who do not care about witnessing the ball game can make the trip by boat to Baker's Island. At 2 p. m. a shore dinner will be given at Chase's and the party is scheduled to reach Boston on the return trip at 7 p. m. The charge for tickets is $1.50 each, and members are allowed to ask friends.

IMPROVEMENTS AT MANSFIELD, OHIO

The Mansfield Railway, Light & Power Company, of Mansfield, Ohio, operating city lines in Mansfield, and an interurban line from Mansfield to Shelby, is making some important improvements to its system. About 3 miles of city track are being relaid and rebuilt with 7-in. T-rail, and considerable special work is being put in. Heretofore the engines in the main power station have been run non-condensing, but a large condenser plant is now being installed. City water is used, and as it was found desirable to use the condensing water over and over again, a cooling tower, 32 ft. x 21½ ft., having 4000 sq. ft. of cooling surface, is being installed. Water enters at the top and falls in sprays, passing over numerous rows of tile. Radiation is aided by two large motor-driven fans. The new condenser is of the Wheeler surface type of sufficient size to take care of the present 1500-hp of engines and contemplated increased capacity. The entire outfit was installed by the Stillwell-Bierce & Smith-Vaile Company, of Dayton. The Railway & Light Company has just secured a ten-year contract to furnish city lighting and is installing in its main station suitable transformers, oil switches and switchboards to take care of 250 arc lights, to be operated under the series alternating system.

The company recently experienced on its Mansfield-Shelby line a strong demand for freight service. Not caring to go to the expense of buying a freight car until the service proved profitable, the company decided to utilize a large double-truck open car that had been found impractical for interurban service. The seats were taken out and a sheathing of matched siding was placed horizontally on the side posts, and then another sheathing outside of this was placed vertically. Large double doors were cut in the sides and made to slide in grooves on the outside. The car was fitted with four 35-hp motors, also air brakes, and is doing excellent service. Two round trips per day are made between Mansfield and Shelby, and a rate of 7 cents per cwt. is made on practically all goods for the 12 miles, with a minimum charge of no less than 25 cents for a package. The company carries a large number of trunks for traveling men, as the road forms part of the only direct route between Mansfield and Cleveland.

INTERNATIONAL ELECTRICAL CONGRESS

The acceptances of membership in the International Electrical Congress, which will be held Sept. 12-17, in St. Louis, number 1702, and over 160 specially invited papers are promised, in all. One thousand certificates of membership have been issued to those who have become members by sending in their subscription, and about 100 more certificates are about to be issued.

Efforts are being made to secure the manuscripts of as many of the 160 papers as possible, by July 1, in order to have them printed in advance and distributed among the congress members at St. Louis. Thus far, six papers have been delivered, and many more are promised by that date.

The programmes scheduled for Sections D and E, which cover electric power transmission and electric lighting and distribution, are here given. A similar programme for Section F, which is that on electric railways, will appear in an early issue.

All communications concerning the congress should be addressed to the general secretary, Dr. A. E. Kennelly, Harvard University, Cambridge, Mass.

SECTION D

Electric Power Transmission. Chairman, Mr. Charles F. Scott; secretary, Dr. Louis Bell.

Sig. E. Bignami, "Electrical Transmission Plants in Switzerland."

H. M. Hobart, "Conditions Conducive to Economy in Motor Design."

Mons. Maurice Leblanc, "Transmission of Alternating Currents Over Lines Possessing Capacity."

Prof. G. Mengarini, "Utilization of Hydraulic Powers in Italy."

Prof. F. G. Baum, "High-Potential Long-Distance Transmission and Control."

P. O. Blackwell, "The Tower-System of Line Construction."

H. W. Buck, "The Use of Aluminum as an Electrical Conductor."

V. G. Converse, "High-Tension Insulators."

M. H. Gerry, Jr., "Line Construction and Insulation for High Tensions."

L. M. Hancock, "Bay Counties Transmission System."

R. L. Hayward, "Some Practical Experiences in the Operation of Many Power Houses in Parallel."

J. F. Kelly and A. C. Bunker, "Long-Distance Power Transmission."

P. M. Lincoln, "Transmission and Distribution Problems Peculiar to the Single-Phase Railway System."

R. D. Mershon, "The Maximum Distance to Which Power Can Be Economically Transmitted."

P. N. Nunn, "Pioneer Work of the Telluride Power Company."

J. S. Peck, "The High Tension Transformer in Long-Distance Power Transmission."

Dr. F. A. C. Perrine, "American Practice in High Tension." N. E. L. A. paper.

Dr. C. P. Steinmetz, "Theory of Single-Phase Motors." A. I. E. E. paper.

SECTION E

Electric Light and Distribution. Chairman, J. W. Lieb, Jr.; secretary, Gano S. Dunn.

Prof. André Blondel, "Impregnated Arc-Light Carbons."

Herr Max Déri, "Single-Phase Motors."

Herr E. de Fodor, "Rates for Electricity Supply."

Sig. Ing. E. Jona, "Insulating Materials in High-Tension Cables."

Prof. W. Kubler, "Upon a Means for Compensating the Series Connection of Induction Motors."

Herr Karl Roderbourg, "Storage Batteries."

Sig. Ing. Guido Semenza, "Commercial Limits of Electric Transmission, with Special Reference to Lighting Service."

Dr. G. Stern, "The Superiority of the Alternating Current for Distribution in Large Cities."

Dr. W. Wedding, "Measurements of the Energy of Light and Heat Radiation from Electric Light Sources."

Arthur Wright, "Recent Improvement in Electrolytic Meters."

Prof. S. P. Thompson, subject to be announced.

B. A. Behrend, "The Testing of Alternating-Current Generators."

George Eastman, "Protection and Control of Large High-Tension Distribution Systems." N. E. L. A. paper.

W. C. L. Eglin, "Rotary Converters and Motor Generators in Connection with the Transformation of High-Tension Alternating current to Low Tension Street Current." Assn. Ed. Illg. Cos. paper.

W. L. R. Emmet, "The Effect of Steam Turbines on Central Station Practice."

Louis A. Ferguson, "Underground Electrical Construction." Assn. Ed. Illg. Cos. paper.

Gerhard Gottling, "Storage Batteries as an Adjunct to Central Station Equipment." Assn. Ed. Illg. Cos. paper.

G. Ross Green, "American Meter Practice." N. E. L. A. paper.

Caryl D. Haskins, "Metering Efficiency on Customers' Premises."

Francis Hodgkinson, "Steam Turbines."

John W. Howell, "Incandescent Lamps."

Philip Torchio, "Distributing Systems from the Standpoint of Theory and Practice."

W. F. White, "The Selection of a Distributing System for a Large City."

NEW YORK CENTRAL MAY FIGHT TROLLEYS

It is reported that the New York Central management, after long and careful consideration of the conditions which prevail, has finally decided to meet the competition of the trolley roads which parallel its lines, by providing for frequent fast service between local stations, and equipping some of its line with electricity. A. E. Brainard, the representative of the Central's passenger department, located at Albany, is quoted as having stated that George H. Daniels, the general passenger agent, has been making a study of electric line competition for a long time, and has worked out a schedule of prices and service, which "it is thought will change some the quarterly reports of the trolley lines."

AMENDING THE LOUISIANA "JIM CROW" LAW

A bill has just been introduced in the Louisiana State Legislature, known as "House Bill No. 87," providing for separate cars for the races in lieu of the wire screens now in use on street railways in the State. During the last session of this assembly the "Wilson 'Jim Crow' Law" was enacted, causing much inconvenience and expense to street railway companies and some little annoyance to the public, but after a few weeks the law enforced itself and things have been moving smoothly. The passage of such a bill as proposed by Mr. Seeber affecting towns of 25,000 or more inhabitants, will virtually be effective only in New Orleans and Shreveport, and will prove a great inconvenience, as local conditions hardly justify the use of trailers as suggested. Moreover, the public of New Orleans has grown accustomed to the "Wilson Law."

THE INTERNATIONAL ENGINEERING CONGRESS

This congress, which will be conducted under the auspices of the American Society of Civil Engineers, will be held at St. Louis Oct. 3-8, or the week previous to the meeting of the American Street Railway Association. The papers to be presented are by engineering authorities from all parts of the world, and cover thirty-eight different subjects; among them are several which bear directly upon electric railway work. Among the latter are the following:

Three papers on "Underground Railways," by William Barclay Parsons, chief engineer, Rapid Transit Commission, New York City; Basil Mott and David Hay, Central London and City & South London Railways, England; and M. Biette, adjoint d l'Ingenieur en Chef du Chemin de fer Metropolitan de Paris, France.

Two papers on "The Substitution of Electricity for Steam as a Motive Power," by James G. White, New York City, and Alexander Siemens, London, England.

Two papers on "Steam Turbines," by Francis Hodgkinson, Pittsburg, Pa., and M. Rateau, Professeur a l'Ecole des Mines, France.

One paper on "Electrical Power Generating Stations and Transmission," by L. B. Stillwell, New York City.

STEAM AND ELECTRIC STATISTICS FROM MASSACHUSETTS

In a recent issue, the "Boston Financial News" publishes the following statistics of the steam and electric roads of that State for the year ending Sept. 30, 1903. The steam statistics include earnings, etc., not only in Massachusetts, but in all of the States operated in, so for this reason the comparison is unfair to the electric lines, which, with few exceptions, transact practically all of their business in the State. But, inasmuch as the steam roads do not differentiate between the business originating in the various States operated in, the reports must be taken as a whole.

The statistics are as follows:

	Steam Roads	Electric Roads	Total
Gross earnings	$93,325,932	$25,540,811	$118,866,743
Operating expenses	67,774,864	17,519,367	85,294,211
Net earnings	25,551,068	8,021,444	33,572,512
Percentage of operating expenses to gross	72.62	68.59	
Gross earnings per mile of track	$19,020	$10,124	
Net earnings per mile of track	5,207	3,180	
Passengers carried	123,162,793	504,662,243	627,825,036

The following figures are also given for the electric roads only:

	1903		1893	
	Gross	Net	Gross	Net
Per car mile, cents	23.76	7.46	30.28	9.23
Per passenger carried, cents	5.06	1.59	5.04	1.54

NEW PUBLICATIONS

Up-to-date New York Air Brake Catechism. By Robert H. Blackall, author of Westinghouse Air Brake Catechism. Published by Norman W. Henley Publishing Company, 132 Nassau Street, New York, 250 pages. Illustrated. Cloth, Price $1.25.

This book is intended to fill the demand which has been created by the increasing use of the New York air brake, for a complete description of the parts of the apparatus employed to be presented clearly and concisely in a single volume. This is the only complete treatise that has been issued on the New York air brake and signaling apparatus, and was written with the idea of furnishing information, not only for those who are interested in handling the brake, but for those as well who have to do with the installation and maintenance of it. A detailed description is presented of the plain and quick-action triple valves, the duplex pump, pump governor, brake and retaining valves, signal valves and other features of the New York equipment. Detailed information is also presented bearing on the peculiarities and troubles met in the care of the New York apparatus, together with their remedies, which will be of particular value to those using this system. An important feature of this book is the clear and instructive drawings presented, illustrative of the various portions of the apparatus. The book is carefully indexed for ready reference to any desired information.

Ready Reference Tables, Volume 1, Conversion Factors. By Carl Hering. Published by John Wiley & Sons, New York; 195 pages, full morocco. Price, $2.50.

The present is one of several volumes in preparation by the author and contains all the principal units used in engineering practice, and in commerce, with their definitions, logarithms, and constants used for converting them to other dimensions or measurements of the same character. Approximate conversion values have also been added so as to reduce the calculations to the simplest possible, and are so selected that the result will be correct within 2 per cent. A great many unusual, foreign and obsolete units are given, as well as a great many compound units with equivalents in other measure. A condensed list occupying three pages appears inside the first cover. To those who have much computation to do, especially the conversion between English and metric measures, the book will be most useful.

STREET RAILWAY PATENTS

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

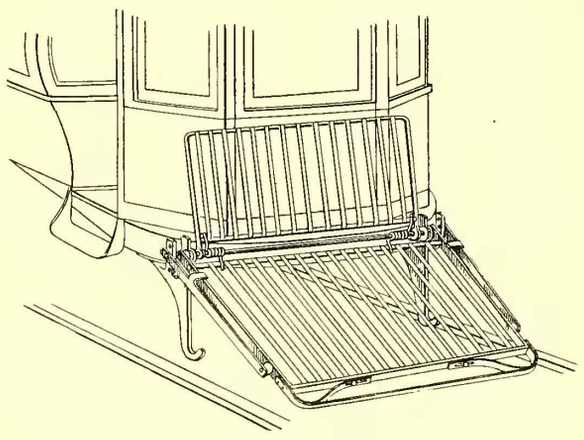
UNITED STATES PATENTS ISSUED JUNE 7, 1904

761,637. Trolley Guard; Linwood B. Aikens, Rockledge, Fla. App. filed March 24, 1904. At each side of the trolley wheel is eccentrically mounted a roller which is adapted, when the wire leaves the wheel and falls upon it, to rotate and lift the wire to a position where it will fall into the groove of the wheel.

761,687. Safety Attachment for Cars; Benjamin Lev, Cleveland, Ohio. App. filed Oct. 17, 1902. Means whereby when an obstruction is engaged and picked up by the fender, it will drop at the rear and rise in front, to thereby form a cradle.

761,692. Car Brake; William C. Mitchell and Mark Cummings, Trafford Park, England. App. filed Oct. 13, 1903. Means whereby the brake-blocks are applied with substantially equal pressure to the wheels on each side of the car, even though different amounts of wear have occurred, and it is necessary to move the brake-blocks on one side through a greater distance than those on the other side of the car when applying the brakes.

761,736. Passenger Traffic Handling Apparatus; Walter Wellman, Washington, D. C. App. filed Nov. 14, 1903. The train is provided with special entrance and exit cars thereby facilitating loading and unloading thereof.



PATENT NO. 761,687.

761,737. Railway Car; Walter Wellman, Washington, D. C. App. filed March 19, 1904. The seats are arranged upon a raised platform extending longitudinally of the car.

761,785. Car Seat; David Rait, Jr., Larchmont Manor, N. Y. App. filed Nov. 17, 1903. The seats are adapted to be folded against the side of the car to thereby provide greater standing room.

761,848. Trolley Signal; Charles H. Morse, Cambridge, Mass. App. filed June 27, 1901. Details.

761,928. Means for Contacting Electrical Conductors; Frederick G. Walker, Cleveland, Ohio. App. filed Aug. 12, 1903. Two trolley wheels mounted at an angle with their rims together thereby forming a single groove for the wire.

762,191. Means for Changing the Tracks of Tramways or Railways Having Movable Rails; Ottaviano Pacini, Pistoja, Italy. App. filed July 24, 1903. A switch, a box, a rail movable therein, wings on each side of the rail, and sheets fixed to the box under

which the wings are adapted to slide, the rail and sheets having their upper surfaces flush.

762,219. Combined Cash-Register, Ticket Register, and Bell Ticket Punch; Paul Whiting, East Las Vegas, Territory of New Mexico. App. filed June 10, 1903. Details of construction.

PERSONAL MENTION

MR. CHARLES T. YERKES was a passenger on the Kaiser Wilhelm II., which sailed Tuesday, June 14, from New York for Bremen.

MR. JOHN R. KREIDER, of Lancaster, Pa., has been made superintendent of the newly opened York Furnace Electric Railway, operating in York Furnace, Pa.

MR. RICHARD McCULLOCH, son of Captain Robert McCulloch, general manager of the St. Louis Transit Company, has assumed the duties of assistant general manager of the company.

MR. JOHN POWERS, of Sterling, Ill., has been appointed general superintendent of the Sterling, Dixon & Eastern Electric Railway Company. He is a man of fifteen years' street railway experience.

MR. WALTER B. MAHONY, associated with Emerson McMillin & Company since 1900, will form a connection on July 1 with Hodenpyl, Walbridge & Company, bankers, of 7 Wall Street, New York City, who control and operate gas, electric light and street railway properties.

MR. H. H. VREELAND, president of the New York City Railway Company, will address the Steam Railroad Master Mechanics' Association in Saratoga next week, on the importance of the mechanical and motive power departments of the steam roads familiarizing themselves with the principles and practical operation of electric apparatus. Mr. Vreeland's talk on this subject will be given on June 22.

MR. A. L. NEEREAMER has been appointed traffic manager of the Columbus, Delaware & Marion Electric Railway, of Columbus, Ohio, in charge of traffic and transportation, with offices at Columbus. The offices of general passenger and freight agent and superintendent have been abolished.

MR. A. G. DAVIDS, formerly superintendent of the Chester Traction Company, of Chester, Pa., has returned to Chester after an absence of two years as superintendent of the Auburn City Railway, of Auburn, N. Y., to become superintendent of the southeastern line of the Chester Traction Company.

MR. A. D. BOWEN, assistant president of the Petaluma & Santa Rosa Electric Railway Company, has withdrawn from that position, although he will retain his interest in the company. The detail work heretofore handled by Mr. Bowen will hereafter be attended to by Mr. E. L. Van der Naillen, the resident engineer of the new railway.

MR. DAVID YOUNG, JR., son of the former general manager of the North Jersey Street Railway Company, now part of the Public Service Corporation, of New Jersey, was married quite recently to Miss Daisy Wadsworth, of Newark, N. J. Mr. Young formerly was connected with the North Jersey Company, but now has an important position with the United Railroads of San Francisco.

MR. G. J. PAUL, for some time general manager of the People's Light & Railway Company, of Streator, Ill., has been confined to his home with a severe illness for some weeks. He was to have succeeded Mr. Godfrey Morgan as superintendent of the Youngstown & Sharon Railway, of Youngstown, Ohio, on May 1, but was unable to assume his new duties, and it is still uncertain when he will be on duty.

MR. J. R. RICHARDS has been appointed roadmaster of the Rochester Railway Company, of Rochester, N. Y. This is a new position. Mr. Thomas G. Hicks is at present superintendent of tracks, and Mr. Richards will work in conjunction with Mr. Hicks. Mr. Richards comes from Buffalo, where he has been for the past three years roadmaster for the International Railway Company. Previous to 1900 he was employed in a similar capacity by the Milwaukee Electric Railway & Light Company.

MR. S. S. FOLWELL, manager of the street railway department of G. D. Peters & Company, London, was in New York this week winding up a visit of some two months in this country. Mr. Folwell states that the business outlook on the other side of the Atlantic is good. G. D. Peters & Company have just secured the contracts from the Underground Electric Roads of London, Ltd., for the car seats and blinds for the 420 new electric cars which will shortly be used in the District Underground Railway. The seats are of the "Hale & Kilburn" type.

DAMON-DILLER.—Announcement is made of the marriage on Wednesday, June 8, of Miss Harriet Diller, daughter of Mr. and Mrs. Henry B. Diller, of Chicago, to Mr. George Alfred Damon. Mr. Damon is managing engineer of the Arnold Electric Power Station Company, of Chicago, and is one of the most promising and popular of the younger electrical engineers of that city. It is not considered good form to congratulate the bride on such occasions, but those acquainted with Mr. Damon feel that this rule should be set aside in this case, on account of the sterling qualities of the groom.

MR. GEORGE F. McCULLOCH has resigned as president and general manager of the Indiana Union Traction Company, of Indianapolis, Ind., to devote himself exclusively to his newspaper enterprises, he having recently purchased and consolidated the "Indianapolis Journal" and the "Indianapolis Star." Mr. McCulloch is a member of the electric railway test commission that will conduct the test at the Exposition. His successor in the Traction Company is Mr. W. Kesley Schoepf, president of the Cincinnati Traction Company, and a director of the Indianapolis Traction & Terminal Company.

MR. PAUL M. MOWREY, who for the last three years has been connected with the Merchants' Trust Company as adviser on industrial investments, has assumed the office of vice-president of the Engineering Company of America, 74 Broadway, New York. Mr. Mowrey has been prominently identified with the engineering and contracting business sinse 1888, when he became connected with the Edison Illuminating Company. Among his numerous successful enterprises was the purchase and consolidation of the street railway and power companies of Richmond, Va., which were later turned over to Frank Jay Gould.

MR. B. F. WILSON has resigned as commercial agent of the Puget Sound Electric Railway Company, of Tacoma, Wash., to accept a position in the offices of the Kansas City, Fort Scott & Gulf Railroad. Mr. Wilson will be succeeded in the local offices of the Interurban by Mr. M. McKay, formerly assistant general freight agent of the Yukon & White Pass Railroad. Mr. McKay was also connected for a number of years, it is understood, with various railroads on the coast, among which was the Rock Island road. He was with the Rock Island in Portland for a long period, and is well known in railroad circles throughout the West.

MR. E. A. ZIFFER, of Vienna, M. A. S. C. E., M. I. C. E., etc., and president of the Lemberg-Czernowitz Railway, celebrated on May 24 the fortieth anniversary of his connection with that company. Mr. Ziffer is one of the oldest and best-known Austrian railway engineers, and although in his seventy-second year, he still enjoys enviable health and strength, and attends to his numerous duties with undiminished activity. He was born in 1833, and in 1852 had already completed his studies at the Vienna Polytechnic, studied architecture at the Vienna Art Academy, and had seen active service in the uprising of 1848. After working on a number of other railways, he became, in 1864, chief engineer of construction work on the Lemberg-Czernowitz-Jassy Railway, traffic manager in 1866, and technical director in 1868. Until May, 1875, he was the technical advisor of the board of managing directors, in that year becoming a member of the board. He has been its president since 1893. Mr. Ziffer on several occasions has ben decorated with medals and crosses of high Austrian orders, and is also an honorary citizen of the cities of Czernowitz and Janow. He enjoys a high reputation in steam and electric railway circles, and has contributed a number of articles to the Street Railway Journal on street railway practice in Europe. He has been for a number of years one of the members of the executive committee of the Internationale Strassenbahn und Kleinbahn Verein (International Street Railway & Light Railway Association) which this year will hold its annual convention in Vienna during the early art of September. In 1893 he founded the Verein für die Förderung des Local und Strassenbahnwesens, the Austrian Street Railway Association, and has been for a number of years its president. Mr. Ziffer has always been an enthusiast in all matters relating to railway work, and both of his sons are prominent railway officials in the employ of the Austrian Government.

E. A. ZIFFER